YEARBOOK 2022-2023
Honors Academy
Bachelor
COLOPHON

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DEAR HONORS BACHELOR STUDENTS,

As we approach the end of the academic year, it is a time for reflection and celebration of our achievements. This year we have been able to return to campus and engage in various activities, culminating in the highly anticipated demo day. It has been truly inspiring to witness the creativity, originality, and dedication displayed by all of you in the Honors Academy projects across the nine tracks. As a member of this vibrant community, I am immensely proud and grateful to have worked alongside you.

Throughout the year, we have seen a multitude of accomplishments from our Honors students. From designing innovative technological solutions to tackling complex societal issues, the impact of your work has been far-reaching and inspiring. This Yearbook serves as a testament to the passion, hard work, and perseverance of our students.

As we look ahead, some of you will be completing your Honors Bachelor’s degree. Congratulations on this momentous achievement. You have worked tirelessly to reach this point, and your dedication and commitment have not gone unnoticed. I wish you all the best in your future studies and careers, and encourage you to continue pushing boundaries and challenging yourselves to make a positive impact on the world.

For those of you considering the Honors Master Program, I urge you to continue your journey with us. The Honors Academy provides a unique opportunity to pursue your passions and work alongside likeminded individuals in a challenging and supportive environment. I am confident that this program will continue to inspire and empower you to achieve your full potential.

Once again, I extend my sincere gratitude and admiration to all of our Honors students for their exceptional work and contributions. You have made this year one to remember, and I am honored to be a part of this community.

Best regards,

Mark Bentum
Dean of the Honors Academy
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ABOUT THE TRACK

How can society and science benefit from AI? Which are AI downsides? Which are AI limitations and how they can be overpassed? Do I really like working on AI or is it just the societal hype? Take few more reflections moments. One common approach would be to define AI as the study of intelligent agents. Agents can be anything, from devices to pieces of software. They can learn from data/environment/experience to maximize their chances of succeeding in a goal. Reflection moment: Are these really universal truths? Traditional AI problems involve reasoning, planning, learning, perception, pattern and image recognition, etc. AI encompasses several subfields. Within this Honors track, the main focus will be on machine learning, data mining, deep learning, deep reinforcement learning methods, but also other subfields (e.g. symbolic reasoning, evolutionary computation) and related fields (e.g. complex systems, neuroscience, optimization) will be addressed. The work will be performed in multidisciplinary teams, following the problem-based and design-based learning approaches. All teams will focus on the technical and scientific aspects of AI, except one which will focus on AI philosophical aspects. All teams will interact with each other.
TRACK COORDINATORS

Sibylle Hess and Wouter Duivesteijn

As the track coordinators of the Honors Academy, we have had the pleasure of overseeing a diverse range of projects that showcase the talents and passions of our students. It has been a rewarding experience to see the students take on challenging projects and to witness their growth as individuals and as a team. The AI track is particularly challenging since the field is vast and borrows ideas from multiple mathematical disciplines. We enjoyed guiding the students to develop new skills and getting up to speed with the current state of the art. Through their hard work and dedication, the students have not only created impressive projects but also developed valuable soft skills such as leadership, teamwork, and communication. The sense of community and collaboration that has emerged within the Honors Academy is a testament to the hard work and enthusiasm of the students, as well as the valuable contribution of the coaches, whose efforts made the success of this track possible. We are proud of what the students have achieved and excited to see what they will accomplish in the future.

COACHES

Zeno van Cauter

Coaching the Honors Academy has been an incredibly joyful experience for me, as well as an opportunity to witness the power of artificial intelligence (AI) in education. From the first day, I was struck by the passion, curiosity, and dedication of the students, who were eager to explore and utilize cutting-edge technologies in their projects. The students also explored the use of AI in many different directions and demonstrated how these technologies could be used to solve real-world problems. It was an honor to be a part of that journey. I am grateful for the opportunity to work with such an extraordinary group of young people who are not only passionate about AI but also making a positive impact on the world.

Pei Yulong

Being a coach of the Honors Academy is an exciting journey. Different from teaching courses and supervising students, in the Honors Academy program, you will work with students with different backgrounds and different ambitions. The projects are challenging not only because they are mostly open questions but also because they include technical work, collaborating with teammates, managing time, etc. The coaching is bidirectional. It means that you help students to achieve their goals from both perspectives of research and personal development and at the same time you can learn from these young and creative students. Overall, observing students improving themselves and becoming better in projects, teamwork, time management, and lots more practical developments makes me feel that this work is really rewarding.

Pratik Gajane

Being a coach of the Honors Academy is a rewarding and fulfilling experience. It provides me an opportunity to share knowledge and skills with highly motivated students, helping them to grow and develop. Coaching sometimes also challenges and inspires me to learn more and leads to meaningful interactions and connections with students. The sense of accomplishment that comes from seeing students succeed and thrive is immensely satisfying.
ABOUT THE PROJECT

We have conducted an investigation into the utilization of Artificial Intelligence for 3-dimensional terrain generation in the visual effects and games industry. Initially, our exploration focused on a diffusion-based approach, considering the recent advances and surge in popularity of this technique. Due to the considerable computational expenses associated with training diffusion models, both in terms of compute time and GPU VRAM usage, we had to prioritize optimizing our model to the best of our abilities, given our limited access to computational resources.

The primary motivation behind this project is to enhance the workflow efficiency of environment artists. However, this AI-powered solution could also be implemented at various stages throughout the visual effects pipeline. Currently, the generation of intricate terrains such as mountain ranges and river deltas relies heavily on specialized and resource-intensive software that simulates realistic erosion caused by wind, precipitation, and rivers. By employing an AI-powered model, we eliminate the need for these time-consuming processes, enabling artists to iterate through different ideas and terrain types swiftly.

OUTCOMES

This project has had several noteworthy results, including ethical considerations regarding generative AI. One significant observation is that the use of AI in terrain generation has undeniably enhanced the efficiency of artistic work. While there are concerns and potential risks associated with generative AI, the prevailing sentiment is that the benefits outweigh these concerns. The general consensus acknowledges the fascinating nature of AI but recognizes that it has not yet become an integral part of the average artist’s process. Some differing opinions persist regarding the ability of AI to be truly creative, further fueling the ongoing debate in this field.

One of the most significant achievements of this project is the development of image-to-image functionality, particularly in the context of inpainting. This breakthrough allows for the seamless generation and reconstruction of missing or damaged parts in terrain images, providing artists with a powerful tool to refine their creations.

Looking ahead, there are many ways in which the project could be extended. One such recommendation involves expanding the dataset used for training the AI model. In fact, one of the main hurdles we had to overcome was obtaining the data we needed: all the
pictures we used to train the model had to be selected and reformatted manually. By incorporating a larger and more diverse dataset, the model’s ability to generate realistic and varied terrains can be improved.

Additionally, we wanted to transform the project into a Blender plugin. This would facilitate ease of use and integration within existing workflows, enabling artists to seamlessly incorporate AI-generated terrains into their visual effects and gaming projects. Such a plugin would enhance accessibility and make the benefits of generative AI more readily available to a wider range of artists and developers.

**MEmORIES**

Our best memory of the year undoubtedly centers around a significant milestone in the project — the final model’s ability to generate a smiley-shaped mountain. It stands as a testament to the team’s collective effort and dedication, illustrating the satisfying result of our hard work and perseverance.

Witnessing the model’s progress week after week was always exciting. The entire project was a team effort where each of us brought our own ideas and skills to the table, and we all put our heads together to problem-solve and overcome all the challenges we faced throughout the year.

The smiley-shaped mountain is a tangible representation of our progress and innovation. This accomplishment not only demonstrates the power of AI but also showcases the potential for creativity and imagination within the realm of generative technologies.

**LESSONS**

As a team, throughout this project, our focus was exploring and learning about diffusion AI models. By delving into the intricacies of this technique, we gained a deeper understanding of its applications and potential in image generation. This allowed us to apply the recent advances in diffusion models to our terrain generation process.

A valuable lesson we learned was the value of collaboration and teamwork. Working together, combining our perspectives, skills, and knowledge, allowed us to overcome challenges more effectively and achieve our goals. Throughout the year, our communication improved as we got to know each other, and we’re confident that we would be able to achieve even better results next year.

Our advice for future Honors students undertaking similar projects is to embrace the iterative nature of research and development. It is important to expect setbacks and challenges along the way and not be discouraged by them. Instead, view them as opportunities for growth and learning. Persevering, adapting, and being proactive in seeking solutions will help you navigate through the project successfully. Additionally, don’t hesitate to talk to your teammates if you’re feeling stuck, a change of perspective might be just what you need.

Finally, we would like to emphasize to our peers the significance of finding a balance between ambition and self-care. Engaging in your Honors project can be demanding, so taking some breaks, seeking support when you need it, and celebrating small victories along the way are all essential to staying positive and motivated. Remember that personal growth and happiness are just as important as academic achievements.

**MEET THE TEAM**

Tudor Macovei
• 2nd year Honors student

Sytze Sies
• 1st year Honors student

Max Schoenrock
• 1st year Honors student

Matilda Fogato
• 1st year Honors student

Andreea Murariu
• 2nd year Honors student

Coaches:
Zeno van Cauter
Andrei Simon Constantinescu
ABOUT THE PROJECT

The goal of the project was to achieve data compression through the usage of an artificial intelligence model, in particular, one that utilized a diffusion-based architecture. As such, we embarked into creating such a model, capable of compression an image to a fraction of its original size. A successful and practical implementation of a model capable of this can have significant effects to society or at least the internet infrastructure. This is because it would allow for significant decrease in the required size to store pictures circulating in the web in data centres (locations which host databases and servers, providing infrastructure for the web and its applications). As such it could potentially the overall power usage of such facilities, reducing in effect, their carbon footprint (assuming usage of fossil fuels to power them).

OUTCOMES

During the course of the project, we learned a significant amount of theory regarding compression and artificial intelligence models, how exactly they train to achieve a particular goal, how a particular goal (such as an encoding or decoding an image) can be translated to some mathematical formula (the loss) and how an A.I. architecture affects the feasibility of such goal. As a result, we developed 3 distinguished models, 2 capable of doing lossy compression on different datasets and one that can do lossless (through a scheme called BB-ANS).
MEMORIES

The best memory of this Honors year was when we successfully developed our first model, the one capable of doing compression in the MNIST dataset. This is because, we had spent months reading through research on the architecture and compression techniques while also slowly writing the code necessary to apply the research itself. When we finally compressed, decompressed our first image and got satisfiable results, it was a moment of glee while also fueling us to go further with more advanced algorithms and models.

LESSONS

The most valuable lessons we learned was to be patient and understand the research. This means going through the theory, the math and also asking the right questions (online or otherwise). Moving the theory to an applicable A.I. model is another feat by itself but learning to use (and understand) other similar open sourced projects to help guide your own was important to achieve what we have.

Our advice to future Honors students is to set up a meaningful schedule with your team members, such that you remain on the same page as to what it is you have to do (in regards to your team’s project) and help each other figure out weaknesses and strengths (very important!). As for anyone that wants to go into the A.I. track, be prepared to learn a lot of useful stuff (but might be a bit rough at the start if you are completely new to the subject).

MEET THE TEAM

Angelos Ermis Mangos
• 1st year Honors student

Simon Sukup
• 1st year Honors student

Isidora Stojadinović
• 2nd year Honors student

Austin Roose
• 1st year Honors student

Coach:
Pratik Gajane

“The easiest way is usually the longest one. Try to run through it though.”
ABOUT THE PROJECT

In recent years, the advent of artificial intelligence (AI) has revolutionized various industries, with the art world being no exception. AI models like DALLE-2 and Midjourney have demonstrated the potential of using AI to generate art from textual descriptions. Our Honors project, “Generate Arts from Keywords,” takes a slightly different approach by employing a GAN (Generative Adversarial Network) model to generate art from user-specified keywords.

The societal impact of our project is diverse, as it democratizes the art creation process and promotes accessibility. In the field of education, both students and teachers could use our model to explore various artistic styles, experiment with visual storytelling, and nurture creativity. For creative professionals such as artists, designers, and advertisers, the tool can serve as a source of inspiration, facilitating the generation of unique and contextually relevant art pieces.

OUTCOMES

The outcomes of our project are primarily focused on the development of a GAN-based model and the exploration of its potential applications in various societal domains. However, due to the lack of processing power, we have not yet been able to generate images as initially planned.

The most significant results of our project include the successful implementation of the GAN-based model, which demonstrated its potential to learn patterns, styles, and relationships between keywords and visual elements.

Despite not being able to generate images yet, our project serves as a foundation for future research and development in the field of AI-generated art.

As follow-up suggestions, we propose to secure additional computational resources, such as cloud-based GPU platforms, to further refine the model so that its ability to generate artwork is improved and to possibly develop a user-friendly interface for easy interaction and customization.
MEMORIES

Throughout our Honors experience, one of the most cherished aspects was the sense of community fostered among a diverse group of smart and passionate individuals. Despite being part of a technical university, we found ourselves engaging in complex and stimulating conversations that transcended technical subjects, delving into various facets of life, psychology, and, at times, even philosophy!

Rather than a single standout memory, it was the cumulative moments spent together over this year during our lunch breaks and impromptu tea times in the Honors Room that truly resonated with us. These gatherings were filled with warmth, laughter, and lively discussions, creating a wholesome atmosphere. Surrounded by warm-hearted people, we realized that these seemingly small, recurring moments held a profound impact on our collective experience, motivating us to grow and learn together.

We believe that the essence of the Honors program extends beyond academic accomplishments, encompassing the lasting connections created and the unforgettable experiences cherished by this community of intelligent, curious individuals, built up over the course of time.

LESSONS

Throughout our project, our journey as beginners in the realm of AI was filled with numerous lessons. The steep learning curve involved understanding the basics of AI and machine learning, and diving into advanced concepts like GANs and CNNs (Convolutional Neural Networks).

The most valuable lesson learned from this project was the importance of perseverance, self-sufficiency, and adaptability. Tackling a complex topic without prior knowledge required dedication, curiosity, and resilience in the face of challenges. This experience has highlighted the significance of continuous learning and the willingness to embrace new ideas.

For future Honors students, it’s essential to be self-sufficient, start projects early, and balance teamwork with individual responsibility. Actively seek information and manage time effectively to ensure success. Be curious, persistent, and open-minded, and always remember that the pursuit of knowledge and innovation can transform the world!

MEET THE TEAM

Armand Viorel Ilăș
• 1st year Honors student

Georgi Tsonkov
• 1st year Honors student

Lam Mo Cheuk
• 2nd year Honors student

Damla Savaş
• 2nd year Honors student

Coaches:
Zeno van Cauter
Andrei Simion Constantinescu

“We keep moving forward, opening new doors, and doing new things, because we’re curious and curiosity keeps leading us down new paths.”
Walt Disney
ABOUT THE PROJECT

The goal of our project is to create an AI tool that recommends Spotify tracks based on color. By associating colors with music, you aim to provide a unique and visually appealing way for users to discover and explore new music. The tool would likely allow users to select or input a particular color, and based on that color, the AI system would generate music recommendations that are thought to match the mood or aesthetic associated with that color.

The contribution our project team wants to make to society is to enhance the music listening experience by introducing a novel method of music discovery. By incorporating color as a factor in recommending tracks, you hope to offer users an alternative and engaging way to find music that resonates with their current mood or desired ambiance. This approach can be particularly helpful for individuals who are visually inclined or have a strong association between colors and emotions.

Moreover, this project can contribute to the broader field of AI-driven music recommendation systems. By exploring unconventional parameters like color, you may uncover interesting patterns and connections between music and visual aesthetics, leading to new insights into the intersection of music, psychology, and perception.

OUTCOMES

The outcome of this project has resulted in the successful creation of a recommendation system utilizing a variety of AI techniques, notably unsupervised learning methods like Autoencoder. The dataset utilized for this purpose comprises audio analysis of tracks. We were genuinely astonished by the remarkable diversity of features, including beats and segments, within songs, and the profound impact they have in generating track recommendations.

As a following up step, we intend to augment the dataset by encompassing a broader array of music genres, artists, and styles, thereby ensuring a larger and more diverse corpus. Additionally, we plan to undertake further research into alternative or advanced unsupervised learning techniques. Simultaneously, we are keen on incorporating User Feedback into our system to not only enhance its performance but also personalize it according to individual preferences.

This knowledge could potentially improve existing recommendation algorithms and pave the way for more personalized and intuitive music discovery experiences.
MEMORIES

One of the most cherished memories from our Honors year is the countless hours we spent together in meetings, discussing and planning. Many of us were initially unfamiliar with AI before joining the program, and that created a strong bond as we pushed each other to learn and grow. It’s these shared experiences of supporting one another and pushing our limits that have left a lasting impact on our team’s friendship.

LESSONS

The most important lesson we learned during our Honors year is the value of working together as a team. By utilizing the unique skills, perspectives, and knowledge of each team member, we accomplished impressive results that surpassed what we could have achieved individually.

I would advise future Honors students to stay determined and committed to their goals. It’s important to seek help whenever needed, as the Honors Academy provides a platform to learn from the talented individuals at TU/e. Embrace the opportunity to learn from a diverse group of people and benefit from their knowledge and experience.

MEET THE TEAM

Alessandro Preiti
• 1st year Honors student

Dimitar Dimitrov
• 1st year Honors student

Phat Le
• 1st year Honors student

Kiril LLiev
• 1st year Honors student

Coaches:
Zeno van Cauter
Andrei Simion-Constantinescu

― Determination fuels the human spirit, while AI amplifies its potential, together igniting a fire of endless possibilities. ―
ABOUT THE TRACK

In this track the students learn about algorithmic problem solving and related computing skills, and put that to the test by participating in competitive programming contests.

