

M2 Internship – Call for application  
**EUROMOV Digital Health in Motion**  
IMT Mines Alès - University of Montpellier

## Sonification of harm movement

A 5-month internship is proposed in Alès / Montpellier. The successful applicant will become part of a dynamic research environment within the newly multidisciplinary joint research center **EuroMov Digital Health in Motion**.

Start date: March 2024.

Net remuneration around 550 euros/month (including social security and health benefits).

### Project summary

In the field of sports or health, movement sonification is emerging as an innovative technique for stimulating the sensory-motor system. It allows to improve the performance of sportsmen, or of patients suffering from neurological disorders or movement pathologies. The sonification of movement has recently shown beneficial effects during rehabilitation following strokes, or on the motor control of Parkinsonian patients.

The internship aims at improving a sonification system of the arm movement, and the realization of a cognitive experiment which will allow a better understanding of the management of the sensory-motor functions related to this movement. We will study the effect of permutation of rotations in the sonification mapping, on performances related to temporal functions (estimation of durations, memorization of durations, sequences of events, synchronization with metronome), or to study more general effects on non-specifically temporal functions (elementary calculations, memorization of spatial or verbal items).

Finally, the project draws a clinical application framework in the treatment of Parkinson's disease. It will allow, via tests involving pilot patients, to specify a clinical experiment.

The work required during the internship consists of:

1. consolidating the sonification techniques to obtain expressive, precise, and hedonic stimuli,
2. leading a clinical experiment involving Parkinson's patients,
3. comparing different types of motion capture systems, including low-cost systems (smartphone, webcam).

## References

- [Sch18] Schmitz, G., Bergmann, J., Effenberg, A. O., Krewer, C., Hwang, T. H., & Müller, F. (2018). Movement sonification in stroke rehabilitation. *Frontiers in neurology*, 9, 389.
- [Sch19] Schaffert, N., Janzen, T. B., Mattes, K., & Thaut, M. H. (2019). A review on the relationship between sound and movement in sports and rehabilitation. *Frontiers in psychology*, 10, 244.
- [Ver20] Véron-Delor, L., Pinto, S., Eusebio, A., Azulay, J. P., Witjas, T., Velay, J. L., & Danna, J. (2020). Musical sonification improves motor control in Parkinson's disease: a proof of concept with handwriting. *Annals of the New York Academy of Sciences*, 1465(1), 132-145.

## Applicant profile

Applicants should anticipate having a MSc and background related to computer science, audio/signal processing, sound design, or computational movement science. Knowledge in music (theoretical and practical) will be valued. The candidate must be able to communicate in English.

Applications should include a cover letter discussing your interest in the position, detailed CV, academic results (evaluation, average and ranking of the candidate during the initial course and Msc).

Contact and information: [patrice.guyot@mines-ales.fr](mailto:patrice.guyot@mines-ales.fr)

Applications will be examined on a rolling basis until January 31, 2024.

## Presentation of the institution and the host laboratory

The **Institute Mines-Télécom (IMT)** is a French public establishment dedicated to higher education and innovative research and, as it represents the ministries of industry and digital technology, it is the largest group of engineering schools in France. The IMT brings 11 public engineering across France together. Collectively, they train 13,500 engineers and doctoral students as well as employing 4,500 women and men and manage a budget of €400m within 55 research centers connected to the schools. IMT publishes 2000 publications each year and registers 60 patents.

**IMT Mines Alès** is one of the schools of IMT. With its 175 years of history of service to science and industry, the school employs 350 people and trains more than 1100 students, engineers and researchers. Its three teaching and research poles work in the areas of risk environment, materials, civil engineering, industrial engineering and digital technology. The values

promoted at the school are boldness, commitment, sharing and excellence. The school spurs on job mobility projects.

**Research Unit “EuroMov Digital Health in Motion”** is a new research unit that was officially inaugurated in January 2021. This research collaboration involves the French institutions IMT Mines Alès and the University of Montpellier in partnership with the university hospitals of Montpellier and Nîmes. The research scope promotes cross-fertilization across three main domains of artificial intelligence, movement sciences and health. The research aims to understand the behavioral plasticity of humans in order to consider new therapeutic approaches and improve sensorimotor recovery, whilst providing a platform for innovation of new digital approaches.