

## **Sujet de stage/PhD: Deep Learning approach for Major Depression Disorder recognition and assessment from speech**

**Context:** Depression is a mental disorder caused by several factors: psychological, social or even physical factors. Psychological factors are related to permanent stress and the inability to successfully cope with difficult situations. Social factors concern relationship struggles with family or friends and physical factors cover head injuries. Depression describes a loss of interest in every exciting and joyful aspect of everyday life. Mood disorders and mood swings are temporary mental states taking an essential part of daily events, whereas, depression is more permanent and can lead to suicide at its extreme severity levels. Depression is a mood disorder that is persistent for up to eight months and beyond. According to the World Health Organization (WHO), 350 million people, globally, are diagnosed with depression. A recent study estimated the total economic burden of depression to be 210 billion US Dollars per year [1], caused mainly by increased absenteeism and reduced productivity in the workplace. In many cases, the affected person denies facing mental disorders like depression, thus, he/she does not get the proper treatment.

Several works in automatic depression recognition and assessment are reported in the literature [2]. Automatic depression recognition has become more and more popular since 2011 with the emergence of the eight successive editions of the Audio/Visual Emotion Challenge AVEC [3]. Typically, depressed individuals tend to change their expressions at a very slow rate and pronounce flat sentences with stretched pauses. Therefore, to detect depression, two types of features are frequently used: facial geometry features and audio features for their ability and consistency to reveal signs of depression. During this internship and the PhD later, innovative approaches based on deep learning will be developed to predict depression and relapse after depression from multi-modal data (speech, face images, text, EEG signals...). **This internship can lead to PhD scholarship if the intern student shows high motivation and satisfactory work and results.** More details will be given during the interview.

### **ELIGIBILITY CRITERIA**

- The candidate must be an M2 Master student or in 5th year of an engineering school **in France.**
- Has done M1 in computer science, applied mathematics or electrical engineering, with a focus on machine learning.
- Experience in machine learning and data analysis
- Experience in the field of software development.
- Demonstrated record of high-performance programming skills in C++/python and html.
- Demonstrated analytical, verbal, and scientific writing skills in English.

### **DURATION**

Internship duration will be 6 months starting from January 2021 at an early date to start. The latest date to start the internship will be March 2021.

### **APPLICATION**

Please send your CV + transcripts + cover letter + recommendation letters to [Alice.othmani@u-pec.fr](mailto:Alice.othmani@u-pec.fr) (before November 15, 2020).

### **References:**

- [1] Greenberg, P. E., Fournier, A. A., Sisitsky, T., Pike, C. T. and Kessler, R. C. (2015). The economic burden of adults with major depressive disorder in the United States (2005 and 2010). *Journal of Clinical Psychiatry*, 76, 155–162.
- [2] Pampouchidou, A., Simos, P., Marias, K., Meriaudeau, F., Yang, F., Pediaditis, M., & Tsiknakis, M. (2017). Automatic assessment of depression based on visual cues: A systematic review. *IEEE Transactions on Affective Computing*.
- [3] Ringeval, F., Schuller, B., Valstar, M., Cowie, R., Kaya, H., Schmitt, M., ... & Çiftçi, E. (2018, October). AVEC 2018 workshop and challenge: Bipolar disorder and cross-cultural affect recognition. In *Proceedings of the 2018 on Audio/Visual Emotion Challenge and Workshop* (pp. 3-13). ACM.
- [4] E. Rejaibi, A. Komaty, F. Meriaudeau, S. Agrebi, A. Othmani, "MFCC-based Recurrent Neural Network for Automatic Clinical Depression Recognition and Assessment from Speech", submitted to *Signal processing: Image Communication*. Published in ArVix <https://arxiv.org/abs/1909.07208>
- [5] Rejaibi, E., Kadoch, D., Bentounes, K., Alfred, R., Daoudi, M., Hadid, A., & Othmani, A. (2019). *Clinical Depression and Affect Recognition with EmoAudioNet*. arXiv preprint arXiv:1911.00310.