The students in the track typically engage in various activities ranging from participating in and training for programming contests to executing research and company projects. While the first year students focus on developing their algorithmic problem solving skills, organizing training sessions and participating in programming contests on various topics (algorithms, algorithm engineering, AI, cybersecurity, algorithmic trading, etc.), the second year students combine participating in programming contests with a research project or company project. All students also participate in the track seminar, where they conduct research into one of their favourite computer science topics and share this with the entire track in presentations of 30-45 minutes. Overall, the students do not only improve their technical skills in programming and problem solving, but also further improve their professional and personal skills along the way.

7 projects
31 students
**TRACK COORDINATOR**

*Kevin Verbeek*

**TRACK COORDINATOR**

I’m an associate professor in the Algorithms, Geometry, and Applications cluster of the Mathematics and Computer Science department. I have been coordinating my track since 2015, and I still enjoy stimulating talented students to reach their full potential!

The year 2022-2023 was finally a year that was completely on campus again, and I was happy to see the students investing a lot of time and energy into training for and participating in various programming competitions. We were somewhat unlucky with the turmoil in the tech sector this year, resulting in Google cancelling all of its programming competitions, but I was impressed with how the students adapted and found new interesting programming contests to participate in. This gives me confidence that, no matter the circumstances, our students will find a way to improve their skills.

The second-year students of the track demonstrated their skills in a project. One group of students developed a simulation that can aid the development of real-life action games in rooms with interactive tiles. We hope that this simulation will be a good steppingstone for our partner to realize such an interactive game room in the near future. Another group worked together with a student from the Networked Society track to study cryptocurrency networks and how resilient they are against attacks.

Yet another group of students worked on algorithmic trading, developing analysis tools on company data that can help in making good trading decisions. Finally, we had a group of students organizing a CTF (capture the flag) group aimed to organize a security competition. They also designed training sessions and presentations for students who wanted to learn about security topics and eventually join the competition. The Stock Market group aimed to combine the market data and company quarterly reports and financial news to analyze investment in a set of companies (portfolio). They came up with new definitions of risk and incorporated it in their analysis. The output of such analysis then can be used to develop a trading algorithm that generates buy/sell signals.

It has been a joy to see these students take ownership of their projects and become more autonomous in their thinking and decision-making. Witnessing their growth and development has been truly inspiring. Throughout the year, I have watched these students learn new skills, and apply them to their projects with great success. It has been incredibly rewarding to see them navigate their way through obstacles, and ultimately achieve their goal. Overall, coaching these students has been a fulfilling experience for me, and I am honored to have been a part of their journey. I look forward to seeing the great things they will accomplish in the future.

**COACHES**

*Pantea Haghighatkhah*

**COACH**


As a coach in the Honors track CPPS, I have had the pleasure of guiding and mentoring some amazing students over the past year. I coached two groups, namely the CTF and the Stock Market groups. The CTF (capture the flag) group aimed to organize a security competition. They also designed training sessions and presentations for students who wanted to learn about security topics and eventually join the competition. The Stock Market group aimed to combine the market data and company quarterly reports and financial news to analyze investment in a set of companies (portfolio). They came up with new definitions of risk and incorporated it in their analysis. The output of such analysis then can be used to develop a trading algorithm that generates buy/sell signals.

It has been a joy to see these students take ownership of their projects and become more autonomous in their thinking and decision-making. Witnessing their growth and development has been truly inspiring. Throughout the year, I have watched these students learn new skills, and apply them to their projects with great success. It has been incredibly rewarding to see them navigate their way through obstacles, and ultimately achieve their goal. Overall, coaching these students has been a fulfilling experience for me, and I am honored to have been a part of their journey. I look forward to seeing the great things they will accomplish in the future.

*Willem Sonke*

**COACH**

This year I coached two groups of first-year Honors students in the Competitive Programming and Problem Solving track. It was inspiring to see the progress they made in their problem solving skills. In the beginning of the year they already got solid results on the EAPC. Later in the year, Google’s Code Jam and Hashcode competitions were cancelled. Some of the students then found and participated in several programming-related contests I didn’t even knew of (including an algorithmic trading contest?). Another group developed an interest in CTF (capture the flag) competitions and at some point was participating in CTFs almost every week for practice – the results speak for themselves. I’m hoping to see all of them in the next year and am looking forward to their results and the projects they will take on!
ABOUT THE PROJECT

The first year of the CPPS honors track has no single, big project which we worked on. However, this does not mean that we did nothing all year. We spent the year improving our algorithmic skills with the goal of competing in programming competitions. This preparation takes form in two parts: algorithmic skills and teamwork. The algorithmic skills we practiced individually using various problems from past competitions, most of us also set the individual goal of solving a certain number of problems by the end of the year. The teamwork we practiced by solving problems together, this includes for example establishing a workflow and improving communication.

Apart from participating in competitions we also research a given algorithm and present it in a seminar. This not only improves our researching skills, but also teaches us how to present our findings in a professional setting.

These skills are not only used for programming competitions, next year we will start working on a bigger project where we can apply our skills. This is also where societal impact will come into play, algorithms have a lot of use cases from regulating traffic to making the internet work.

OUTCOMES

The outcome of our year at honors can be measured by our performance in the competitions that we competed in. Firstly, the Eindhoven Algorithmic Programming Contest (EAPC), the entirety of our track participated in this contest. As it was in the beginning of the year, we had barely had any algorithms to apply and preparation was limited. Still, we placed very well out of the 50 teams that participated we placed 12th, which almost would have gotten us to the next round.

The second competition that we participated in was IMC Prosperity, which was a trading competition where you had to maximize profit. This competition unfortunately was severely out of the scope of our knowledge, this combined with lackluster preparation meant that we scored lower than we should have. All-in-all it was not all in vain, next year we will be once again participating in the EAPC. Here, we will see our improvement of an entire year of practice. We will also participate in other contests from here on out so that we keep on practicing and improving.
MEMORIES

Our favorite moment of the honors year was participating in the EAPC. There was a nice atmosphere, free snacks and, most importantly, balloons! The contest was an overall good learning experience. We set a baseline for our algorithmic skills at the time and our results were also surprisingly good.

LESSONS

In the end we learned a lot in our first year. We learned a lot of algorithms; we learned how to research a certain topic in depth and how to give a long-form seminar explaining that topic. We also learned that preparation is key in whatever you do. If you are not prepared well either in background research or in team coordination, your performance will take a heavy hit when you have to compensate for those flaws. This is also the advice that we would give to future CPPS honors students: when a competition is coming up, practice a lot beforehand as a team. That is the most important factor in how you will do in a contest.

MEET THE TEAM

Sali Basri  
• 1st year Honors student

Georgi Nihrizov  
• 1st year Honors student

Tudor Popescu  
• 1st year Honors student

Anass El Ouasdad  
• 1st year Honors student

Jan van Baast  
• 1st year Honors student

Coach:  
Willem Sonke

“A quote?  
We don’t have a quote!”
ABOUT THE PROJECT

Since the Competitive Programming and Problem Solving track is unlike any other Honors track (it is better, obviously), our first year does not involve working on a specific project. Instead throughout the year, our goal was to develop our programming skills as well as our knowledge of algorithmic problem solving and cybersecurity. These skills will be put into action in our second year when we will be focusing on specific impactful projects tailored to our interests.

OUTCOMES

Although there were significant global events (in the world of Competitive Programming), which prevented us from participating in certain (now defunct) programming contests, our teams (yes, we are actually two smaller teams frankensteined together to write this yearbook entry) did their best to find and partake in competitions within their respective fields of interest. The Pointer Pioneers’ most significant result was placing within the top 4% at the “Space Heroes CTF”, a cybersecurity competition hosted by Florida Tech University. 3B focused more on algorithmic contests, which unfortunately were not as common, so they were not able to attend many. They did however successfully compete in the GAPC, organized by the University of Groningen, where they improved with respect to their first competition.
MEMORIES

As opposed to the stereotypes surrounding Competitive Programming students, our most memorable moments as a group actually involved socialising: we organised the social event for the entire track, where we improved greatly on our social skills, soft skills and organising capabilities. It was also a great teambuilding experience for us as a supergroup.

LESSONS

The most valuable lesson we learned was to always strive to do what you are passionate about. The Competitive Programming and Problem Solving Honors track gives us first years a lot of freedom and resources to pursue the path of our own choosing. Our advice for future Honors students would thus be to capitalise on this given opportunity and make the best out of it by expanding the boundaries of your knowledge and abilities.

MEET THE TEAM

Ivan Georgiev  
• 1st year Honors student

Techna Huynh  
• 1st year Honors student

Teun Peters  
• 1st year Honors student

Gabrielius Rosinas  
• 1st year Honors student

Daan van Uffelen  
• 1st year Honors student

Evy Zandbelt  
• 1st year Honors student

Coach: Willem Sonke

“Programmers, masters of code and creators of virtual worlds, seldom tread upon the green blades of grass, for their minds wander through the vast landscapes of the digital realm.”
ABOUT THE PROJECT

Obesity rates among youth are still on the rise, and motivating the next generation to get more physically active seems increasingly difficult due to growing convenience of online services. On the other hand, the number of gamers worldwide is steadily rising too. Our client from City Gaming Eindhoven wants to combine these observations into a physical gaming room - a unique room filled with interactive LED tiles to play active games with friends. We are aiming to help him achieve this by virtually modelling this room modularly to test the parameters and specifications of the room.

We do this by creating the room in OpenGL, an API never before used by us, that directly interacts with the Graphical Processing Unit of a computer, making this a new and challenging experience for us. We are designing numerous games to demonstrate in our model, which shows the restrictions and benefits of certain limitations, like the room size and tile dimensions!

OUTCOMES

We have fully realized a 3D tiled room within OpenGL, as well as a player character that can walk around in the room and interact with tiles lighting up. Next to that, we have made a custom interface to design games in and have already made a library of conceptual games, which we are currently implementing into the final product. We are also waiting for a physical tile to hook up to our model, in order to show a prove of concept that our model can control the actual room in the future!

MEMORIES

Our first social event of the year was amazing! We all shared huge pizzas together while playing games all throughout the Honors room. From Machiavelli (the Dutch version of Citadels), to Catan and Mario Kart. It was a great way to get to know everyone from our track, especially the new first year’s students we never really met before! With our second social event coming up quite soon, we’re excited to show our competitiveness and crush our competition in whatever might be ahead.
LESSONS

We have learned a plethora of new soft skills this year, from honing our teamwork skills and improving our meeting qualities, to maintaining contact with an actual client. However, by far the most valuable lesson we have learned is programming in OpenGL. This is an opportunity we never would have been able to get during our regular academic curriculum, since we have no projects focused on anything of the like and our peers generally wouldn’t agree to intentionally making a straightforward course so much more challenging by working in specific application programming interface such as OpenGL. It’s a great addition to our skillset and has taught us versatility in picking up new languages as well!

We hope any future students will see the Honors Academy as we did: a place to challenge yourself along with likeminded students in a way otherwise almost impossible in the standard curriculum. Don’t be afraid to push your boundaries and branch out beyond your own field. :D

MEET THE TEAM

Wout Huynen
• 2nd year Honors student

Niels van Noort
• 2nd year Honors student

Kati Overbeeke
• 2nd year Honors student

Andree Ştef
• 2nd year Honors student

Ziana Tudose
• 2nd year Honors student

Coach:
Kevin Verbeek

“Wout is afraid of me and I’m afraid of Niels. If Niels is also afraid of Wout, we have a triangle!”

Kati Overbeeke
ABOUT THE PROJECT

In our track, there is a strong focus on algorithmic programming, but not as much on cybersecurity. Therefore, we organised a CTF, Capture The Flag, contest. This is a programming contest, focused on several different sectors within cybersecurity. This can range from digital forensics to website exploitation, and much more. At the TU/e, there are many courses related to the subject of cybersecurity, but all are focused on theoretical knowledge. Therefore, with our contest, we opened the opportunity for students to apply their knowledge in practice.

Additionally, as there are many bachelor students who have received quite little information, but do have a keen interest in cybersecurity, a training camp was organised beforehand, covering all the different types of questions which occurred in the contest itself. During these sessions, the students were able to work on preselected problems, steadily increasing in difficulty, while we gave hints to help them along. Of course, the snacks always help with a boost in the learning experience. :)

OUTCOMES

There were two main goals for the project. The first was extrinsic, to organise the contest itself, and have the participants enjoy the contest, as well as learn from doing so. This succeeded grandly, as we could tell from the feedback form which was filled in very positively, as well as the conversations we had with the participants afterwards. We barely ticked any boxes in the ‘Bad CTF bingo’. Due to the nature of the design of the questions, participants were learning while doing, and due to the volume of the questions, all teams were able to work on questions within their reach continuously.

The second motivation was intrinsic, as not all members of the team had much, if any, experience with the topic of cybersecurity and CTF contests. Luckily, as our team consisted of a mix of more and less experienced members, we were able to help each other in our learning processes, and gained quite some knowledge. Through gaining this knowledge, we were able to create both easy and difficult changes, the latter of which even the more experienced participants were puzzled by.

After the contest, we learned more on the CTF community on the university, and that this had dwindled over the last years. Through this contest, we hope we have brought together many students with this interest, and that they will be able to work together and compete in contests in the coming years. We hope that an Honors group, or any other participants, will take it upon themselves to further build upon this community next year.
MEMORIES

The contest itself was the best moment of this year for us. We had been working towards it the entire year, and turned out to be a great success. We enjoyed ourselves thoroughly during the contest, by giving out hints to the participants and following their progress. Many of the challenges were designed with certain puns in mind, so seeing the participants find all these, and enjoying reading these was very enjoyable.

As many participants had already joined the training camp, we knew how much they had learnt on how to solve challenges, and to see this come to fruition during the contest itself was amazing. We were very glad to see so many participants had been able to learn a lot during the camp, and therefore were able to properly compete in the contest, instead of being stuck after a few hours, which often occurs in other contests.

Finally, receiving all the wonderful feedback, and hearing how much the participants had enjoyed themselves brought a smile to our faces, and we hope that all of them continue to enjoy and participate in CTF contests all over the internet.

LESSONS

We have learnt on several different aspects of a CTF competition, both on the contents of the questions themselves, as well as the organisation. As the famous youtuber LiveOverflow has said, creating challenges which are purely guessing the correct solution technique are not enjoyable and do not teach the participants anything. Alongside this, there are many more good practices for creating CTF questions, which we tried to adhere to as much as possible. On top of learning on how to create proper challenges, our goal of understanding the theory required for creating these challenges was successful as well.

With regard to the organisational aspect, our main learning point was the promotion. The first promotion for the training camp went very well, with more sign-ups than we expected. Unfortunately, due to some issues with later sign-ups for the contest itself, there were less participants than we hoped initially. This turned out to not be a bad thing, as now we had the opportunity to help each participant better, but we would not have minded a few more attendees. If we would be allowed to do the promotion again, we would have created a discord server with all participants of the training camp, to be able to reach them more easily for the signing up to the contest. Apart from these few organisational issues, we learnt so much on the topic of cybersecurity, and were very glad we could bring the community together, so we hope that this will be a more regular occurrence in the future.

MEET THE TEAM

Bas Paardekooper
• 2nd year Honors student

Radu Pogonariu
• 2nd year Honors student

Dea Llazo
• 2nd year Honors student

Pascal Otjens
• 2nd year Honors student

Coach:
Pantea Haghighatkhah

“What if we create a challenge in which participants have to listen to a Japanese voice for a minute and translate it?”

Us

“Bees

Daily bee quote

Wax from head, honey from heart

Honey from heart, wax from head

Wax from head, honey from heart

Wax from head, honey from heart”

Tu/e Campus

"CATCH THE ROBBERS!"

CAPTURE THE FLAG

SECURITY CONTEST

Beginning 4th quartile

"What if we create a challenge in which participants have to listen to a Japanese voice for a minute and translate it?"
ABOUT THE PROJECT

The goal of the project is to understand and research about the stock market.

OUTCOMES

The project is centered around analyzing the stock market using various strategies and techniques to identify potentially profitable investments. The team is made up of three members: Minh, Lisa, and Maarten, each with their unique expertise.

Lisa and Minh have taken on the challenging task of pair trading. So what is pair trading? A pairs trade or pair trading is a market neutral trading strategy enabling traders to profit from virtually any market conditions: uptrend, downtrend, or sideways movement. This strategy is categorized as a statistical arbitrage and convergence trading strategy.

Lisa is primarily responsible for identifying pairs of stocks that have high correlation, which is essential for the success of the pair trading strategy. She is working with various metrics both qualitative and quantitative and running clustering to analyse the data. Lisa’s skills in data analysis and visualization are critical in identifying pairs of stocks with a high correlation.

Meanwhile, Minh is mainly responsible for back testing and portfolio optimization. Back testing involves testing the effectiveness of a trading strategy on historical data to see how it would have performed in the past. Portfolio optimization is the process of selecting the optimal combination of assets to maximize returns while minimizing risk. Minh works on the efficient frontier. The efficient frontier is the set of optimal portfolios that offer the highest expected return for a defined level of risk or the lowest risk for a given level of expected return. Minh is working on developing and testing trading algorithms to ensure that the pair trading strategy is profitable in the long term.
Maarten’s role in the project is equally essential. He is working on natural language processing (NLP) to help other people find which stocks to look into. NLP is an area of artificial intelligence that involves analysing and understanding human language. Maarten is using NLP to analyze news articles and other relevant text to identify which stocks are trending and why. His work is crucial in helping the team make informed decisions about which stocks to analyze further.

The project is being approached by the team in a thorough and data-driven manner. The team’s ability to investigate various stock market analysis vantage points and reach well-informed conclusions based on thorough analysis and study is a result of each member’s joint effort. The team’s strategy involves identifying stocks with a high correlation, backtesting and optimizing a pair trading strategy, and using NLP to identify stocks that are trending.

MEMORIES

The best memory of the Honors is that.

LESSONS

• How stock market works
• Learning is fun and leverage the resources you have in Honors

MEET THE TEAM

Maarten Dankers
• 2nd year Honors student

Minh Pham
• 2nd year Honors student

Lisa Verhoeven
• 2nd year Honors student

Coach:
Pantea Haghighatkhah
ABOUT THE TRACK

The Empowerment for Health & Wellbeing track is an ambitious, hands-on and human-centered endeavour into developing solutions for the health of people. Its students aim to contribute meaningful innovations and designs to society, and to help inspire the next generation of systems in healthcare.

