



08 AVR

🕒 14h30 à 16h30

📍 ENS Paris-Saclay

THÈSES ET HDR

Alice CHAVANNE : soutenance de thèse

Titre : Utilisation de données d'imagerie cérébrale IRM dans des prédictions longitudinales pertinentes pour les troubles anxieux

Direction : Jean-Luc Martinot et Ulrike Lueken

Soutenance le 08/04/24 en 1E29

📅 AJOUTER AU
CALENDRIER

Alice CHAVANNE

Utilisation de données d'imagerie cérébrale IRM dans des prédictions longitudinales pertinentes pour les troubles anxieux.

PhD summary:

Anxiety disorders are widespread and represent a heavy burden of morbidity. However, despite an abundance of neuroimaging literature at the group level, robust brain markers of vulnerability or therapeutic response have struggled to emerge. In recent years, individual-level prediction approaches using machine learning have become increasingly popular in mental health research, and some promising results have been reported in small-scale neuroimaging studies (typically with $N_{total} < 60$ participants). These results have not yet been replicated in larger, multisite samples. The present PhD project involved the use of supervised machine learning to prospectively predict the development of anxiety disorders in adolescents using a longitudinal general population dataset, IMAGEN, as well as to predict the response to psychotherapeutic treatment in phobic patients using the SPIDER-VR dataset.

Using the IMAGEN data, machine learning analyses were performed on questionnaires and neuroanatomical data from non-anxious adolescents to predict the development of a future anxiety disorder ($N = 156$) compared to a healthy control status ($N = 424$). The study highlighted the predictive potential of sociodemographic and questionnaire data for predicting future clustered anxiety disorders, and that of grey matter volumes for predicting generalised anxiety disorder. Functional MRI measures extracted from an emotional face processing task did not produce predictive performance above chance.

Using SPIDER-VR data, machine learning analyses were conducted to predict the response of spider phobic patients ($N = 190$) to a virtual reality exposure therapy session, using questionnaire data, structural MRI data and various functional MRI measures extracted from a symptom provocation task. Contrary to expectations, the study did not confirm the predictive potential of the sociodemographic and questionnaire data, nor of the neuroimaging data, with the exception of the variance of the BOLD signal, which produced moderate predictive performance.

Overall, this PhD work challenges the optimistic results of previous smaller-scale studies on anxiety prediction using neuroimaging-based machine learning. Nevertheless, the results support the fact that easy-to-administer questionnaires show promising predictive performance for predicting the onset of anxiety and that structural MRI may provide additional predictive value. Various other biomarkers of anxiety have emerged in the literature with the potential to improve the accuracy of anxiety predictions, and further multimodal research using large-scale datasets and rigorous machine learning methodology is required to achieve clinical utility.

Jury:

- Stéphane Lehericy (Center for NeuroImaging Research, Institut du Cerveau)
- Ulrike Lueken (Department of Psychology, Humboldt-Universität zu Berlin)
- Tim Hahn (Institute of Translational Psychiatry, Universität Münster)
- Monique Ernst (National Institute of Mental Health, National Institute of Health)
- Gabriel Robert (Pôle Hospitalo-Universitaire de Psychiatrie Adulte, Centre Hospitalier Guillaume Régnier Rennes)
- Sarah Lemler (Centrale Supélec, Université Paris-Saclay)

Direction de la thèse :

- Jean-Luc Martinot (INSERM U1299, ENS Paris-Saclay), directeur de thèse
- Ulrike Lueken (Humboldt-Universität zu Berlin), co-directrice de thèse
- Eric Artiges (INSERM U1299, ENS Paris-Saclay), encadrant