## MIAI – Joint industry/academy PhD grant

**SECTOR:** Higher Education Institution

LOCATION: France, Grenoble

RESEARCHER PROFILE:
☐ *First stage researcher,*

**INSTITUTIONS:**

**Univ. Grenoble Alpes, University of Innovation** One of the major research-intensive French universities, Univ. Grenoble Alpes[1] enjoys an international reputation in many scientific fields, as confirmed by international rankings. It benefits from the implementation of major European instruments (ESRF, ILL, EMBL, IRAM, EMFL*). The dynamic ecosystem, grounded on a close interaction between research, education and companies, has earned Grenoble to be ranked as the 5th most innovative city in the world. Surrounded by mountains, the campus benefits from a natural environment and a high quality of life and work environment. With 7000 foreign students and the annual visit of more than 8000 researchers from all over the world, Univ. Grenoble Alps is an internationally engaged university.
A personalized Welcome Center for international students, PhDs and researchers facilitates your arrival and installation.

\* ESRF (European Synchrotron Radiation Facility), ILL (Institut Laue-Langevin), IRAM (International Institute for Radio Astronomy), EMBL (European Molecular Biology Laboratory), EMFL (European Magnetic Field Laboratory)

*Key figures:*

- \+ 50,000 students including 7,000 international students
- 3,700 PhD students, 45% international
- 5,500 faculty members
- 180 different nationalities
- 1st city in France where it feels good to study and 5th city where it feels good to work
- ISSO: International Students & Scholars Office affiliated to EURAXESS

**Probayes** Created as a spin-off of INRIA and CNRS, the two largest research institutions in France focusing on computer science, applied mathematics and fundamental science, Probayes is today a leader in the Artificial Intelligence world.
Probayes was created in 2003 and currently employs 50 data scientists who work alongside the largest groups and accompany them towards AI solutions with higher ROI. With a strong know-how in machine learning combined with solid design and development skills, they develop innovative models for their customers' needs. They provide expertise in various domains such as the health, automotive, defense, logistic, chemical and banking sectors. Probayes has joined the Groupe La Poste in May 2016 and has become the group's Artificial Intelligence competence center while benefitting from the group's Big Data infrastructures and IT security. The company headquarters are located in Montbonnot (department of Isère (38) located in the region of Rhône-Alpes) but there also exists a branch office in Paris since 2017.

## MANDATORY REFERENCES:

PROJECT TITLE: *MIAI @ Grenoble Alpes*
SUBJECT TITLE: Investigating CPAP telemonitoring big data: Understanding impact of at home management and predicting acute events
**RESEARCH FIELD (cf mots clefs sur Euraxess Jobs): artificial intelligence, machine learning, time series**
SCIENTIFIC DEPARTMENT (LABORATORY'S NAME):  HP2 U 1042- *MIAI @ Grenoble Alpes (trajectories Medicine Pépin-Mignot)*
DOCTORAL SCHOOL'S: EDISCE
SUPERVISOR'S NAME*:* Jean-Louis Pépin (HP2) - Ronan Le Hy (Probayes)

## SUBJECT DESCRIPTION:

Obstructive sleep apnoea (OSA) is a major worldwide health concern. OSA is associated with obesity in more than 60% of cases and with co-morbidities including hypertension, arrhythmias, stroke, coronary heart disease and metabolic dysfunction. It is increasingly recognized that the high prevalence of obstructive Sleep Apnoea (OSA), and the cardio-metabolic morbidities associated with it make OSA a burden for society. Continuous positive airway pressure (CPAP), the gold standard treatment, is highly effective in suppressing repetitive upper airway obstructions during sleep. CPAP improves daytime sleepiness, neurocognitive function and blood pressure.

Wireless telemonitoring of CPAP treatment uses digital technologies to collect health data in the patient's home, and electronically transmits the information on applied pressures, air leaks, residual events under CPAP and objective adherence to health care providers. One of the capabilities of telemonitoring is probably the early detection of problems (such as leaks or persistent respiratory events of sleep apnoea) thus facilitating appropriate interventions, and thereby improving the patient's early experience with CPAP. Moreover, the detection of treatment-emergent central sleep apnoea by telemonitoring could facilitate early intervention to reduce the risk of therapy discontinuation and justify the shift to more efficient ventilator modalities such as adapted servo-ventilation.

This thesis will focus on the development of machine learning algorithms to:
- model patient CPAP compliance trajectories while taking into account mask (interface) changes and patient characteristics (age, weight, face shape...);
- identify central/residual apnea events from CPAP telemonitoring data.

Practical tasks include exploration of:
- feature engineering for CPAP telemonitoring data and patient context linked to sleep apnea;
- modeling options (time-based models like HMMs and RNNs; anomaly detection models);
- interpretation of models.

Data enrichment will be done by integrating clinical informations, co-morbidities and medications. Data from diagnosis polysomnography will also be available for a subset of patients, and will permit to further optimize the algorithms.

## ELIGIBILITY CRITERIA

Applicants must hold a Master's degree (or be about to earn one) or have a university degree equivalent to a European Master's (5-year duration),

Applicants will have to send an application letter in English and attach:
- Their last diploma
- Their CV
- A short presentation of their scientific project (2 to 3 pages max)

- Letters of recommendation are welcome.

Address to send their application: [sbailly@chu-grenoble.fr](mailto:sbailly@chu-grenoble.fr) (Sébastien Bailly, HP2)