In this track, students pursue a variety of health related topics, such as Dementia, Nutrition, Artificial and Virtual Reality, Sports (injuries), Medication Adherence and Medical Devices. In these projects, students generate deep insights through engaging with stakeholders, doing both literature and field research as well as synthesizing all their findings into working prototypes (hardware and software).

The track builds on our multidisciplinary nature; we engineer interactive products, do qualitative interviews with patients and caregivers, run lab tests as well as putting our prototypes into the hands of users in real contexts.

TRACK COORDINATOR

Victor Donker

My name is Victor, part-time lecturer at Industrial Design and honored to be track coordinator of Empowerment for Health & Wellbeing. I am an experienced designer, entrepreneur and marketeer in the high tech and medical device industry. After completing my BSc & MSc in Industrial Design and during my Engineering Doctorate (EngD) in User System Interaction, I started as an entrepreneur in the healthcare sector. I have co-founded the company Usono, a company with which we develop smart solutions for medical ultrasound imaging. It’s great to combine my (commercial) responsivities as company owner with educational work at TU/e. I basically love to help other people and combine my industry activities with lecturing and coaching at TU/e. Coaching 6 students that work on a project for Usono is just the perfect example.

This was my first year in this role, and I can only say I enjoyed it a lot! For me it’s great to have taken over this track from my processor Roy van den Heuvel, who set up this track since the start! This track for me is all about creativity and real-life, hands-on approach to major challenges in healthcare. It’s very exciting to share my experience, expertise, and network in the industry with eager students. Seeing young talents struggle and tackle
challenges is motivating to me. I have deep respect to all students that take up the extra challenge and show their patient for healthcare. Thanks to all students for your efforts and motivation last year. I can’t wait to look what upcoming years will bring us.

COACHES

Jun Hu

Dr. Jun Hu has a PhD in Industrial Design and a Professional Doctorate in User-system Interaction, both from TU/e. He has also a B.Sc in Mathematics and an M.Eng in Computer Science. He is a System Analyst and a Senior Programme with the qualifications from the Ministry of Human Resources and Social Security, and the Ministry of Industry and Information Technology of China. He has more than 280 peer-reviewed publications with an H-Index of 28 in conferences and journals in the fields of HCI, IoT, AI, industrial design, computer science and design education.

René van Donkelaar

As Director of Education of the Bachelor and Graduate programs Biomedical Engineering, I care about the personal development of students. The Honors Program is one of the ways in which the best students can develop themselves in addition to what the regular programs offer. Hence, I’m very supportive of the program. So far, I was involved in the final assessments of BME students, but I had not supervised them. This year, I had the opportunity to guide students who were contributing to the A-Life artificial heart team, when I took over from Carlijn Bouten. The artificial heart topic is however not within my core expertise. My research focuses on the mechanics of articular cartilage, pathological changes during osteoarthritis, and regenerative approaches. Regardless, I really enjoyed the process, and I had some inspiring meetings with the Honors students.

Yunjie Liu

My name is Yunjie Liu, a PhD candidate in the Department of Industrial Design. My interest lies in leveraging conversational user interfaces to empower self-management for dietary behaviour. My research focuses on increasing self-awareness and eating mindfulness by facilitating self-tracking and self-reflection on dietary behaviour. My expertise lies in user experience research and design for behaviour change.

This year was my first time being involved in the Honors project and guiding students in a multidisciplinary group working on the food choice project. This project aligns with my expertise, and it’s exciting to share my experience and knowledge with the students. In the meantime, they also collaborated with industries and other stakeholders, e.g., the Jumbo FoodCoach team and local cycling associations. It’s a unique opportunity to work with people who have different expertise yet share the same vision. I enjoyed the process and look forward to meeting new Honors students.

Carlijn Bouten

As a professor in the field of cardiovascular regenerative medicine in the Department of Biomedical Engineering, I operate at the cross-section of engineering, medicine and physiology. Together with my multidisciplinary team I strive to innovate the way we, as engineers, can contribute to replacing or regenerating tissues of the human heart (heart valves, vessels and cardiac muscle). This includes the creation of living heart valves and vascular implants, but also the development of novel therapies to restore cardiac muscle remotely. During the Covid-19 Pandemic, I started the Hybrid-Heart student team to work with us on a soft robotic heart in the context of the EU HybridHeart project. The Hybrid Heart is an implantable heart that converges non-living soft-robotic technology with tissue engineering, to create a cardiac replacement for patients that is recognized by the body as ‘it’s own’.

This year, the students working in that team joined the Honors Program under the name “A-Life”, thereby broadening their expertise and interests also to other organs of the human body. Due to personal reasons I was not very active in the Honors Program so far and I am grateful to René van Donkelaar for stepping in for me this year. Next year, I am happy to design one or two projects together with the Honors students to further progress this exciting field of medical device development and regeneration.
ABOUT THE PROJECT

Heart failure is among the top 10 most common causes of death in the Netherlands, with around 38,000 new diagnoses every year. For some people, the only treatment option left is to get a heart transplant. Unfortunately, due to the shortage of donor hearts, the majority of patients are not eligible for a new donor heart. To solve this problem a new total artificial heart is being developed. With the development of an artificial heart, there are also concerns raised among people. One of them is that not everyone would want a total artificial heart inside their body.

This project aims to increase awareness and inform people about an artificial heart. When more people are confident about receiving an artificial heart, this would help solve the donor shortage and fewer people will die.

OUTCOMES

The project had set out to recreate a biolab on Hololens and make it interactive, showcasing the coupling of the heart with an electrocardiogram or pressure loops. However, things did not go as planned, and there were two main issues that arose during the project’s development.

The first issue was communication with the stakeholders. Despite efforts to keep everyone informed about the project’s progress, there were still some miscommunications that caused delays and confusion. This issue could have been addressed with more proactive and consistent communication with the stakeholders.

The second issue was a change of the project goal in the middle of the year. This change caused a significant setback, as it required the project team to redirect their efforts towards a new objective. The change was necessary to better align with the needs of the stakeholders, but it was still a challenge for the team to adapt to the new requirements.

Despite these issues, the project team was able to complete the project with some modifications to the original plan. The project still recreated a biolab on Hololens, but the focus shifted towards showcasing the basic physiology of the heart, wind kessel, and compliance. The interactive aspect of the project remained, providing stakeholders with a unique and engaging experience.

In terms of follow-up suggestions, it is essential to prioritize consistent communication with stakeholders throughout the project’s development. This will help ensure that everyone is on the same page and reduce the risk of miscommunications. Additionally, it may be
beneficial to establish a clear process for managing changes to the project’s goals to minimize the impact on the project’s timeline and objectives.

In conclusion, the project faced some challenges with communication and changes to the project goal in the middle of the year. However, the project team was able to adapt and complete the project with some modifications to the original plan. Follow-up suggestions include prioritizing consistent communication with stakeholders and establishing a clear process for managing changes to the project’s goals.

MEMORIES

The main good memory of this year would have to be the journey itself. A group of 6 students from different backgrounds got together because they shared a vision: making an impact on the world through health. We discussed certain things, set schedules and compromised with each other to fulfill that vision. It wasn’t always easy, but we learnt together in the ups and downs of the project how to become better professionals.

Leisure group days also formed a great memory. A good example would be our first one. We all went bowling and had a fantastic dinner afterwards. That simple act helped us to get to know each other better and create stronger bonds within the group, which then translated into better performance in the work itself.

LESSONS

During our Honors project, we encountered several challenges. One of these was communicating with stakeholders. Stakeholders can be very important in making your project a greater success. When you reach out to them rather sooner than later when you get stuck, they are of great importance to help you progress your project. We have experienced that most stakeholders are very willing to help you and can even use their network to get you in touch with other experts. This is especially the case when you put in the effort to keep close contact with your stakeholders and update them to keep them invested in your project.

Sometimes we encountered a situation where the response rate of a stakeholder was very low. In this situation, we had to come up with an idea to continue our project more independently without the help of this stakeholder.

Our advice for prospective Honors students would be to not be afraid to ask for help when you get stuck. It would be a shame to lose a lot of time on something when it could be solved by simply asking around. On the other hand, remember that it is your project and that you do not become too dependent on others. Another piece of advice would be to use the “hot connections” of your stakeholders to broaden your network. And of course, have a lot of fun exploring this unique way of learning and make sure to have enough group bonding activities with your project group and Honors track! You have the influence to make this experience a great one!

MEET THE TEAM

Brent van Herk
• 2nd year Honors student

Malaika Shankar
• 1st year Honors student

Jilke Nooijen
• 1st year Honors student

Kirsten Heinen
• 1st year Honors student

Juan Pintado
• 1st year Honors student

Charalambos Kypridemou
• 1st year Honors student

Coach:
René van Donkelaar

“Who needs a real heart when you can have one that runs on Windows?”
ABOUT THE PROJECT

Ultrasound technology is widely used in healthcare thanks to its broad range of applicability. One of these cases used ultrasound imaging on muscles, ligaments, and other parts of the skeletal system. This has made it a useful tool for physiotherapists and sports coaches, allowing them to diagnose injuries with more precision. While useful, this approach is still quite time-consuming as it requires often complicated manual manipulation of the transducer and interpretation of the resulting images by the practitioner. Therefore, it is our goal to simplify the process of making an ultrasound image, provided by a probe fixation device for the knee, stabilizing the probe during active movement, and software, supporting the practitioners in the diagnosis of muscle health and injuries.

OUTCOMES

The outcome of the efforts was to expand the product portfolio of the company Usono by developing a probe for ultrasound to be applied to the knee. This involved exploring old and new mechanisms that allow the probe to be rotated, tilted and adjusted while still being firmly connected to the knee. This was 3D printed and some metal parts were cut with a laser cutter. A core part is the software that with further development automatically diagnoses muscle, tendon and fascia injuries. The market for Usono was also explored. The product development and market research were unexpectedly more complex than initially thought of. It was valuable to work with stakeholders and to experience what it is like to be part of a bigger multidisciplinary network.
MEMORIES

One of the most memorable moments for most people from the team was a brainstorming session with the CTO and CEO of Usono on the HighTech Campus. This enabled us to work in a corporate setting, which was exciting. Another dear memory was playing beer pong with our Honors track.

LESSONS

An important lesson learned is that the best way to explore new opportunities is to sit together with each other, bundle our knowledge and just start making. It does not matter if the first prototype looks like something a toddler made with sticks and leaves, most progress is made designing and making instead of thinking everything through. It is crucial to not be afraid to ask questions, whether this is in our team meeting or a meeting with stakeholders. Essentially it has all to do with daring to get out of your own comfort zone as that is when learning happens the most, this might often mean to not stay within your own discipline but rather try out something new.

MEET THE TEAM

Vera van Beek
• 1st year Honors student

Michel Harms
• 1st year Honors student

Lucas Kiewek
• 1st year Honors student

Michal Kuchar
• 2nd year Honors student

Kyra Schuttert
• 1st year Honors student

Pavle Varinac
• 2nd year Honors student

Coach:
Victor Donker

“To ease, improve and innovate your use of ultrasound.”
ABOUT THE PROJECT

The goal of our project was to create a dietary variety score to encourage a more varied diet. The score is a part of a mobile application that is built on various behaviour change strategies.

The focus of the project is on the Sustainable development goal for good health and wellbeing in society.

OUTCOMES

We are collaborating with the Foodcoach app by Jumbo but our solution is independent of the existing platform. Our research and design are focused on semi-professional cyclists and how they can benefit from this solution. Our design involves a mobile application that lowers the threshold for semi-professional cyclists to find simple, inexpensive and time saving food options to maintain this varied diet. This diet recommender system is based on the designed variety score algorithm.

In retrospect, it is important to note that while collaborating with an external stakeholder, the value proposition from your team’s end needs to be well developed, in advance. This ensures that you retain your independence as a team without completely compromising your ideas for what the stakeholder wants.
MEMORIES

Our first visit to the Jumbo Visma office in Den Bosch was very interesting, as the building also served as a training area for professional cyclists of the Jumbo Visma team. It was also our first time meeting with an external stakeholder as a team, which made it a memorable experience.

LESSONS

We learned what challenges there can be in working with stakeholders. Our advice would be to always make it a priority to stay independent and work with them, instead of working for them. Nonetheless, involving parties from the industry taught us a lot and was a valuable experience, especially on communicating and negotiating with external stakeholders.

MEET THE TEAM

Hanna Broszczak
• 2nd year Honors student

Philipp Liehe
• 1st year Honors student

Amani Asharaf
• 1st year Honors student

Ameena Arafa
• 2nd year Honors student

Ramya Krishnan
• 2nd year Honors student

Coach:
Yunjie Liu

“The It’s better to know how to learn than learn how to know.”

The Team

AMANI
Data Science

HANNA
Industrial Design

RAMYA
Industrial Design

AMEENA ARAFA
Industrial Design

PHILIPP
Data Science
ABOUT THE TRACK

Students from our Track contribute to forwarding the energy transition by addressing climate and energy related problems through research in, design of, and sometimes even implementation of energy innovations.

Our students developed this year seven multidisciplinary teams and focused on the following topics: Developing a Flow Battery (Team Better/e), Dynamic Wireless Charging Automated Guided Vehicles (Team InCharge), Developing support for Heat Battery Systems (Team Therosel), Combating Energy Poverty and making sustainability affordable for all (team Simenergy), How to make use of bubbles as an energy source (Team Bubbl/e), Developing a sustainable homemade battery for every one (Team Voltalgae) and Make use of car batteries for off grid applications (Team Sparke). Team Better/e being a second-year team, designed their first prototypes, won a prize at the DTU green challenge in Copenhagen and have contacted the first customers. Also, Team InCharge became more mature by contacting first customers and winning the Vanderlande Logistics Innovation award at the TU/e challenge. For persevering and looking at the positive side of things, the teams should all be very proud of themselves. All students worked nearly independently within the teams, took responsibility and above all ensured a positive atmosphere to work in, even in busy study periods. Well done!
TRACK COORDINATOR

Han van Kasteren
TRACK COORDINATOR

Facilitating the projects of excellent students at our university has been a privilege as our students always persevere to a point where they are able to amaze you. It’s often not the objectives they reach as a team, but the steps they take as individuals to make this happen, because they are part of this well-functioning, highly ambitious track.

I am always surprised with what the teams come up given the original idea and the often completely different amazing end result. What I learned on top of this, is that our students are resilient. They are highly motivated for, and dedicated to, their team’s objectives. Therefore, they manage to deliver. I thank the students of our track for their continued dedication and effort.

COACHES

Yali Tang
COACH

This year I am coaching two teams Better/e and Bubbl/e in the Energy Transition track. Team Better/e is a second-year team, which has shown maturity in all aspects of both personal and project development. Despite the challenge to get a proper lab space on campus, every single member of this team keeps their enthusiasm and works hard to build a prototype of an all-iron flow battery. Team Bubbl/e is a new team working on an innovative idea using bubbles as a medium to recycle the wasted flow energy. They are highly motivated and dedicated to this objective. I am very glad to work with these young, energetic, smart students. And I am so happy to witness their self-development as well as their achievement on contributing to different energy-transition solutions.

Mark Cox
COACH

I have been working for Honors Energy Track since 2015 as a coach. Like every Honors year, this year it has been a pleasure to see students grow in their personal development and see them achieving results and contributing towards new energy solutions. I am especially proud of how Honors students realize their dreams despite a lot of scientific and practical challenges by working in mixed teams and with fellow students and external partners. The Honors students often contribute to the solutions of societal problems by developing or contributing sustainable technologies and products in the quadruple helix context. With a mix of creativity, energy, collaborative mindset each year the magic happens, and amazing projects are developed or pursued and engineers of the future prepare themselves for their upcoming role in society.

Tiago Castelo de Oliveira
COACH

Over the past year, I have had the privilege of working alongside the remarkable SimEnergy team at the Honors Academy (Energy Transition Track). I am immensely proud of their growth and achievements during our time together. Witnessing their harmonious collaboration, skill development, and the successful realization of their ideas has been truly inspiring. Collaborating with them and offering both personal-professional and technical support has been a rewarding experience. What makes our partnership truly special is the mutual learning we engage in. As much as I impart knowledge and guidance, I am constantly learning from their unique perspectives and insights.

Photo: Bart van Overbeeke
ABOUT THE PROJECT

SimEnergy envisions to combat energy poverty by assisting households in reducing energy consumption. The team aims to address the issue of the lack of knowledge and direction amongst household users when it comes to energy consumption. There is a lack of direct and clear communication from energy companies when assisting users to save energy. This problem is becoming more pressing with the rising energy prices.

SimEnergy leverages the power of Data Analytics and Artificial Intelligence to collect and transform data from smart meters into useful visuals and insightful information. Our advanced algorithms break down the total power of a household into the device level and provide users with clear and personalized advice to reduce costs via a user-friendly app.

OUTCOMES

Our team has achieved several outcomes. Firstly, we successfully developed a machine learning algorithm that can distinguish the energy consumption of multiple household devices such as fridges and washing machines. Also, we developed the hardware of our product, which is a plug-in tool that connects to the smart meter and extracts data every 6 seconds. This data serves as input for the AI to accurately break down the energy consumption of each household device for further testing and analysis.

Additionally, we worked hard to try solve the challenge of presenting this valuable data in a user-friendly manner so that consumers could better understand their energy consumption and learn ways to reduce it. Through market research and customer interviews, we developed features for a future app that will help users better manage their energy usage.

Furthermore, we conducted market research to study existing products and competitors in order to explore the market and build our business model.
MEMORIES

One of the best memories we had as a team was during a team bonding dinner. We decided to order pizzas, watch the World Cup and have a relaxed evening together. We chatted and got to know each other better by sharing stories and experiences. The team bonding dinner served as a reminder that having fun and building strong relationships outside of the working environment can be just as important as working hard. It helped us to get to know each other better, creating a stronger bond between team members.

