



3.2 SOMNIA database for sleep medicine

Roadmap and goal

A good night's sleep is of the utmost importance and sleeping disorders have a huge impact on people's well-being. 10% of our population suffers from one or more forms of sleeping disorder and that number needs to come down.

Sleep medicine has serious limits in terms of measuring and monitoring. New technologies to monitor sleep and sleep disorders over long periods of time in a home setting are urgently needed. However, suitable non-obtrusive sensing technologies are basically a surrogate for gold standard measurements. To achieve adequate performance, algorithms need to be developed and validated, but this requires large datasets in patients of all ages with a variety of sleep pathol-

ogies, which combine gold standard polysomnography directly with innovative sensing technologies.

Polysomnography (PSG) is the primary tool for sleep monitoring and the diagnosis of sleep disorders. Recent advances in signal analysis make it possible to reveal more information from this rich data source.

Approach

The SOMNIA (Sleep and Obstructive Sleep Apnoea Monitoring with Non-Invasive Applications) project has created a database combining clinical PSG with advanced unobtrusive sleep monitoring modalities in a large cohort of patients with various sleep disorders. The SOMNIA database facilitates the validation and assessment of the diagnostic value of the new techniques, as well as the development of additional indices and biomarkers derived from new

and/or traditional sleep monitoring methods.

Apart from the relevance of creating this rich database for sleep research, the use of it in a multidisciplinary context and for analytics beyond sleep has created a breakthrough for many e/MTIC studies.

Led by Kempenhaeghe Sleep and Epilepsy Center, e/MTIC has built a dataset with the sleep patterns of over 2,000 insomnia patients. This dataset is an enormous help to improve diagnostics and effectiveness of sleep products. The solution hinges on a close collaboration between Sleep Medicine Center Kempenhaeghe, Eindhoven University of Technology and Philips Research. The clinical care team, including doctors, nurses and sleep technicians is engaged to enable data collection. With all partners we developed streamlined data sharing procedures and an open framework to allow relatively quick introduction of new devices. All these were basically the result of a co-creation approach between trusted partners.

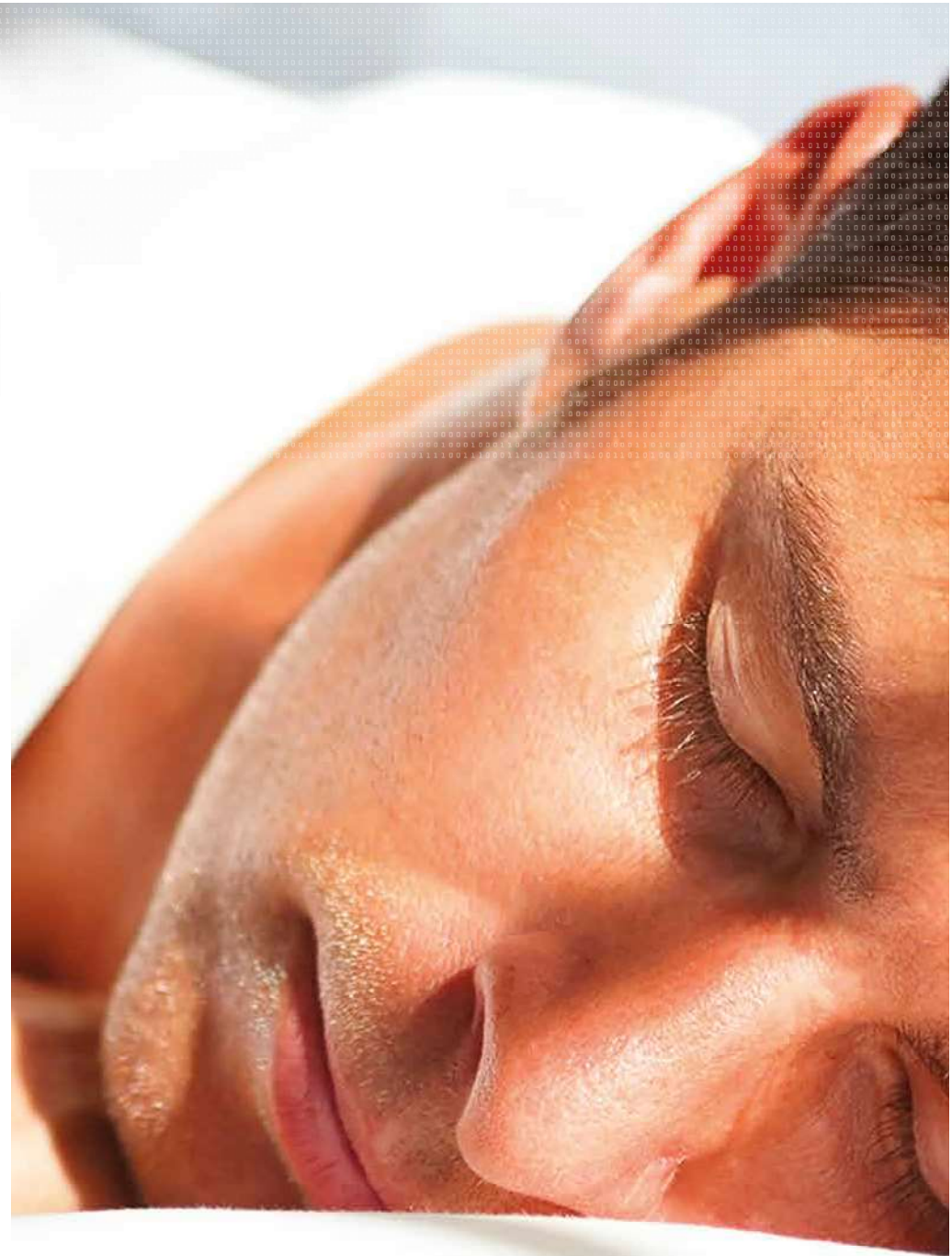


Figure 5: Unobtrusive sleep monitoring applying new sensor technologies, AI algorithms and validated through the SOMNIA program



Sebastiaan Overeem

Prof. dr. Sebastiaan Overeem, somnologist at Kempenhaeghe explains: “Somnia is a flexible, scalable and yet highly standardized data collection program. It is a vital part of our research and meanwhile fully integrated in our routine. An efficient source for collecting, analysing and disseminating datasets for multiple use. A unique and intelligent library where data of over 2000 registrations is gathered and evaluated. It is this technology that bridges the gap between collecting relevant data on a large scale and its effectiveness for the daily practice of patients and doctors. The uniqueness shelters in

actual incorporation of new technology: AI and algorithms. It is this technology that marks the path from early idea to better and more efficient healthcare.”

Results

The database has been used in many projects already and has led to over 20 published scientific papers. One project concerns the accurate determination of the stages of a person’s sleep. e/MTIC researcher Pedro Fonseca and co-workers have been able to develop an automatic sleep staging algorithm using heart rate variability, body movements, and recurrent neural networks. This ap-

proach has been validated in a sleep disordered population through the SOMNIA project ².

New sensor technology, infrared observation cameras and future smart apnea monitoring devices are among the tools developed in the e/MTIC ecosystem that will bring the principles of value-based healthcare from bench to bedside. The way of working of both data collection, sharing and analysis serves as an example to several other e/MTIC projects. In the future, the Health Data Portal will support SOMNIA studies without data having to leave the hospital.

Sebastiaan: “Sleep medicine is a young and complex science. Therefore, I am even more proud that we are lifting our profession from the safe, warm e/MTIC bath into the future. As a distributor of valuable data, as a stimulus for tomorrow’s care talent and as an accelerator of care in general.”