

SUPSI

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SUPSI, Inselspital, University Hospital Bern and the NeuroTec Center at sitem-insel join forces for sleep research: new innovative project Sleep Physician Assistant System (SPAS)

Sleep disorders are a major and growing public health problem affecting a significant part of the world's population, which needs medical assistance. The Eurostar “Sleep Physician Assistant System (SPAS)” project aims to create a platform that supports and optimizes the work of health care professionals active in the analysis of sleep disorders. SPAS is initiated by the Department of Innovative Technologies of the University of Applied Sciences of Southern Switzerland (SUPSI) in collaboration with the NeuroTec Center at sitem-insel (Swiss Institute for Translational and Entrepreneurial Medicine), the Sleep-Wake-Epilepsy-Center (SWEZ) of the Inselspital, University Hospital Bern and two companies active in the areas of medical technologies (Relitech, the Netherlands) and data science (Biomax Informatics, Germany).

To study sleep disorders, health care intervenes with a nocturnal polysomnography: patients sleep overnight in the hospital and are monitored by a medical team that measures a number of basic physiological parameters such as brain activity, eye movements, limb movements, oxygen levels, heartbeat and breathing, with the aim of identifying possible disorders. In this context, scoring takes place, a procedure that identifies the different sleep phases. This operation involves manual and often tedious work that requires repeated intervention by professionals, partially supported by automatic or semi-automatic analysis software. However, the vast majority of sleep physicians do not use these systems and do not perceive them as a real help.

SPAS Project

Starting from an accurate analysis of the main approaches adopted to simplify the scoring process, the Sleep Physician Assistant System (SPAS) research project aims to provide a concrete solution to fill existing gaps and better support physicians in the characterization phase of sleep signals. The project intends to develop a flexible platform able to assist the physician in a pragmatic and effective way, freeing him or her from tedious work and making it possible to focus on more complex activities. Through a series of mechanisms based on machine learning techniques, the platform operates like a "silent apprentice" absorbing information and acquiring the skills of the physician, partially replacing him/her in the data processing and evaluation phase.

The advantages of the new system

An important advantage of using the SPAS platform is a better extraction of processed data that will be fully exploited by improving the processes of diagnosis (identification of early markers) and general treatment. The assessment time of physicians could be reduced by up to 50%-80%. The platform will be able to exploit

data from already widely used sleep stations and systems and aims at being easily integrated into the normal sleep physician routine.

Project partners

The project, co-funded by the State Secretariat for Education, Research and Innovation and the European Union, is an innovative example of a NeuroTec/sitem-insel project resulting from the collaboration of basic research institutions, hospitals, and private companies. It was launched in July 2018 by the Institute for Information Systems and Networking of SUPSI in collaboration with the Sleep-Wake-Epilepsy-Center (SWEZ), which is a structure of excellence. The SWEZ is part of the Neurozentrum of the Inselspital, Bern University Hospital and collaborates closely with the newly established NeuroTec Center at sitem-insel. The fruitful cooperation between the partners is a central element of the project: a link between SUPSI, the Inselspital, Bern University Hospital, and the NeuroTec Center, which aims to strengthen the cooperation between leading academic institutions that will facilitate the transfer of research results into clinical practice and generate a positive impact on the medical sector.

The project team, led by **Francesca Faraci**, Lecturer and Researcher at the Department of Innovative Technologies at SUPSI, and by **Panagiotis Bargiotas**, Attending Physician and Researcher at the Sleep-Wake-Epilepsy-Center/NeuroTec Center, is currently working on the development of the platform focusing on the definition of requirements and user-case scenario, as well as on the development of the user interface and software algorithms. For this part, the Sleep-Wake-Epilepsy-Center/NeuroTec Center has selected a database of polysomnographies as the basis for the development of the algorithms.

In the working group is also active **Luigi Fiorillo**, a SUPSI student who is doing a PhD, jointly supervised by Francesca Faraci and Prof. Dr. Paolo Favaro (University of Bern). Luigi has joined the PhD Network in Data Science, a national network that offers students with a master's degree the opportunity to obtain a PhD in collaboration between Swiss Universities and Universities of Applied Sciences. The experience gained in the PhD Network in Data Science will ensure a further contribution to the project team by expanding the possibilities of collaboration with other poles of scientific research in Switzerland.

During the presentation of the SPAS project, Francesca Faraci, commented: "SPAS is an excellent example of how applied translational research can reduce the gap between basic research and clinical practice. Advanced data analysis and artificial intelligence techniques struggle to converge into products that are integrated and used in the regular routine, often due to non-participation of the end-users in the development phase. The SPAS idea was born while talking with sleep physicians and company leaders in the medical sector, and listening carefully to their perspectives and real needs. This project shows how a multidisciplinary approach can effectively lead to real products and services; collaboration is the winning key to really improve prognosis, prevention and patient care."

For his part, **Panagiotis Bargiotas**, Sleep Physician Researcher at the Sleep-Wake-Epilepsy-Center/NeuroTec Center, commented:

"Medicine made huge advances in the 20th century mainly in translating basic science to clinical practice. However, in the 21st century we are witnessing a never-seen-before progression in field such as medical technology, biomedicine and computational science all with the potential of improving health. Medical research has to move carefully towards this direction and benefit from it. It is exciting and very creative for us physicians to work together with computational scientists and being an active part of the developing process of new medical tools. We are strictly collaborating with SUPSI and the companies to guarantee that the end-

user needs are correctly identified and addressed. Together with my director Prof. Dr. med. Claudio Bassetti we joined this collaboration because we strongly believe that the end product, apart from making our everyday clinical work more efficient, will also contribute to the improvement of diagnostic processes in sleep medicine as well. This is beneficial for both the physician and the patient. I am very happy to collaborate with colleagues in SUPSI and I am really looking forward to seeing the fruits of this collaboration.”

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