LESSONS

• What is the most value lessons learned?
  Some of the most valuable lessons we learned throughout our project revolve around the importance of effective teamwork and communication. We found that our most productive stages were those in which we worked collaboratively as a team. Given that we are divided into three sub-teams - hardware, software, and non-technical - it became clear that regular meetings to share updates and support each other were vital to our success.
  In addition to these lessons, we also developed strong problem-solving abilities as a team. We recognized that challenges were inevitable, but we approached them with a good plan and clear goals to overcome them. This not only allowed us to tackle difficult situations with ease but also helped to strengthen our team’s cohesiveness.

• What is your advice for future Honors students?
  First, challenge yourself. Taking on a challenging project and goals can help you develop your skills and discover your own limitations. Additionally, choosing a project that you’re passionate about can make the process more enjoyable and keep you motivated throughout the project. Also, seek guidance from your coaches when needed and take the time to get to know your team members on a personal level. This can help you overcome obstacles and work together more effectively. And most importantly, have fun!

MEET THE TEAM

Arif Ashworth
• 2nd year Honors student

David Melamed
• 2nd year Honors student

Jiyeon Han
• 2nd year Honors student

Marco Mo
• 2nd year Honors student

Jimena Botella Baena
• 1st year Honors student

Anna Prokhorova
• 1st year Honors student

Liam Geschwindt
• no Honors student

Soukaraya Ghosh
• no Honors student

Coach:
Tiago Castelo de Oliveira
While energy markets all over the world have taken on the enormous task of switching to renewable energy, there is a fundamental problem with renewable power sources. The supply of energy from renewable power sources cannot be controlled, as their energy is generated by natural sources such as the sun and the wind. Additionally, the demand for power cannot be regulated, as people are not willing to adjust their power usage to specific circumstances. This creates a mismatch of supply and demand in the energy market of a purely renewable power grid.

An example for this mismatch in supply and demand is the following. The highest demand for power is often right after sunset, when people come home and begin using their appliances. However, solar panels stop producing energy at sunset. This mismatch is even more apparent in winter, when the sunset is earlier and more energy is used to generate heat and light in the darker hours.

This can create a situation where at the peak of the day, there is an oversupply of solar and wind power. While you may think that this situation is far off in the future, it is called curtailment and it happens all the time across the globe. For example, California curtailed of 1.2 million MWh in the first half of 2020 (January-June). However, after the sun sets and solar power stops being generated, there is shortage of renewable energy supply and the increased demand cannot be met. In this case, fossil fuels are needed to fill the difference. This misalignment in supply and demand is one of the largest problems preventing us from going 100% renewable.

To match supply and demand, there are two possible methods; either demand is shifted, or the supply is shifted. It is not feasible to shift demand, as people are dependent on power at specific times. Therefore, to enhance the effect of renewable energy sources, the most benefits can be obtained by shifting the supply of power. While we cannot control the weather, we can store the excess power in a battery or other storage device, and then release it when it is needed. This would balance the energy grid and thus be a feasible solution to this problem.

The solution that we are proposing to balance the energy grid is redox flow batteries. We believe that this technology will be the future of grid-level energy storage.
OUTCOMES

During this year we were able to test two prototypes of the single-cell battery with water; We based our work on extensive literature research done by the team in the previous years. For the first prototype, we decided to 3D print the housing of the cell. However, while testing the assembled battery, we soon realized that this first prototype was flawed. Therefore we decided to redesign the housing of the single-cell battery and use a better material for the second prototype. We chose to use steel and assemble it with sturdier screws that could help improve the cell’s design as a whole, making it look more compact and more resistant to water (and even chemicals) leaks. The second prototype turned out not to have any leakages, which was a great achievement for the team.

We now aim to work on the chemistry of the battery in order to be able to test it on the working prototype. Moreover, we are looking into developing a stack design for the redox flow battery.

MEMORIES

As part of our bonding activities, this year we went go-karting with the whole team. Before that, we went out to get dinner all together at a fancy restaurant in the center of Eindhoven. We had a great time that evening as we got the opportunity to get to know each other outside the regular team meetings and spend some time together doing something completely new for all team members.

Moreover this year our team became a Stichting and got our own bank account which was very nice as we are now able to be independent and be a better-structured team as a whole.

LESSONS

• What is the most value lessons learned?
  The effort of every individual is key to the success of the team as a whole.
  Learning to work in a diverse team for a long time can be challenging but fun.
• What is your advice for future Honors students?
  Always make sure you like and are passionate about the project you are working on.
• Is there anything else you want to share with your peers or future Honors students?
  It is important that the team can think ahead about planning the project as a whole and can be realistic in planning the small steps towards the completion of it.

MEET THE TEAM

Paulius Volčokas
• 2nd year Honors student

Goof Roelands
• 2nd year Honors student

Chiara Sabina Bariletto
• 1st year Honors student

Erik Nijkamp
• no Honors student

Deepak Mohan
• no Honors student

Coach:
Yali Tang

“Better/e - The future is redox.”
ABOUT THE PROJECT

InCharge is a team that focuses on implementing dynamic wireless charging in logistic sectors.
Dynamic wireless charging (DWC) is the concept of charging electric vehicles while they are in motion. This can be achieved by using coils in both the automated guided vehicle (AGV) and the road itself. The vehicle is charged by electromagnetic inductance. This means that the coil in the road generates a magnetic field that passes through the coil in the car, inducing a current in the vehicle that charges its battery.

They would not need to be stopped to be charged and the facility could operate 24/7, increasing productivity. The space previously needed for the AGVs to charge could be put to better use. Our preliminary analysis (using real data from warehouses) has shown that dynamic wireless charging increases the productivity of the products delivered by 10% per hour.

This year we have been working on building a new prototype from our last proof of concept where a small autonomous vehicle would move above the coils and be charged.

Besides, the team has also been working on the impact analysis, quantifying the increase in productivity of using DWC in warehouses and comparing it with a common facility that uses ordinary AGVs.

OUTCOMES

The project has had plenty of setbacks during the year, but we have managed to come back from this and submit a great project at the end.

For one, getting information from the partners to do the impact case analysis has not been a straightforward task and most of the information used was sourced from public domains. However, with the help of faculty members and open literature, we have developed a program capable of determining the increase in productivity and we are constantly improving it by applying new and more parameters.

The process of constructing the new prototype has been hard and with a lot of setbacks, having built multiple vehicles that in theory they would work, but then there were always errors with the motors. Yet in the end, we are proud to be able to show our new small system at congresses and symposiums.
MEMORIES

The team organized a dinner at Jon’s house together with Simenergy where most of the team came together and had nice tortillas all together.

LESSONS

As we mentioned before there have been plenty of setbacks during the year where the team did fall but that only made us come back stronger.

For future Honors students we would say that maybe some times along the project it looks like your project is not going forward but just hang in there, be persistent and never give up.

MEET THE TEAM

Jon Ander Almagro Aranguren
• 2nd year Honors student

Mikey Gustavsson
• 2nd year Honors student

Lorenzo Cammarota
• 2nd year Honors student

Gregory Melville
• no Honors student

Tudor-Andrei Pioara
• no Honors student

Eduardo Gomez Hernandez
• no Honors student

Erik Eifel Forcat
• no Honors student

Karim Mahmoud
• no Honors student

Maria Virginia Ciabattoni
• no Honors student

Carlota Prieto Fieldmann
• no Honors student

Carolina Billep Garay
• no Honors student

Coach:
Han van Kasteren

“Where is Tiago?”
ABOUT THE PROJECT

Over the past few decades, climate change has become a problem that can no longer be ignored. Since a lot of awareness of this problem has been raised, more households and companies have installed solar panels or other renewable energy sources to generate sustainable energy. However, there is a complication that arises because of the increase in the generation of renewable energy. At times, when a lot more power is generated than demanded, there is a possibility of the grid becoming unstable. This can lead to blackouts, which means that it is no longer possible to use all the energy that has been generated, which is a waste of energy. Reciprocally, when there is not enough energy generated to meet the demands, there is also an overload leading to the same complications. Consequently, grid balancing is needed which is the process of managing this energy supply and demand to ensure the stability of the grid.

Instead of buying numerous batteries to enable this grid balancing, our team wants to look at the storage solutions already available around us; more specifically, a new generation electric vehicle capable of bidirectional V2X (vehicle to everything) charging. Therefore, our goal is to investigate how vehicles with bi-directional charging capabilities can be used to form a renewable energy grid to enable grid balancing in medium-to-large scale facilities in the near future.

V2x (Vehicle-to-Everything) technology enables electric vehicles (EVs) to provide power to buildings or electrical devices. It therefore allows the batteries of EVs to be used as a mobile power source, and for energy storage. During off-peak hours, when more energy is generated by a renewable energy source than demanded, the EV battery can store this excess energy. This excess energy can then be supplied to the building again during peak hours when more is demanded than generated. The use of V2x technology requires a bidirectional charger and an EV battery that supports bidirectional charging. A bidirectional charger enables the EV battery to be both charged and discharged. Therefore, using V2x technology, grid balancing can be performed ensuring the reliability and stability of the energy grid and an increase in the effective use of renewable energy.
OUTCOMES

Our project started in October 2022 as a collaboration with Eindhoven Airport and will continue next academic year. During this first year of the project, our team has been working on a numerical model that can be used to calculate the demand and generation of energy by the facility when V2x technology is used to perform grid balancing. The outlook for next year is to create a small-scale physical model to test this technology in practice, using the data collected from the numerical model. Afterwards, our team aims to start testing with a real EV as well as developing a plan for future implementation on a larger scale.

MEMORIES

We made many good memories this year, but some of the best come from our meetings at Eindhoven Airport. We had to take the bus together, which was a fun way to get to know each other. It was also cool to show up at the office of Eindhoven Airport and get a name pass at the reception. Interacting with the real client and being treated in a professional way was really motivating and made the project come to life for us.

LESSONS

Doing this Honors project together taught us a lot. It is one thing to do a project, but at Honors, we got the possibility of creating something ourselves, which came with a lot of responsibility as well as freedom. Organizing the project and meetings, meeting with our real-life client Eindhoven Airport, and last but certainly not least kicking other people out of meeting rooms when we had it booked, were lessons that made us grow individually as well as a team. Our advice to future Honors students is to be proactive and have a lot of fun with your team.

MEET THE TEAM

Emma Borst
• 1st year Honors student

Rokas Bubulis
• 1st year Honors student

Arianna Pasterkamp
• 1st year Honors student

David Warrand
• 1st year Honors student

Coach:
Mark Cox

“Greetings fellow humans.”
Climate change and global energy crisis requires the use of sustainable methods of energy generation rather than from fossil fuels. So, it is vital to develop efficient energy harvesting techniques. The major driving force is the huge release of waste energy (like exhaust gasses) by industries. What if it was possible to generate energy out of the flow of gasses? That is precisely the concept of a theoretical bubble column power generator (BCPG). We aim to create and optimize a working model that can be used to reclaim ‘waste’ energy out of inevitable movement of gasses in industry processes.

The BCPG is a novel concept that uses multiphase flow phenomena and Faraday’s law to generate electricity. Magnetic nanofluids are used, containing dispersed magnetic nanoparticles (MNPs). When placed under an external magnetic field, the MNPs align themselves to this field. Therefore, when a stream of bubbles is made to pass through, it disturbs the MNP alignment and according to Faraday’s law, emf is induced. So, this can be converted into a technology to gain energy out of movement of gasses.

The team was building on the work done by two previous students as part of their Master and Bachelor projects. The first months were focused on catching up on the work done before and doing literature research. Then the real work could start.

Our team sought to find a good application for this technology, as well as continued working on the BCPG. For this reason the team joined the Rethink Waste Challenge organized by Wageningen University. This put us in contact with many different companies and stakeholders seeking to become part of a circular economy. Finding the right value proposition became the primary focus of this team.

At first, we focused on wastewater treatment plants and the energy that could be extracted from the gas released during digestion. Eventually, we had to concede that there wasn’t a significant amount of energy being wasted as there are many ways to increase efficiency. So, it was decided to pivot to a more decentralized product.

Septic tanks are a way of water treatment that isn’t connected to a central treatment facility. In Europe their usage is usually limited to rural areas but they are quite common all over the world. Inside the tank, a number
of processes occur to process the waste. This leads to a creation of dangerous septic gas that needs to be vented to avoid dangerous concentrations and prevent explosions as well as poisonings. We plan to apply our BCPG to generate electrical energy out of this gas flow to help power these remote dwellings.

**MEMORIES**

During our first team bonding activity, we spent an enjoyable afternoon playing some board games. Although there was the usual debate about the rules of UNO, it was a lot of fun watching everyone getting mixed up with the rules. The evening ended with some delicious snacks and our last game. We had a great time building and stealing each other’s castles. In the end, Maki emerged victorious with her castle.

We also had evening meetings during which we brainstormed ideas for potential applications of our technology. We were definitely productive but also enjoyed pizza and some good laughs.

Another memory was the first time we visited our setup. Everything was pretty much a mess but we managed to figure out the different parts after a bit of digging.

Some of us also went to Wageningen where we spent the day avoiding lessons. The sign up did not go great so we sadly did not get any lunch. But we could enjoy the music with instruments made of trash during the introduction. After that, talking to students from Wageningen was fun and it was interesting to talk with people who were not in the technical area to hear their view on things. So overall a fun day. And spending most of your day in public transport is also a great way to get to know each other better.

**LESSONS**

One of the biggest lessons we learnt was to make better planning of our tasks. It is important to have a clear agenda of all the tasks and subtasks with priorities to make sure that work gets done as efficiently as possible. It’s important that everyone agrees with the division of tasks and what standard of work is expected from each one of us. Regardless of the amount of planning, it is always good to be prepared for unexpected hurdles or opportunities. Sometimes, certain things take a lot longer than expected.

We also learnt how to approach companies and pitch our solution. It was always interesting to get different perspectives and guidelines on how to go about with the project. A lot of the workshops from innovation Space like roadmap and ideation really helped us to get more concrete with our idea and make progress as a team.

We also learnt that Jakub has the power to turn jokes into reality. For instance, he said “would it not be funny to call our team Bubble?”

**MEET THE TEAM**

Amir Mousawi  
• 1st year Honors student

Bagavathi Mohan Neela  
• 1st year Honors student

Jakub Grencner  
• 1st year Honors student

Maki Vrasdonk  
• 1st year Honors student

Medora James  
• 1st year Honors student

Coach:  
Yali Tang

“We have the solution, does anyone have a problem?”

Bubbl/e
ABOUT THE PROJECT

Team Voltalgae aims to use BPV systems to power small weather stations, sensors in a smart house, greenhouse, or other types of sensors, overall low-power IoT devices. These can produce energy from light in a renewable and sustainable way instead of just storing energy. This project has a circular perspective as a Life Cycle Assessment of the whole life of these BPVs is planned. We are trying to offer a service, in which the BPV systems are replaced after a certain time, which makes the materials stay in the economy as much as possible.

These devices’ energy generation is less intermittent than solar panels, as they can also generate a current in the dark. They do not need to be connected to the grid and might be strategically used in remote areas. In addition, most of the materials used for these cells have to be biocompatible and non-toxic to the environment in general.

Currently, BPV cells in an ambient environment reached peak power outputs of 4 W cm-2 and can power a chip continuously, nevertheless, the potential energy output improvement aims to reach a mW cm-2 range, required for low-power IoT devices, and even higher to expand its range of usage.

The project is committed to providing decentralized energy to low-power IoT devices (SDG 7 - Affordable and Clean Energy), and prioritizes the use of materials with a known origin, allowing for a complete assessment of the battery’s life cycle, including raw material extraction, disposal, and CO2 emissions (SDG 12 - Responsible Consumption and Production). As an overview of these emissions, the lithium production for a large greenhouse using (approx.) 30,000 IoT devices implies, approximately, the emission of 16,000 kg of CO2.
OUTCOMES

This year has been primarily focused on conducting research, actively participating in contests and conferences to gain insights from others about our ideas, and developing a compelling story which we could own and feel as personal between us and our project. As we aim to have a smoother workflow in the upcoming academic year, we expect to start with the basics of prototyping to showcase in drafts our project at the TU/e contest this year. During the summer, we plan to enhance our social media presence and website, so that we can establish a strong foundation for prototyping and experimentation in the following year. With a well-established profile, we hope to attract the interest of various companies that align with our project.

MEMORIES

Leyna: “I think the most important thing I remember is that no matter, both good and bad feedback (fortunately, mostly constructive), I’ve never stopped from thinking this idea was worth the risk and we were unique. I just realized by the way people were willing to listen what we were saying and even inspired them to think differently.”

Sacha: “For me, the best memory of this Honors year was the mid evaluation. Seeing what other tracks are doing was really interesting!”

Guille: “The best memory of this Honors year was seeing people joining the team over the months because that showed me that, not only us, but other people also see value in the project.”

LESLSSONs

The most important take away message is that if we want to effectively change the way we power the future, simply developing energy-efficient breakthroughs is insufficient. The key is to consider the entire lifecycle of a product or service, from its production to its disposal - the cradle to cradle principle - , because sustainability can be quantified. Our project is a clear example. It is a tiny but decisive step. Besides, we reminded ourselves of the importance to minimize the batteries environmental impact by reducing carbon emissions and preserving natural resources.

Our advice for future Honors students is that even if you feel like you don’t know anything or you don’t have the right tools, just start. Take what you have and do the best you can with it. The tools appear throughout the path.

Additionally, creating an optimal work environment is crucial, where work is taken seriously in the same way people’s values and expectations are. It is important to avoid keeping people who match with the technical and work requirements, but do not have the motivation to work.

MEET THE TEAM

Leyna Calderón
• 1st year Honors student

Sacha Dekker
• 1st year Honors student

Guillermo Valdivia
• 1st year Honors student

Coach:
Han van Kasteren

“Let’s start powering small, but powering differently.”
ABOUT THE PROJECT

The overarching goal of our project was to raise awareness and understanding of heat battery technology as a sustainable and efficient solution for the energy transition. We aimed to demystify this technology for homeowners and other potential users, helping them realize the benefits and likely cost savings heat batteries can offer.

Our primary contribution to society lies in education and information dissemination. We designed an accessible and engaging multi-platform educational approach - our website and LinkedIn page - to help people understand the benefits and advantages of using heat batteries in housing. This involved creating easy-to-understand resources, including articles, infographics, videos, and interactive tools such as a digital twin model of a home using a heat battery.

We also sought to foster community and collaboration within the heat battery industry through our LinkedIn page. By connecting experts, enthusiasts, and newcomers, we facilitated knowledge-sharing, discussions, and networking opportunities that could drive further innovation in the field.

Ultimately, we envisioned our project as a catalyst for change. By promoting a more thorough understanding and broader adoption of heat battery technology, we aimed to contribute to a more sustainable and energy-efficient future.

OUTCOMES

Our project has yielded numerous positive outcomes. We’ve successfully established a comprehensive educational website that provides easy-to-understand resources about heat batteries. While the completion of the digital twin model proved to be a challenge due to software constraints, the array of articles, interviews and infographics we developed have served as effective tools to help users understand the practical applications of heat batteries.

One of the most significant achievements of our project is the creation of a vibrant network on our LinkedIn page. We’ve connected over 100+ professionals, enthusiasts, and newcomers in the heat battery industry, far exceeding our initial goal. The discussions and knowledge sharing taking place on this platform have proven to be invaluable, fostering a strong sense of community and collaboration within the industry.

Despite not being able to finalize the digital twin due to the complexities involved in modelling heat batteries
using OpenStudio, we believe we have laid a solid foundation for future teams to build upon. Given more time to familiarize themselves with the software, future teams would be able to bring this aspect of the project to fruition.

For follow-up, we suggest that future teams continue to grow the LinkedIn network and engage with users regularly. There is also potential to explore collaborations with more industry experts and research institutions. Additionally, the development of the digital twin should be a top priority, as its completion would significantly enhance the website’s interactive learning experience. Finally, the prospect of integrating our resources into educational curricula presents a promising direction for expansion and wider societal impact.

MEMORIES

The best memory of this Honors year was definitely the return of our fellow team member Vicky after leaving the team due to reaching burnout with her workload. It was truly inspirational for us to see her strength of character through the months - building herself up from scratch to the point of being able to recommence her part in the team.

On top of this, our team outings to the Confluence and Scala Gala were also rather memorable (for different reasons :).

LESSONS

One of the most profound lessons we have learned through our journey is that the Honors track is about much more than just the project itself. It’s about personal growth, resilience, and the ability to navigate the balance between our project and the rest of our academic commitments. We realized that experiencing stress and not being able to dedicate as much time to the project during demanding periods doesn’t diminish our capabilities or worth.

The key to success as an Honors student lies not in flawless execution but in maintaining honest, transparent communication with your track coach about your personal circumstances. By acknowledging and sharing our challenges, we were able to find support and solutions, reaffirming that vulnerability is not a weakness but a strength.

To future Honors students, our advice is to approach the experience with realistic and adaptable expectations. Set goals that are sufficiently challenging yet flexible enough to accommodate the inevitable ebbs and flows of academic life. This is especially crucial for international students, who often face additional pressures and timelines.

Remember, the Honors project is more than just an academic obligation; it’s an opportunity for exploration and self-discovery. It’s your playground to experiment with and develop the skills you are passionate about, whether that be coding, interviewing, survey-making, or marketing. Embrace the learning process and avoid the trap of perfectionism. The true value of this experience lies in the journey and the skills you acquire along the way, rather than the pursuit of an elusive ‘perfect’ outcome.

MEET THE TEAM

Nipun Kaushik
• 2nd year Honors student

Raoul Sanches
• 2nd year Honors student

Jasmine Frijters
• 2nd year Honors student

Vicky Hufken
• 2nd year Honors student

Lars ten Hacken
• 2nd year Honors student

Coach:
Mark Cox

“I’ll try to be more dominant from now on. Sorry guys.”
Raoul during the team feedback session
ABOUT THE TRACK

The innovation theme of our track is Artificial Intelligence for High Tech Systems. High tech systems have a significant positive impact on changing and shaping our modern lives and societies. Recent advancements in Artificial Intelligence (AI) take this change to the next level of smart high tech systems.

This year we focused on the Perception, Prediction and Planning (P-Cub/e) challenges of smart high tech systems with relevant use-cases in autonomous racing cars and human-robot interaction. Our students found a lot of chances to learn and apply advanced AI & Robotics knowledge to real engineering challenges. In addition to developing hard skills, we also offered our students many opportunities to develop and improve important soft skills such as presentation, communication and teamwork.

Our first-year program was organized in modules that cover different AI & Robotics topics on coordinate transformations, deep learning, deep perception, robot programming with ROS, robot localization and mapping, and autonomous navigation. Each module was completed with mini challenges to enhance learning by applying the new knowledge on realistic settings. Students presented their creative work at the end of each module and received constructive feedback from both coaches and peers. In the second year, students continue with their own innovative challenges on smart high tech systems.
I am an assistant professor at the Mechanical Engineering Department. I have a PhD in autonomous robots and human-robot interaction and substantial industrial experience.

I have always been fascinated by autonomous robots and artificial intelligence. I want to find the best way(s) autonomous robots can integrate into human daily and work life to make it better. This is applicable to robots in the household but also to medical robotics. My passion for autonomous robots that help people and artificial intelligence is what I try to transmit to the Honors Academy students.
ABOUT THE PROJECT

The main goal of our project was to design and test a robust method that could be used to automated distance measuring between a Sorama microphone array and some point of interest. This is important because in order for Sorama’s products to correctly function they need an accurate distance measurement to their point of interest and while it’s possible to do this measurement manually, this is quite tedious and sometimes simply impossible. As such, this project is an important step forward in automation which will eventually allow Sorama’s products to be mounted on fully autonomous agents that can be sent into areas that are inaccessible to humans. For Team ReLEASE this was an important project to take up because it had real life implications. We wanted to work on a project that was technically challenging and high tech all the while with consequences for the real world. Our contribution to this challenge means that eventually distance measuring can be automated which means that Sorama can operate their devices in delicate environments where human intervention is not always possible.

OUTCOMES

As expected the project was very challenging. Nonetheless, we are currently developing a minimum viable product where distance is measured using ultrasonic pulses. The system in principle consists of an ultrasonic speaker and buzzer. Where the buzzer informs the microphone array that a distance measurement is about to take place. The microphone array then listens for the ultrasonic pulse. Since the system knows when an ultrasonic pulse was emitted and received, the time difference can be used to compute the distance traveled using the elementary speed-time formula. This distance can then be used to properly configure the microphone array so that it can accurately beamform to the particular point of interest that is being investigated.

Ultimately, the most important result is that we have designed a prototype that can measure distance between the microphone array and a point of interest without any major nor expensive modifications to Sorama’s microphone array. As for next steps, the prototype needs to be tested in different environments to ensure its robustness and it should be implemented into the microphone in a more streamlined fashion than it is now.
MEMORIES

Perhaps the best memory this year is a collection of visiting Sorama’s office for the first time, receiving the device and conducting our first experiment and actually seeing the microphone array in action!

LESSONS

The most valuable lessons learnt throughout the 2 years at the Honors Academy must be that good communication and organization are essential for a successful project. Clear role distinctions and consistent meetings keep the project on schedule and allow the team to bounce ideas off each other. Our main advice for future Honors students is: pick a project that really means something to you, have clear roles from day 1 and finally have fun!

MEET THE TEAM

Arlette Beekman
• 2nd year Honors student

Robin van Mook
• 2nd year Honors student

Egor Larionov
• 2nd year Honors student

Jonathan Sum
• 2nd year Honors student

Coach:
Elena Torta

“Putting all the equipment in this tiny box is actually more difficult than coming up with a prototype for distance measurement.”
ABOUT THE PROJECT

As an initial goal for the first year of our track, the High Tech Systems team focused on learning the fundamentals of autonomous robotics. For this, an initial goal of developing a search and rescue robot, able to explore an unknown environment and to detect potential victims such a mission, was set to guide the direction of the team’s research and learning. As a learning tool, the ROSbot 2.0 robot was employed due to the variety of sensors it incorporates. Furthermore, ROS (Robotic Operating System), a widely used framework to facilitate the integration and communication of robot hardware with software tools, was utilized to program and control ROSbot 2.0. With this, the team learned how to make a robot explore an unknown environment, map such an environment, and be able to navigate through this environment given the map data through a series of complex algorithms. Furthermore, the team explored the camera vision aspect as well, learning about object recognition, particularly about feature detection to recognize particular shapes.

Given this, the team wants to apply the knowledge acquired during the first-year learning process onto a tangible, socially significant project for our second year as a track. We are currently finalizing the brainstorming phase and exploring the most interesting and potentially feasible ideas to begin full development as the end of the first-year approaches. Whether developing an autonomous robotic solution to help remove landmines from endangered areas, or helping scan and map the ocean floor for research, next year has a lot in store for the High Tech Systems track.

OUTCOMES

The most significant outcome of our project was the knowledge and skills we gained while developing it. We learned how to use the ROSbot’s Lidar to scan and map the environment around it, and how to explore this environment by navigating to unmapped areas. Using the robot’s camera we were able to detect specific pre-trained objects and make the ROSbot move towards them.

While we had managed to set up the base aspects needed to achieve our project goal of a Search and Rescue robot, we found out there were limitations that kept us from reaching it fully. First, we discovered that the ROSbot’s computing power was not enough to simultaneously explore the environment and search for objects with the camera. This issue was solved by offloading a major part of the computer to our laptops and sending the results back to the robot. The larger issue we realized was that the ROSbot is not a fitting platform for exploring an environment where a Search and Rescue operation would normally take place and it would easily get stuck in uneven terrain, as would be a collapsed building. This lead us to decide to not pursue the Search and Rescue project further, as it would be
mostly focused on the aspect of building an entirely new robot to be able to traverse rough terrain. This could be something of interest to a future High Tech Systems team.

Even though we were unable to complete our project entirely, we all still feel like it has served the purpose of giving us a context in which to become familiar with the concepts of ROS and robot perception and control. The things we’ve learned with this project are so useful in fact, that whatever project we choose to focus ourselves on next year it is almost certain we will reuse much of our work from this or at least use it as a starting point for further development.

MEMORIES

Our favorite memory from this year was the beginning of our Honors journey when all of us were trying to set up our laptops and the ROSbot for the project. We did not expect it to go smoothly, but we also did not foresee two months of struggling to download a few files correctly.

Out of seven of us, two people had a different version of Linux, two people’s laptops stopped working, and one person managed to corrupt their Windows. The two pioneers, whose dual boot managed to run, tried downloading the necessary software. No need to say that this was a challenge by itself.

Once we had downloaded the necessary recommended components, we were ready to set up the ROSbot. Once we managed to turn it on, we realised that our Linux version does not match the ROSbot version. Due to the previous struggle, instead of downloading a different version on our PCs, we decided to change it on the ROSbot itself. After some research, we realised that the only way to do this, is to flash its SD card. Have we managed to do it? Not really. Have we managed to convert it back? Luckily, yes! What did this mean? It meant that we had to be able to access the right version on our laptops. Luckily, Docker exists and everything works now.

These two months brought us together as a team, and despite the mutual struggle, we have learnt a lot.

P.S. Moral of the story: do not flash an SD card of a ROSbot.

LESSONS

• What are the most valuable lessons learned?
  At the start of our project, we were faced with a very simple problem. Namely, to move the ROSbot from point A to point B. However, upon trying to tackle this problem we encountered a lot of issues such as dual booting our laptops, starting the ROSbot, using the Robot Operating System and setting up simulations. On top of that, we did not have a clear plan, which complicated things even further. It wasn’t until we decomposed the problem into smaller, attainable steps that we actually managed to solve it. Thus, we learned not to underestimate a problem and to always decompose a problem into smaller steps that can actually be solved.

• What is your advice for future Honors students?
  When given a robot, it is really tempting to immediately start doing cool stuff with the robot. However, we strongly advise future Honors students to really spend some time creating a goal for the project so that you have a clear vision of what you want to achieve. This is very helpful in deciding which resources you need, your time division, which decisions to make, such as the algorithms that are used for the code, and most importantly ensuring that you develop your personal goals.

• Is there anything else you want to share with your peers or future Honors students?
  Being part of Honors Academy can sometimes be quite stressful. Luckily, there are also a lot of fun activities that you can enjoy, and you get to expand your network. And the best part of being an Honors student is of course that you can enjoy the delicious, free food before the workshops.

MEET THE TEAM

Ema Šujišter
• 1st year Honors student

Andres Manuel Diaz Aguilar
• 1st year Honors student

Tom van Eemeren
• 1st year Honors student

Marom Sverdlov
• 1st year Honors student

Dragoș Adrian Diaconu
• 1st year Honors student

Youssof Madbouly
• 1st year Honors student

Egor Obidin
• 1st year Honors student

Coach:
Elena Torta

Photos: Bart van Overbeeke
ABOUT THE TRACK

We live in a hyper-connected world. Social media networks such as Facebook and Instagram link different people from all over the globe. Moreover, the internet no longer only consists of just computers but connects a great variety of smart devices, from thermostats to self-driving cars.

Typically, such networks are large, consisting of millions or even billions of entities, and have a truly complex structure. These complex networks enable new information to spread very rapidly. Sometimes, news even reaches a fraction of the world population in a matter of hours. This interconnected world thus gives rise to new and exciting possibilities for society. However, it also introduces new challenges to society. For example, networks are used by some people and organizations to influence others negatively, by spreading false information very effectively.

In this Honors Academy track, multidisciplinary teams of students are challenged to identify real-world network problems that have a huge impact on society. Through stimulating activities, the students learn to work in a team, do research in network science, and communicate their findings to experts and a general audience. The final deliverable is a research program that the team will execute in their second year, which will have a true impact on the future of our networked society.
**TRACK COORDINATORS**

**Erik Steur**  
**TRACK COORDINATOR**

In this third year of existence of the track Networked Society, we had three student teams. Two teams of first-year Honors students had the task to define a research project on networks and their role in society. Our second-year Honors student teamed up with two students from the Competitive Programming and Problem Solving track to execute a research project on cryptocurrency networks. It has been a true pleasure to work with these brilliant students. I enjoyed seeing them developing the skills required to set up, execute and communicate exciting research projects. What I am most proud of is that our students managed to create a very pleasant and open environment that stimulated learning and personal growth.

**Pim van der Hoorn**  
**TRACK COORDINATOR**

This year 8 new students joined the track, making it the year that we had to supervise the largest number of students since we started two years ago. It was very nice to see a great amount of interest in the track, although it did require a more structural approach to planning activities from the coordinator/coach side. But I think we succeeded to a reasonable extent in this. Looking back on the last year, I am very happy to see the enthusiasm the new students brought and the growth they exhibited. Our second-year student also managed to identify an interesting research project and was even able to set up collaborations with students from a different track. Altogether, the 9 students managed to create an environment in which they could openly discuss questions and issues they faced and identify interesting research projects, for which I applaud them. So to me it was again another fun and successful Honors year.

**COACHES**

**Remco van der Hofstad**  
**COACH**

With 8 students registering for the Networked Society Track, we have lots of young and enthusiastic students to work with, which is wonderful indeed. The first-year students oriented on what scientific domain they wish to apply Network Theory to, which gave interesting insights. One group spent some time on how to define polarization in a network. All student teams read interesting papers to sharpen their understanding of various network applications in the real-world, including applications in biology (food webs) and ecology (the interactions between bacteria in the gut). It promises to become an exciting year again when these teams will choose their topic of research, and the approach that they will take on answering their research question. Our second-year student teamed up with bright Competitive Programming students to analyze bitcoin networks, which has learned us a lot about how these ad-hoc networks manage to function robustly. Finally, the group that graduated last year is in the phase of completing their first academic article, which will turn them into role models for the Honors Academy, I believe! All in all, a very diverse and highly exciting year again.
ABOUT THE PROJECT

As Networked Society Team 1, our main goal for Year 1 was to do a thorough research on various applications of networks. For this purpose, the project and main goal of year 1 was to delve into different fields of science that benefit from networks to better understand and navigate the complex systems that underpin our world. By studying the behaviour and structure of networks, we could gain very essential insights into how information and resources flow through society, and how we can optimize these systems to achieve better outcomes for our societies.

OUTCOMES

Throughout our literature search, our team came across a bunch of “surprising” information that played a fundamental role in building up our knowledge. One of these in the topic of “political polarization in networks” was how polarization between people could be contagious. A study we went through touched upon how exposure to highly polarized opinions from others in one’s network can cause individuals to become more polarized themselves. More interestingly, this can happen even if people were previously moderate in their political views. For our second topic, “using networks to investigate ecology”, a popular topic we elaborated upon, talked about how prioritizing the creation of green corridors can help to enhance connectivity and promote biodiversity conservation in urban areas. Besides, we learned how having large green spaces in a city is not always the most important for biodiversity conservation, but cities need a network approach in their green space planning to conserve biodiversity, which is unfortunately not being implemented in most of the urban areas of today’s world.

Our current goal is to focus further upon the topic of “using networks to investigate ecology” and come up with a well-defined research question in the upcoming month. With the mentioned findings and other studies we delved into, we built a great interest in using networks to conserve biodiversity in different urban forms.
MEMORIES

We collected a lot of great memories throughout our first year in the Honors Academy. If we are to talk about one, it should definitely be our modelling meeting on the topic of “political polarization in networks”.

As one of our goals, our team has tried to reproduce the findings of popular papers from the literature to assess our understanding of the concept. During one of our meetings, we went through a paper on political polarization in social media environments, in which a new metric for defining the polarity of a network was proposed. While trying to achieve the paper’s results through our code, we formed a better bond between ourselves. It was so entertaining for the team even though the process was a bit chaotic, but we ended up having so much fun by not figuring out the errors in our code! At the end of the day, we all knew each other better and simply became better friends!

LESSONS

Regardless of one’s interests, background, and ambitions, there always is a common way of doing things together. Therefore, our team has tried to communicate a lot and make sure that we do not follow “groupthink” and value everyone’s interests. This method of ours was very well-suited to our meetings where we discussed how we want to work together and individually. That is how we could keep each other’s motivation high through establishing a common sense of progress.

Additionally, it helped our team members to understand what is expected from each other and created a sense of meaning in our work.

The best advice our team can give to future Honors Academy students is to be critical, especially when accepting new knowledge. Never rely on one source of information regardless of whether it is considered trustworthy by the majority or not. Throughout our research on hundreds of papers about a certain topic, we realized that there always are opposing views to a certain theory or an understanding that was proved to some extent. Therefore, be patient, and continue researching until you believe that you have done so, and this “final point” comes with time and experience.

Additionally, always be planned. Honors Academy is a place where you get a high degree of autonomy in terms of time management and planning. This may make some people relaxed more than necessary, and they may end up with a low-quality output (project), or no output at all. Secondly, put so much attention on your Personal Development Plan (PDP). Prepare a detailed PDP to track your progress continuously and reflect on your progress. This will very positively influence your motivation and mental well-being.

MEET THE TEAM

Bartu Demirci
• 1st year Honors student

Igor Dmochowski
• 1st year Honors student

Marcos Ruibal Ortigueira
• 1st year Honors student

Roshni Kukreja
• 1st year Honors student

Coach:
Erik Steur

“Success comes from a combination of willingness to achieve and organizing to track progress.”

Bartu Demirci
ABOUT THE PROJECT

The goal of our project within the Honors track is to conduct research in the field of networks with the aim of identifying an important societal problem and formulating possible solution strategies. We want to make a meaningful contribution to society by addressing network-related issues and proposing innovative solutions.

Through extensive research and exploration of various sources such as books, papers, and sessions with the team where we thought each other useful skills, such as network analysis coding, our Honors team aims to gain a comprehensive understanding of networks and their associated challenges. We have organized activities like journal clubs to facilitate discussions, share knowledge, and deepen our expertise in domains of interest to the members of the team, such as sports, arts, physics and biology.

We have also gained valuable knowledge, through the sessions of feedback with our couches, which are experts in their respective fields. These interactions further enhanced our understanding of the field and help us refine our research direction.

Based on the knowledge and insights gained during the orientation phase, our team decided to focus on making a change in the field of medicine, in the human biome. We thoroughly considered the relevance of these challenges to society, ensuring that our research efforts have a tangible and positive impact. For this reason, we have investigated the relations between the microbiome and obesity as well as the gut microbia.

Overall, our project aims to contribute to the field of networks by identifying and addressing important societal problems or challenges. We strive to propose innovative solutions and share our research findings with a wider audience, ultimately making a positive impact on society’s understanding and utilization of network technologies in medical sciences.

OUTCOMES

By the end of the year, we aim to communicate the identified challenge that we want to further research in the next academic year and their relevance to the field of medicine to a general audience. We will accomplish by writing a blog post in an article form that will be published on The Network Pages (https://networkpages.nl). This platform will enable us to share our research findings and potential solution strategies with a broader audience, creating awareness and encouraging further discussions in the field.

Furthermore, by the end of the Honors Academy program we aim to publish an article describing our research in networks in the microbiome in a specialized
scientific journal. We would also like to further propagate our interest for networks and work towards a bigger purpose, ultimately helping society. However, the most important outcomes will have been the team learning more about the scientific method, how research is conducted, as well as further developing our domain-specific and soft skills.

Even though we have laid down the foundations for our project, there is still a lot that needs to be done so it is hard to view any of these components as specific outcomes. Luckily we are positive that we can continue to innovate, learn and (hopefully) excel in the coming year.

MEMORIES

The best memory of this Honors year was by far building a tower of pasta and marshmallows at the first workshop. It was extremely fun to build a tower as a team and see how each member approached solving the problem, as this gave us a short insight into how we would approach problem solving in our entire project. This workshop was during the period when we did not know each other and everything was very new - we still weren’t super sure about who each person was and what they would bring to the table. But this short activity was a great ice breaker and made us realize that it was good that we decided to spend our extra hours doing something with networks and not making pasta towers (as, unfortunately we were not very good at the latter)!

LESSONS

As a group we confidently agree that the most valuable lesson we learned is the immense power and potential of networks. Throughout the track, we delved into their various aspects, from social networks to technological ones, and how they have transformed the way we live and interact with each other. We learned that networks have the ability to connect people, information, and resources from all corners of the world, and how this connectivity has led to unprecedented levels of innovation, collaboration, and growth. Additionally, we discovered how virtually limitless the applications of networks are in different fields, from supply chains to biology, sport or social sciences. Overall, this track has given us a deeper appreciation for the importance of networks in our modern world and how they can be applied in various areas to bring about positive change and answer otherwise complex questions by delivering a new perspective.

Our advice would be to stay curious and focus on connecting the concepts learned as part of your Honors track with your personal interests. With a sense of curiosity and an open mind you will discover ways of integrating your passions into your Honors project. In that way, you will create a more meaningful and rewarding experience and you will be able to see your current endeavors from a fresh outlook. So, our advice to future Honors students is to embrace the curiosity that led you to this program, and use it to explore new ideas and connect with your personal interests.

Besides, we believe that one of the most valuable pieces of advice we can offer to future Honors students is to prioritize cooperation with their fellow team members. Honors work often involves collaborative projects, and it is essential to develop strong communication skills and a willingness to work together in order to achieve success. One key aspect of effective teamwork is learning how to listen to and respect the ideas and opinions of others, even if they differ from your own. Additionally, it is important to establish clear goals and expectations for the project and reconcile your Honors and university duties. By working cooperatively, Honors students can leverage the strengths and skills of each team member to achieve a higher level of success than they could individually. So, our advice to future Honors students is to prioritize cooperation and communication in their group work, and to approach collaborative projects with an open mind and a willingness to learn from others.

MEET THE TEAM

Kajetan Knopp
• 1st year Honors student

Alisa Kondratyev
• 1st year Honors student

Andreea Pîrvulescu
• 1st year Honors student

Jakub Wrzesień
• 1st year Honors student

Coach:
Pim van der Hoorn
SensUs is the international student competition in the field of Sensors for Health, organized by students for students. Each year, we challenge students from all over the world to develop sensors for a large problem in healthcare. Every year SensUs has a new theme. This year we challenge Teams, worldwide, to develop sensors for rapid detection of Traumatic Brain Injury (TBI). These are injuries from an external force, caused for example by an accident in traffic, in the workplace, or in sports. TBI can be diagnosed using imaging tools like CT or MRI, however these imaging techniques are often not sensitive or specific enough. According to experts, many TBI injuries go unnoticed and the patients do not get the treatment that they need. Therefore innovative sensors are needed, rapid sensors that are sensitive, easy to use and reliable. That’s the goal of SensUs!

In the SensUs Organization track, the TU/e students organize the global competition. They develop new ideas and solve complex problems by working together. The students develop expertise in communication and judgement, in sensors for health, and in management skills. They learn to communicate and negotiate with companies, and with students from all over the world.

In SensUs, students work on the future of healthcare and learn what it takes to make international impact.

We are team SensUs and we organise this competition for improving the quality of life!
The SensUs competition was invented at TU/e, initiated by a group of students in the Honors Academy with me as their coach. I am a professor at TU/e in the departments of Biomedical Engineering and Applied Physics. SensUs has grown and has become a vibrant community. Every year I am excited and proud to work with the students and see how their efforts generate new ideas, new activities, and a smashing competition with worldwide impact!

The students define the theme of the SensUs competition, define the rules, coach the Teams, involve companies, work with healthcare professionals, and organize the entire contest week when all participating teams come together in Eindhoven. Teams participate from North-America, Asia, Africa, and many countries in Europe. The students develop expertise in communication and judgement, in sensors for health, and in management skills. They learn to communicate and negotiate with professionals and with students from all over the world. I am honored to coach the students.

My mission is to train and inspire young scientists and engineers and to lay the foundations for solutions that will in the future improve the quality of life of patients. SensUs brings talented young people together from different scientific disciplines and from different countries. Every year I am proud of how the students develop new ideas and handle complex problems. It is amazing how the students develop themselves and realize every year a completely fresh competition that is full of innovation!
ABOUT THE PROJECT

The SensUs Student Competition is an annual international competition that brings together students from various universities around the world to develop innovative biosensing solutions for real-world healthcare challenges. The goal of SensUs is to inspire and educate the next generation of scientists, engineers, and entrepreneurs in the field of biosensing and healthcare technology. With the competition, we hope to stimulate the advancement of biosensing technology in the healthcare sector.

OUTCOMES

The theme of SensUs 2023 is Traumatic Brain Injury (TBI). The participating teams will develop a biosensor that can detect GFAP, a marker for TBI. This year, the SensUs Organization hosted its first live kick-off event to start the competition. Throughout the year, we are guiding the participating teams by hosting several feedback moments, entrepreneurship sessions, and partner sessions such that they can realize their full potential.

Furthermore, we are currently occupied with the preparations for two exciting events: the Distributed Testing Event, an engaging interim competition in an online format, and the upcoming SensUs Innovation Days, the week where all teams will compete with each other in Eindhoven which will be scheduled just before the start of the new academic year. Our team is actively involved in ensuring the organization of both these events, dedicating our time and effort to make them truly remarkable experiences.

Additionally, SensUs is constantly evolving and innovating its concept. Throughout the year, every member is trying to challenge the status quo which generates many new initiatives, and opportunities for improvement.
MEMORIES

Our fondest memory of SensUs is composed of smaller moments, including delightful dinners, plenaries, an enchanting day trip to Efteling, and numerous other experiences with more to come!

We can’t contain our excitement for the upcoming SensUs Innovation Days! Especially since the Kick-Off Event. This event was composed of presentations, a panel talk, and a networking moment. This event was really the first moment of the year in which every member within SensUs could see what was possible when a group of motivated students worked together on a single goal; It really gave us a taste of what is yet to come.

We are absolutely thrilled to experience the SensUs Innovation Days; an incredible event that we’ve worked towards for the entire year and will definitely create many fond memories.

LESSONS

It is never a shame to fail, but it is a shame if you haven’t tried!

We’ve learned a lot in different areas including professional contact, interpersonal skills, time & task management, and collaboration.

Work with passion, and reach out to the organization when you need help, people are always willing to help. Collaboration is essential in such an organization.

MEET THE TEAM

Bhuvan Vankadari
• 1st year Honors student

Bisher Ghadri
• 1st year Honors student

Daua Karajeanes
• 1st year Honors student

Lyonne Vlaar
• 1st year Honors student

Noah Olmeijer
• 2nd year Honors student

Parth Bora
• 1st year Honors student

Vladislav Budiak
• 1st year Honors student

Babette van Leeuwen
• no Honors student

Damla Metindogan
• no Honors student

Floor van Veen
• no Honors student

Hans Douben
• no Honors student

Joyce Pols
• no Honors student

Roos van de Watering
• no Honors student

Sarah van der Stam
• no Honors student

Siebren Barten
• no Honors student

Coach:
Menno Prins

“Within SensUs everything is figureoutable!”
ABOUT THE TRACK

Smart Cities addresses various topics from the perspective that smart and innovative solutions are required for the built environment. Implementing these solutions is challenging. The fundamental problem is that needs and preferences of citizens, quantitatively and qualitatively, tend to change faster than an inert physical environment can accommodate. The temporal scales of change considerably differ, creating inefficiencies in the urban system. Optimal interventions can only be instantaneous because, over time, people’s preferences and the properties and performance of the built environment diverge. Over the year, emerging information and communication technologies enable new strategies for urban interventions, thus bridging or narrowing this gap.

We invite all students to join us and work out the most challenging problems in the urban context together. With a compact series of lectures/talks/discussions at the beginning, you as a student will be equipped to define a self-chosen assignment on a specific topic and form groups to conduct the project.
Dr. Faas Moonen is an associate professor of Innovation Structural Design at the Built Environment. He has been the coordinator of the Smart Cities track from the beginning. Next to being the coordinator of the Smart Cities track, he also coaches different groups of students within the track. He also is a teacher of various courses within the Built Environment faculty, and has a great interest in projects which contain the subject of sustainability. One of his projects is the GEM-Stage, a sustainable energy solution for festivals. Another one of his projects is a pavilion that will be shown during the Morgen festival, which is made of a biobased material.

Floor van Schie graduated in September 2017 with a combined master in Architecture and Structural Design at the Eindhoven University of Technology, focusing on the integration of these two disciplines. As of Nov 2020, Floor graduated from her two-year Post-Master of Smart Buildings and Cities as PDEng trainee (Professional Doctorate in Engineering) on a project in which homeowners are helped with the energy transition of their houses. Sustainability is one of her main focus areas.

Iris Moonen graduated in September 2017 at the Building Physics department of the Eindhoven University. She graduated of her two-year Post-Master of Smart Buildings and Cities as PDEng trainee (Professional Doctorate in Engineering) on a project in which homeowners are helped with the energy transition of their houses. Sustainability is one of her main focus areas.

Mark Cox I have been working for Honors Smart Cities since 2015 as a coach. Like every Honors year, this year it has been a pleasure to see students grow in their personal development and see them achieving results and contributing towards new Smart cities solutions. I am especially proud of how Honors students realize their dreams despite a lot of scientific and practical challenges by working in mixed teams and with fellow students and external partners. The Honors students often contribute to the solutions of societal problems by developing or contributing sustainable technologies and products in the quadruple helix context. With a mix of creativity, energy, collaborative mindset each year the magic happens, and amazing projects are developed or pursued and engineers of the future prepare themselves for their upcoming role in society.
ABOUT THE PROJECT

3D printing is a rapidly evolving technology that is revolutionizing the way we think about manufacturing and construction in the built environment. With 3D printing, complex and intricate designs can be created quickly and with high precision. This technology has the potential to reduce construction waste and lower the carbon footprint of buildings by optimizing material use. As the technology continues to improve and become more accessible, it is likely that 3D printing will become an increasingly important tool in the built environment. However, the technology currently relies on materials such as concrete or steel, which have a substantial carbon footprint. The goal of our team is to take a different route and explore the possibilities 3D printing wood could introduce. We aim to achieve an understanding of the technology by first developing a printable cellulose based material and subsequently continue our research by printing models of structures such as houses and bridges. We believe our investigation of 3D printing with wood could present an insight into a more sustainable alternative to the current process.

OUTCOMES

Our mission is to research, develop, and refine a sustainable, organic material for 3D printing that is both strong and visually appealing. In the long term, we aim at proving this technology by building a tiny house with the material. After a year of studying the possibilities and challenges of the technology, we have managed to create multiple mixtures of cellulose and lignin, these are still in the development phase and require additional testing, but present a great success. Subsequently, we introduced two conceptual designs for our final product, the tiny house. In the near future, we will continue material research and refinement of the design, hopefully leading to physical models.
MEMORIES

The best memory of this Honors year will have to be one of our first meetings. It was a late Monday afternoon, winter was starting, it was cold and dark outside and everyone wished to go home as soon as possible, if not immediately. Despite that, it was this meeting where we decided to finally make progress and divide work. In an effort not to go on tangents and get distracted, we included dancing breaks in our two hour long agenda. As we tried to stay concentrated and set off one of the most difficult and important stages of our project so far, we got to know each other better and enjoyed our time. This meeting was both a valuable experience as well as a nice memory.

LESSONS

The most valuable lessons learned were the importance of organization and communication. As already mentioned in our favorite memory, it was hard to get our work started. When seven ambitious people come together for an interesting project without a clear goal or task division, it takes time and effort to synchronize and fulfill everyone’s expectations. However, the initial slow progress and chaos taught us how to communicate better and more efficiently.

The advice we would give to the future Honors students would be not to get scared off by seemingly impossible challenges or problems within the team. Mostly it is the most difficult situations that lead to the most valuable outcomes.

MEET THE TEAM

Maria Malli
• 1st year Honors student

Laura Trávníková
• 1st year Honors student

Nicolas Beaus
• 1st year Honors student

Mauricio Buendía
• 1st year Honors student

Renzo Jansema
• 1st year Honors student

Noah Jansema
• 1st year Honors student

Amar Mohindra
• 1st year Honors student

Coach:
Mark Cox
ABOUT THE PROJECT

Over the past decades, our world has changed rapidly. Population growth and climate change have become major factors in our economy, and thus also in the building sector. The increase of population increases the demand for housing and other buildings. The global climate crisis also comes with some major consequences for the built environment.

Currently, it is estimated that the building sector is responsible for around 38% of the CO2 emission globally (Sobota et al, 2022). To achieve the climate goals of the Paris climate agreement in 2050, major changes have to be performed in this sector. Finally, the emission of nitrogen oxides and ammonia also causes huge problems for the sector. The emission of these gasses causes a reduction in biodiversity. The lack of permission for these emissions also causes building projects to be delayed or even canceled. These problems require the building sector to improve and change. However, the construction of new buildings is (most of the time) still done in the way it has been done for decades.

OUTCOMES

To overcome the problems that come with building, a more efficient and industrialized approach is needed to the construction of new buildings. In our project, we hope to improve the way construction is done, so that it becomes more environmentally friendly, efficient, cost-friendly, and better for the construction workers. This is done by designing a prefabricated module that can be placed inside houses. The module should contain all the elements of a house that require connection to the water network, plumbing systems, and electronic systems. When new houses are built, this system can be placed inside the building. The significant advantage of this is that modules can be prefabricated in a factory in an efficient production process.

One of the main points of the module is the plug-and-play approach. When the module is finished in the factory, it can be transported to the construction site. At the site, it should only be placed inside the house and the least work as possible should be necessary to get it to work. For this, the module will contain plugs for the water, plumbing, and electricity systems, so that specialized construction workers are not necessary on site to place the module. Also, the module will be connected to the house with the same connections that
are used to connect it to the transportation trailer. This reduces the amount of material that is used and the time that is needed to place the module. Since the transport connections are already connected to the module, transport also becomes easier.

To reduce the carbon footprint of the module, timber is used as the main building material. Timber as a material has the least carbon footprint and can be adapted quite easily. The other materials (for example the tiles) are customizable and can be chosen by the customer upfront. This makes it easy to install everything in the fabric already and reduces the time of building on site. Other parts of the module can also be customizable, it is possible to make larger or smaller rooms by reducing walls or changing the position of a certain room. In this way, the requirements of the customer can be met, even before the construction of a building starts.

**MEMORIES**

It is hard for us to pick one specific ‘best memory’ since Honors brought many chances and many good memories. The entire process started for all three of us with the Honors introduction weekend, here we met each other without knowing that we would be working together for the next two years. This intro weekend made us even more enthusiastic to start with Honors than we were before.

After getting started with our project, we would say that the monthly meetings and the interim presentation are our best memories since we get interesting feedback and other insides to our project.

**LESSONS**

The most valuable lesson we learned as an Honors group is: collaboration is key. 100% of you as an individual is not even 1% of the team, this is due to the valuable fact of discussions which are extremely important, especially in the design process.

Our advice for future Honors students is to take the chance and go for any Honors track! It motivates you and broadens your perspective, you will get to know new people which are similar minded and are willing to put in extra energy into the project. You as an Honors student can design your own future, good luck.

**MEET THE TEAM**

Finn Aarntzen
• 1st year Honors student

Robin Geraedts
• 1st year Honors student

Jakub Janas
• 1st year Honors student

Coach:
Faas Moonen

“Do what you say and say what you do.”
Robin Geraedts
ABOUT THE PROJECT

Public spaces and the public furniture are essential to foster a pleasing and healthy environment for people. However, in our increasingly urbanized society, they are becoming less accessible and not enough cared for. In turn, public spaces and outdoor furniture have become a scarcity in our society. Consequently, the link between people and nature has weakened, creating a segregation between nature and people. As cities have become more compact with urban functions, nature has been driven away. By expanding urban bounds of the cities, the ecosystems once living in the cities have been destroyed, since neither plants nor animals have evolved enough to survive in such conditions. The decline in the quantity and availability of outdoor public furniture has major repercussion on the environment and society.

Public outdoor furniture plays a crucial role in fostering green spaces and encouraging people to interact with nature.

Public spaces found in the urban bounds of a city are becoming increasingly urbanized with little-to-no space for nature. In this urban-driven society, the quality and quantity of outdoor furniture is minimized, often leading to dissatisfaction of the citizens. With this project, we opt to provide nature-inclusive outdoor furniture, which is not only aesthetically pleasing, but it also incorporates practical features which can foster a greater cohesion between people and nature. Our design embraces mini ecosystems for small animals and insects, which facilitates their way back into the cities. By creating these nature pockets within the city, we aim to contribute to a healthier and more diverse urban environment, beneficial both for people and the environment. Additionally, our outdoor furniture promotes sustainability, made out of reclaimed materials in the building process, to satisfy the requirements of a circular economy. Our product is a nature-inclusive bench, which elevates the co-habitation of humans and nature, while encouraging environmental responsibility.

OUTCOMES

The most valuable outcome of the project by engaging in hands-on experimenting and building is that we gained a sense what it means to actually try and turn a concept into reality. Even though we had drawn drawings with a great precision regarding the positioning of the building components and then we have carefully defined the steps of the execution of the building process, many unaccounted obstacles occurred. The unexpected errors have delayed the whole process...
and many redesigning options had to be considered. Such small elements as the thickness of connections or the imperfections of wood cutting and gluing has affected the design and it took a considerable amount of time to repair.

As far as planning goes, we tried predicting the date of the completion of the bench, however, it is still not completely built. What we wanted to achieve is to have a completely built prototype, since one of our leading goals was to collect feedback from the potential users of the bench and to evaluate the success of the functions of the bench. However, we have decided to pursue this project even further and after Honors, which is why we still strive to complete the bench prototype and place it in a public space. We are still curious how the bench will integrate within nature and whether it will create the change we want to see.

MEMORIES

Our favorite memory of this Honors year has been building the physical prototype of our bench. Once we conducted our material research, we focused on obtaining reclaimed materials for the realization of the bench. We went on several bike trips to talk to suppliers who would give their by-products (waste) materials to us. We spent most of our meeting hours for Honors working in the workshop in Vertigo. We were collecting plank by plank, sanding and gluing them together to create the seating component of the bench. By means of trial and error, we have successfully (imperfectly) created a seating area. Most of the building time of the bench, we were designing as we went along. The most interesting part started when we obtained the bricks for our vertical component of the bench. We spent our meetings creating structures with different patterns with bricks and checking the structural integrity of the patterns.

MEET THE TEAM

Matea Shumkovska
• 2nd year Honors student

Manuel Soares
• 2nd year Honors student

Igor Sztormowski
• 2nd year Honors student

Kazuma Takahashi
• no Honors student

Coach:
Floor van Schie
ABOUT THE PROJECT

The primary goal is to compete in architectural competitions that include sustainability and the topic of smart cities. We chose two competitions that involved the design of a skyscraper. The first competition focused on the connection between the building and the city as this aspect is missing in the current cityscape. The second competition focused more on sustainability, thus the skyscraper is made from timber. This sustainable building material is gaining popularity given the current environmental issues. Our goal was to design a mixed-use, timber skyscraper that can be implemented in the city of the future.

OUTCOMES

Through the process of taking part in architectural competitions, the physical outcomes were the vision and design of a timber skyscraper illustrated with posters that represented the team’s vision to integrate life in the city with life in the tower. Having a timber tower also integrated sustainability and building physics solutions into the design. Another outcome is a detailed study and understanding of the chosen site located in Rotterdam to fully optimize the light/sun conditions as well as prominent wind forces. Other outcomes include team cooperation skills by constantly working under pressure and compromises taken to reach final decisions as well as soft skills such as improving graphical design with Photoshop and Illustrator skills.

MEMORIES

It was a year filled with growth, laughter, and shared challenges. The architectural competitions served as a plot for us to build the foundation of our communication, and eventually, we found common ground for all of the opinions to be heard and validated. Therefore, the best memory is not just down to a single moment, but to all our team meetings and outings. By far the most nostalgic memory of all of us together was our first dinner as a team, when we truly got to know each other. The good vibes lasted till late in the night, tears were spilled, weird laughs were turned into inside jokes, food allergies were made fun of, drunk photos made it to the group’s profile pictures and an interesting concoction of pesto-seafood-cheese-laoganma-pasta was successfully served. Some even started vacuuming their chairman’s floor.
LESSONS

One of the most valuable lessons learned throughout the year was to understand and appreciate the different ideas and approaches of team members. Our team has members from different backgrounds and levels of experience. This setup brought fresh perspectives, ideas, and solutions to the table that contributed towards a creative result. In addition, effective cooperation played a crucial role, as each team member has a unique role to play in the success of the project. Throughout the year, we experienced tight deadlines as well as the need to dive into performing new tasks. Without good cooperation, the design process would not be ready for completion. The process itself is, however, never truly complete. As a team, we continuously strived to evaluate and optimize the product for the best possible outcome. Good planning skills and task management proved to be valuable skills to be learned by all of us. We cannot wait to explore more what lies ahead in the second year of the Honors program!

One piece of advice that we would give to future Honors students is, if you hesitate about something, just do it. This is the perfect opportunity to experiment, try something new. Do something that you always wanted to explore besides your studies. There are countless options and resources to gain new knowledge, so definitely think outside of the bubble. Be enthusiastic, enjoy the time, and most importantly enjoy what you do.

MEET THE TEAM

Nicole Bergendal
• 1st year Honors student

Mara Gianotten
• 1st year Honors student

Matúš Kianička
• 1st year Honors student

Diana Marin
• 2nd year Honors student

Sebastian Spiteri
• 1st year Honors student

Coach:
Floor van Schie

“It’s calm, gigi hadid!! Slaayyy!!“
ABOUT THE PROJECT

Student housing is an ongoing problem for students in every city. From own experiences, finding housing at the beginning of your studies can be very stressful and determine whether you will be able to study at a university far from home. This especially holds for international students. Last year, Dutch universities even requested new (international) applicants not to come to their city if they had not found a student room yet. Extra housing is needed. However, building additional apartments costs a lot of money and time. Therefore, an alternative that provides a quick solution should be found.

Ekodome is a start-up company that designs self-assembly domes that could serve as an alternative for student houses. These are sustainable multipurpose living spaces and are sold worldwide. The domes do not need a foundation, due to their shape and inherently strong and stable structure. Therefore, they can be built by the owners themselves, which makes them relatively affordable.

Currently, the domes are mostly used as greenhouse, for glamping and as an addition to people’s houses and properties. For each use, different materials, sizes and designs are developed.

The goal of our project is to design a dome such that it can be used for student housing at the beginning of the academic year. This would provide (international) students a place to stay while they search for permanent housing. Since a majority of the students find a room via their friends, getting to know their peers and Eindhoven as a student city will help them in this process.

There are a few benefits of using domes as an alternative of building extra apartments. First of all, the domes are designed to be self-assembly by two people in a few days. Next to this, no building permit is needed to set up the domes. In addition, the domes can easily be assembled and taken down, so they only need to be set up temporarily. They can be stored after students have found a permanent place.

OUTCOMES

This academic year we have mainly focused on defining our project goal and creating a vision. The latter consists of the target audience, requirements and creating a design. We have made a first model of different interior designs of student domes to visualize the most practical and efficient options. Next to this, we have already done research on various sustainable and lightweight materials that could be used for building the
actual domes. We contacted the TU/e about possibilities of placing these on campus. Another option could be for either the TU/e or a housing company to buy some domes and rent them to students as a pilot.

Next year, we are planning on further developing the possibilities of implementing student domes in Eindhoven. This would require more extensive research on materials and facilities. In addition, we need to build upon the ideas we have developed for efficient use of the living space, such as customized furniture and interior design.

**MEMORIES**

Every week, our team has an evening meeting where we cook dinner together, chat and afterwards discuss the project progress. The bonding between the group members is valuable to our team and our achievements.

Next to this, we enjoyed the various fun activities organized by Confluente, such as the gala.

To us, Honors has also been about making friends.

**LESSONS**

Being able to define our own project and decide for ourselves what fields and skills we would like to develop as individuals is an opportunity, the regular bachelor does not offer to a great extent. Being open to freely brainstorm and come up with the craziest ideas actually leads to the best solutions and projects.

Since the variety in people and projects going on in Honors is great, learning about what the other teams are working on, is valuable to hearing different points of views to a problem. Our own team is multidisciplinary, which is something that contributed positively to our project and the different approaches to challenges we faced.

The main take-home message is that your TU/e bachelors is more than just passing courses and getting nice grades. The most important thing is developing yourself as a critical, analytical and widely skilled individual.

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**MEET THE TEAM**

Vera Jakobs  
• 1st year Honors student

Anastasiya Khlieban  
• 1st year Honors student

Agatha Mihalcea Simoiu  
• 1st year Honors student

Maribel Kamal Rizk  
• 1st year Honors student

Coach:  
Faas Moonen / Iris Moonen

“The road to success is always under construction.”
ABOUT THE PROJECT

The Energy Pathway is an architectural installation that aims to create an experience that involves different senses that encourage visitors to contemplate the meaning of energy. We aim to demonstrate the invisible energy flow visible by converting them to motion and light. By combining architecture and technology, we offer both experience and education by showcasing the organic flow of wind energy through the windmills and create an environment that engages people’s senses, such as auditory from the sound of the windmills and visual from the LED and colored windmills.

OUTCOMES

The main outcome of this project will be the installation of the Whirlwind pavilion at the Morgen Festival, in Renesse in September 2023. The installation consists of 2 interlocking spirals of steel poles that each hold 2 windmills. Each windmill is connected to LED that lightens up based on the organic energy collected from the wind at that moment in time.

MEMORIES

The best memory of the year had to be going to Renesse to see the town where our installation was going to stand. It made the whole project much more realistic! Although it was the dead of winter and -1 degrees outside, we had a ton of fun walking around the beach. All this with the added benefit of getting to stay at a 4-star hotel with an indoor swimming pool and an amazing breakfast buffet!

LESSONS

We learned a lot about selling an idea. One of the biggest challenges of making such a large installation was getting sponsored for it. We had to budget, keep track of our expenses but most of all be so sure of our project that we would be able to convince others that it was worth investing in it.

Be ambitious in your project! Although we were worried about the idea of making a whole pavilion in less than one year, we learned so much and are so excited to see our ideas come to life! Whenever we show our progress to other people and get such positive feedback, it makes all the hard work worth it.
MEET THE TEAM

Rosanna Al-Mahaqeri
• 2nd year Honors student

Lin Shu
• 2nd year Honors student

Inês Ascensão
• 1st year Honors student

Coach:
Mark Cox

“Some people build walls, we build windmills.”
ABOUT THE PROJECT

We want to accelerate housing renovations by predicting which homeowners are willing to renovate using an AI model with publicly available data.

OUTCOMES

We are producing an AI model based on the WoON dataset of 2018. The more data the better! But data acquisition is always tough.

MEMORIES

Hard core programming with the expert Mr Cronk.

LESSONS

We have autonomy over where the project is going, always do what you think is best, that is when you will learn what you want to learn.

MEET THE TEAM

Thomas Cronk
• 2nd year Honors student

Arjen Smetsers
• 2nd year Honors student

Coach:
Iris Moonen
ABOUT THE TRACK

In the field of Smart Mobility and in particular Cooperative Connected Automated Mobility, we see many opportunities to use technology to solve mobility problems. By adding smartness, we aim to decrease the negative effects of traffic jams, traffic injuries and deaths down to 0% and even lower the overall emissions from traffic and mobility solutions. Mobility impacts us all in our daily lives and the number of people, from industry, academia, and government trying to provide mobility to all of us is therefore immense.

With the trend towards further automation, connectivity, and cooperation of all modalities of transportation, Smart Mobility is further evolving towards Cooperative Connected Automated Mobility. This field focuses on connecting self-driving vehicles, traffic management systems, mapping, efficient powertrains but also vulnerable road users (such as pedestrians and cyclists) and other modes of transport to establish a mobility system for all, and making use of IoT, data science and Artificial Intelligence to achieve this.
This year, we had teams with a strong focus on our three pillars: societal challenges in the field of CCAM, being part of one of the Automotive student teams, and a project initiated at Honors. All topics fit very well within the Smart Mobility track, combining both sustainability, cooperative and connected mobility, and autonomous vehicle technology.

Most Smart Mobility track students really choose this track to be able to collaborate within a team. But this year, we also had lots of new teams starting, some originated from our students themselves. We have seen growth in our students that started last year, with some students now taking a leading role. Being the coach of the mm-wave localisation team this year, we focused much more on a research approach, which was a nice change for me as well.

I am proud that we have also shown what collaboration between tracks can do: with our earlier collaboration in past few years already with Energy Transition (Team Polar previously) and this year even extended to CPPS track with HackHouse!

We will surely continue and explore this kind of collaboration further in the future!

This year we had several workshops within our track, focusing also on teamwork (a workshop provided by external trainer) and ethics and data privacy, and additionally focusing on collaborative PDP design within the track much more than in previous years.

Mihai-Dragoș Ungureanu
COACH

This year has been my first year being on the other side of the table, from being a student in the Smart Mobility Track to joining now as a coach for the track. I have tried my best to help the students achieve their full potential within their own project, the track, and the Honors Academy, guiding them but also sharing a little bit of my experience as an Honors Alumni. I have been working with two teams for the past year: IDDS and HackHouse. Both teams started this year with a challenging new project, and they have worked hard to try to achieve their ideas and end goals. There were challenging moments, drawbacks, moments of stress but also moments of gain and excitement when things worked out as initially planned. Both teams tried to find the best solution to every aspect of their project, and I can say that I am proud of what they achieved by the end of this academic year and the quality of work put into their projects. They listened carefully to the feedback given by their coach and their track coordinator, and I think I have also learned so much from them as well. The students showed me that by having a dream but also goals and a concrete plan on how to achieve them, any project can become a success and a reality. As both teams are composed of second year Honors Students, and this was their last year as Honors students, I want to wish them all the best in the continuation of their studies and hopefully all the plans I read so much about in their PDP’s will one day become a reality in their lives.

Thank you all for this amazing year!
ABOUT THE PROJECT

We as an Honors track project, want to innovate the way micro public-transportation takes place. By introducing an automated shuttle service in campuses, airports and business-hubs, we want to make it easier for the people to travel small distances. By creating this public-transport opportunity, we also aim at creating an alternative to the use of personal automobiles to cover these small distances.

OUTCOMES

We as a team started with a project that was somewhat lacking of a direction. The assessment of our capabilities and the possibilities we could aim for took longer than expected. However our team managed to came up with a solid idea at the end, Automated Shuttle Services. A strong suggestion would be to not overestimate your abilities facing the steepness of the learning curve, this results in unmet deadlines and overwhelmed morales. (Team work, powering through hard work).

MEMORIES

The best memory of this Honors year is definitely the interim-presentations. During those presentations our team regained confidence in our abilities to push forward with our project. This was mainly due to the positive feedback we got from other track students, as well as our good performance during the presentation.

LESSONS

Most valuable lessons learned: Struggling with learning something is an essential part of the learning process. Even in the least productive learning phases of a project, the most crucial part of the process is taking place, so have a hard nose, because without it, you cannot see the finish line.

Future advice: Try to understand what your abilities and goals are and work towards them, do not take duties that are easy for you to do. Our group consisted of students who had little to none background information in our project, but we launched ourselves into the unknown, and benefited greatly.
MEET THE TEAM

Eren Ilter Çak
• 1st year Honors student

Egor Karasev
• 1st year Honors student

Shashank Prabhu
• 1st year Honors student

David Markovic
• 2nd year Honors student

Blendi Ahmedi
• 2nd year Honors student

Coach:
Milind Tripathi

“Guys, I finally have Ubuntu...”
ABOUT THE PROJECT

Over the past ten years TU/ecomotive went from a simple fuel efficient car to one of the most ambitious sustainable car concepts to date ZEM, the car that captures CO2. Today our team is working on the next step of this journey. Not only by improving where previous generations stopped but also with a climate positive future for mobility in mind.

At the moment global emissions from the mobility sector are being addressed by electrification (European Environment Agency (EEA), 2022). Out with the exhaust and on to an electric future. This already brings us much closer to a climate-neutral future. However electrification on this scale unveils new problems.

In a world that revolves around electric mobility and where the energy mix is green, the material production of cars will be the main contributor of mobility emissions and may even rise to 60% by 2040 (Hannonet al., 2020). So did we come up with a fancy way of producing cars then?

No, we focused on something much more simple: extending the use phase of vehicles. If you drive 200,000 kilometers with a car instead of 100,000 you would cut your emissions per kilometer in half.

That is why we developed the car that lasts a lifetime!

But how do we do this? Well EV’s don’t need much repair, since they don’t have a clutch that can break down. Most experts say the battery will outlive the rest of the car, and electric motors are much simpler and easier to maintain (Jerew, 2021). On the other hand interior things like upholstery might get damaged and out of fashion quicker (Westbrook, 2019). While safety systems like camera’s and sensors have new versions and features.

This leaves a relative big gap in the lifespans of components. That’s where our idea comes in. Why don’t we pull the two lifecycles apart? We have our bottom part of the car with the long lasting systems, like the drivelines, steering system, braking and suspension.

While we have the systems with a shorter lifecycle in the top. Now we can separate these two lifecycles and instead of replacing the whole car, we can only replace the top part of the car thus reducing production emissions significantly.

In our car the top can be taken apart from the board and be replaced by a new top. However since building three cars in one year is out of our scope. The other possible iterations for our modular board have thus been made in augmented reality. This altogether shows the full lifecycle our vehicle can go through matching to the lifestyle of a user.
OUTCOMES

At this point in time we have the entire car designed and rendered. All of the self designed parts have been sent to manufacturing and all of the ordered parts have arrived at the office. Over the next few weeks as more of our self designed parts come into the office we will assemble the entire car ready to be presented on the 27th of July. The final outcome of this project is the completed concept car.

MEMORIES

Getting pet fish for the office. They are called Luca and Zwem after the last two cars produced by our team. After a particularly stressful week, it was our team managers birthday. As a joke we gave him the fish as a birthday present so he would have more things to manage. Surprisingly, the fish have become one of my favorite parts of the office. Watching them swim around without a care in the world has been really calming and peaceful in trying times.

LESSONS

Even though it sounds cliché, team work is the most important aspect in a project. Every project will be much more fun when the team functions properly. As advice for future Honors students, when working in a team always communicate and be aware of your own and your teammates shortcomings.
ABOUT THE PROJECT

We are aiming to create a system that is able to detect if a cyclist is drunk or not based solely of driving behaviour. This system can be installed on rental (e) bicycles with the aim of reducing accidents, injuries and repair costs all while having a minimal impact on the user experience. Such a system can prevent accidents and injuries caused by drunk driving, reduce the repair costs and contribute to creating a safer and more secure environment for everyone, including both cyclists and other road users.

OUTCOMES

The project is still mostly in the research and preparation phase for creating a physical system later on. Current set of electronics, detailed budget as well as algorithm on how to detect abnormal driving behaviour are developed. Based on the business case development and market research made, this system is of potential interest for scooter/bike/segway rental companies, who would like to invest in safety of their vehicles and equipment.

The most unexpected outcome for the team was a lack of data and/or relevant simulation environment for bicycles that can be used prior to experimentation and own data gathering. Lots of effort was put into researching similar approaches in papers, however not a lot of use can be made from those. As a lesson learnt it can be mentioned that focusing on our own detailed experimentation plan and budgeting should have had higher priority.

MEMORIES

The best memory for the team this Honors year was a set of workshops that helped us to define our business strategy better as well as come up with ultimate solutions for several technical and organizational issues. Working on our creative skills during these workshops was also a fun and enjoyable way of getting further with the project.
LESSONS

The most valuable lessons learnt were the following. With a completely new system and algorithm like IDDS it is important to do research as a basis and overall understanding of what we are working on. However, too much time was spent on finding data or similar experimentation results, which could have been invested in finalizing our own experiment plan and gathering our own data. That would accelerate the process by a margin. Taking into account ethical issues like validity of data, experiment safety as well as the ethical impact is also a big part of developing an experiment, which was underestimated.

For a completely new project try to create a project proposal as detailed as possible, backed with strong research argumentation and planning. Creating such a document is also helpful to understand what needs to be prioritized and where less effort is needed.

It is important to understand that too much focus on a technical part of the new project can slow down the overall development. Technical work on the actual system needs to be balanced with research work, project organization within the team and externally, as well as efforts should be made to get through ethics board approval.

MEET THE TEAM

Vadims Kisels
• 2nd year Honors student

Daniils Balonuskovs
• 2nd year Honors student

Christian Friedmann
• 2nd year Honors student

Coach:
Mihai-Dragoș Ungureanu

“It’s nice to be important, but it’s more important to be nice!”
H.P. Geerdes
ABOUT THE PROJECT

The 5G mmWave localization project is about determining if the existing 5G infrastructure can be used effectively to accurately determine the position and orientation of a receiver. One potential application of such system is in autonomous vehicles where redundancy in systems that determine position and orientation is required. Standard positioning systems such as GPS (or other satellite based navigation systems) lack the precision needed in presence of high rise buildings or other environments where the signal can become obstructed and attenuated.

However, by assuming that that area is already well covered by 5G base stations, a vehicle could potentially be able to locate itself, therefore enabling autonomous driving in areas where satellite-based navigation systems do not work well.

OUTCOMES

After extensive literature research, we studied what experts in the field have written regarding localization of receivers using different methods. We were interested in the algorithms or simulations that they have made as that would be useful to our objective. While the simulation that we used and adapted seems to be the most suited for that purpose, it did not help us reach a clear conclusion if a real-world implementation would be feasible, both from a technical and an economical point of view. The original creators of the simulation, that used it in their paper which tackles position and orientation estimation using 5G mmWave, found that accurate positioning is possible in multiple scenarios, however implementing this in an urban/highway scenario was beyond the scope of their research. More research is needed to determine whether such an implementation is possible.
MEMORIES

Best memory of the Honors year for our team was probably the intermediate presentations. We had the opportunity to think about how to present the seemingly complicated project in a simple way. We received extremely valuable feedback and had really encouraging conversations with other Honors students. Moreover during the presentations we had the opportunity to get insight into the work of our fellow mates, which further inspired us.

LESSONS

The most valuable lesson we learned was that research does not always result in a great discovery or invention. What matters is the route taken, the lessons learned, the knowledge and skills acquired, and not only the final destination.

Don’t be afraid to make misstates, to get lost and to ask for help. Also don’t be afraid to challenge yourself with a difficult project.

Enjoy your studies as much as possible but keep a good balance between work and fun. (e.g. you can join a committee in Confluente, you learn many things and also have fun!).

MEET THE TEAM

Alexandros Peonidis
• 1st year Honors student

Nikola Petrov
• 1st year Honors student

Coach:
Jos den Ouden

“If you cannot convince them, confuse them.”
ABOUT THE PROJECT

The technology behind Maglev and Hyperloop is already quite advanced and well known, however it is not yet applied at a large scale. There are many teams looking into how to create a functional Hyperloop, but there aren’t many who have created a fully functional design yet. The same goes for Maglev trains: the technology has been present for multiple decades but is not applied at a large scale yet due to various problems, mainly due to the high cost of infrastructure and trains.

The goal of us is to focus on recreating the technology of a Maglev train, making use of both electrodynamic suspension and electromagnetic propulsion, and to see if it can be combined with current railway tracks, thus creating a new type of “fusion-track”. This new fusion-track can then be used by both conventional high-speed trains and the new Maglev train design, without the need of an entirely new infrastructure for the use of Maglev trains. By lowering the costs, while still being able to achieve maximum efficiency out of Maglev technology, the idea of applying Maglev trains for medium-long distance travel should become more appealing in the future of railway travel. Furthermore, with this technology, we can provide an alternative means of fast, sustainable and cheap travel and provide them the opportunity to avoid using planes which are detrimental to the environment.

OUTCOMES

Although the results are a bit different from what we expected in the beginning, we are still happy with what we eventually achieved. One of our most significant results is our numerical model of the suspension and propulsion system of the Maglev train, as it took the most time out of everything we did within this project. However, we are also very satisfied with some of our other results, such as a CAD model for our new train and track design, and a simulation regarding the necessary changes to the timetables if we were to implement the Maglev train on an actual route, for example Amsterdam-Paris.

One of the goals that we were unable to achieve was to make a physical model of our concept idea, as we unfortunately did not have the proper time or money for it in the end. This would have been amazing to have and
is still a goal we have set for the future. A second, more important goal is to try and make the team larger and develop its structure, to hopefully go towards a student team in a few years. This will allow us to perform research significantly faster, and perhaps also start research in different areas from what we have done up until now.

**MEMORIES**

Some of the best memories are the conversations we would often have after our meetings where we would just describe how great or sometimes how awful our days were that week. This would result in some of the weirdest but most hilarious conversations we have had until now.

The best memory would be the project altogether, not just a specific part of it. Seeing how we all came together to work on something most of us had no knowledge about, but still seeing how we made it work somehow, with our ups and lots of downs, to create a great result. We hope we can continue this project next year, so we can hopefully make better and more memories together, both with new and current members of the team. However, as the project is never finished, we can still make new memories along the way.

**LESSONS**

The most valuable lesson was that if there is a will, there is most certainly a way. If a group of students from various academic backgrounds get together for a project that is different from their studies and manages it, then every Honors project, no matter how crazy it sounds, has a chance to reach great success.

The advice we can give to future Honors students is to just start with it and see where it goes. If the progress is halted until everything is planned to perfection you would need a decade for your Honors project to become reality. Once you start with it, and it goes wrong at a certain point, it is nothing more than a learning opportunity for next time.

For example, our project had a bit of a rough start, as we did not really know what we were doing at first and thus did not have a proper structure or planning for the group. However, as time passed, we got a better overview of what needed to be done, learned from our mistakes and got more knowledge and insight on the different topics we would study. It was a bit difficult, as most relevant topics were outside our respective field of expertise, but that did not stop us from continuing the project. In the end, we became a (somewhat) competent team that has achieved a great result with what we wanted.

**MEET THE TEAM**

Sarp Deger
• 2nd year Honors student

Annelies van Vastenhoven
• 1st year Honors student

Lars Hilkens
• 2nd year Honors student

Coach: Jos den Ouden

“The goal is to make the train go whooosh”
Lars Hilkens

“It was cool, very... train like”
Annelies van Vastenhoven

(After a groundbreaking research)
“Model trains are COOL and ORGANIZED”
Annelies van Vastenhoven
This yearbook is a celebration of the collective achievements of the Honors Academy. It is a testament to the countless hours of hard work, dedication, and collaboration that have gone into making this year such a success. As H.S.A. Confluente we are honored to be able to bring these students together and grow stronger as a community.

As we look back on the past academic year, we are filled with a sense of pride and gratitude for the amazing year we have had as an association. We had a lot of fun together during our countless activities in- and outside of the Honors Room, had random discussions, played a lot of chess, and finally started on those due dates that kept coming closer. But none of this would have been possible without our amazing committees creating these events and opportunities for our members. This year we had lunch lectures, workshops, a gala, high teas, and a grand total of two networking events! Furthermore, we were able to bond with other associations over activities such as Battle of the Rooms, the Batavierenrace and our networking event together with TU Delft and TU Twente. We still have a few activities planned for the last stretch of this academic year, but like every year we will close off this successful year with the study trip, for which we will travel to Vienna and Salzburg this year!

It was an immense pleasure to serve this community as the eight board of H.S.A. Confluente. We want to thank all our predecessors, boards 0-7, for the hard work they put into the association, and wish the best of luck to our successors. We hope you all have enjoyed this year as much as we did. We look forward to the adventures that await us in the years to come!

Board 8 - To Fly Skyhigh!

Pascal Otjens
Chairman

Pham Duc Minh
Secretary

Maarten Dankers
Treasurer

Niels van Noort
Commissioner of Internal Affairs

Floor van Veen
Commissioner of External Affairs (2nd semester)
& Commissioner of Educational Affairs

Vicky Hufken
Commissioner of External Affairs (1st semester)
INTRO WEEKEND
We started the year with the Intro Weekend, where all new Bachelor Honors students got to know each other and the association! With the weekend being filled with activities and workshops we had an amazing first event!

MONTHLY DINNERS
Every month we would come together in the Honors Room to enjoy a tasty meal prepared by the board and meet up with friends after a month of hard work. It was great to relax in between our busy study schedules. After every monthly dinner we would go to the Hubble community café together for our monthly drinks.

GALA
After weeks of folding, the gala committee was finally able to put up the decoration for our gala this year; a thousand paper cranes. During a majestic evening full of beautiful gowns and stylish suits we danced to lovely music all night long.

CHESS COMPETITION
One of the most played games in the Honors Room is chess, which is why we decided to collaborate with S.C.C.E Noesis to organize an open chess tournament during winTU/er. Everyone competed fiercely, but of course there could only be one winner!

LUNCH LECTURES
Throughout the year we’ve had the pleasure to organize multiple lunch lectures to enrich the minds of our members even more. These lunch lectures were given by external parties, such as Effective Altruism, as well as by our own Honors students!

BATAVIERENRACE
Together with our sister Honors associations HCSA (Groningen), NSHV (Nijmegen) and Ockham (Enschede), we participated in the Batavierenrace! We ran from Nijmegen to Enschede and ended up in the top 200 out of the 350 teams!

CAREER NETWORKING EVENT
We were lucky enough to have two Networking events this year! The first one took place in November 2022 and was a collaboration with the Honors students of TU Delft and TU Twente! The second one took place in May 2023 and was a collaboration with the student teams of innovation Space! It was a great chance for our students to see what opportunities are out there after their studies.

PROSPECTIVE HONORS STUDENTS BBQ
A barbecue was hosted for prospective bachelor Honors students to talk with current Honors students about our experience and to answer any questions they might have, in a casual setting.

INTRO WEEKEND
We started the year with the Intro Weekend, where all new Bachelor Honors students got to know each other and the association! With the weekend being filled with activities and workshops we had an amazing first event!

MONTHLY DINNERS
Every month we would come together in the Honors Room to enjoy a tasty meal prepared by the board and meet up with friends after a month of hard work. It was great to relax in between our busy study schedules. After every monthly dinner we would go to the Hubble community café together for our monthly drinks.

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Honors Academy Staff

KATHINKA RIJK
As strategic policy officer (Honors) education, I think about what the future of Honors Academy should look like. And nothing inspires me more than to see the magic that is already happening now. With a mix of ingredients such as talent, motivation, determination, fun, and teamwork, the achievements you can reach are endless. It is so energizing to hear you talk about your amazing work and to see the way you help each other to take that extra step to make miracles happen in your projects. Congratulations on all you have achieved, and best of luck with whatever the future brings!

MARIJKE VAN DEELEN
My name is Marijke van Deelen and I work as a policy officer for the Honors Academy. Together with my colleagues I develop policy and regulations that guarantee and improve the quality of the Honors program. Therefore, I am also in regular contact with Confluente and track coordinators. I love being surrounded by highly motivated people who want to grow personally and professionally, so working together with Honors students and staff is right up my alley! Congratulations to all graduated Honors students! And to those of you who are continuing your Honors program, enjoy your summer and see you in September!

LENNY A Pon
My name is Lenny Apon and I am the Education Coordinator of the Honors Academy and innovation Space. My tasks focused mainly on coordination, organization, and communication. I aim to create a crossover between the great activities which takes place at the Honors programs and at innovation Space’s vivid community. I am impressed by the great Honors projects at the Demo market, and I am happy to see some of you as a (trial) student team at innovation Space. I am sure we will see many of you with great careers as top-researcher, start-up or CEO of one of the organizations of the future.

RACHEL VAN DE POL
My name is Rachel van de Pol and I mainly work behind the scene. I am responsible for the administration of the Bachelor Program and organizational duties within the Honors Academy. I am proud of our students for their dedication and creativity in the Honors projects we have seen this year. It is great to see the Honors community flourishing again on campus. Congratulations on what you have accomplished this year and have a great summer!
LISA VAN OS
My name is Lisa van Os and at the start of this academic year I kicked off my adventure at the TU/e Honors Academy. I mainly focus on the Honors Master Program with tasks such as organization, administration, and communication. The most appealing element of the Honors Academy is the focus on personal development, and I hope you really enjoyed and learned a lot last academic year. Congratulations to all graduated Honors students! And to those of you who are continuing your Honors program, see you next year again!

STEPHANY GIEL
My name is Stephany Giel and I am the student assistant of the Honors Academy staff. I am a Building Environment student who is specializing in Architecture. Within the Honors Academy, I help out with various tasks, such as the social media and other design tasks. I am impressed by all the fascinating and innovative projects that Honors Academy students have been working on this year. Therefore, I would like to congratulate you all on your work and wish you an amazing summer!

ROBERTA DE FRANCO
I’m Roberta De Franco, and I work as a policy officer at the Honors Academy. My passion for education, especially innovative approaches like those offered by the Honors Academy, drew me to this role. As a policy officer, my main objective is to enhance the Honors Academy program continually. To achieve this, I focus on implementing and clarifying regulations and guidelines, which are crucial to maintaining the quality and integrity of the Honors program. In carrying out my responsibilities, I work regularly with key stakeholders, including the Student council and our committed Track Coordinators. Their invaluable input helps me to stay informed and up-to-date on the needs and expectations of the Honors Academy community. I strongly believe that collaborative efforts are vital to the success of any program, and I am fortunate to have the opportunity to work with such an exceptional group of people. To all the Honoros Academy students who have achieved so much, congratulations!