The objective of this PhD project is automatically analyze recorded speech of patients with Huntington’s disease, a serious neurodegenerative disease, to obtain a biomarker allowing clinical follow-up. We will use techniques derived from automatic speech processing [4,5], natural language processing [6] and machine learning [7]. The aim is to derive markers of the symptoms commonly observed in clinical (cognitive, behavioral, emotional and motor disorders) using speech signals derived from telephone interviews and/or speech recorded at home.

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A first phase of the work will consist in testing existing speech representations usually used in Health Behavior Informatics through speech analysis. The PhD student will characterize the limitations of these speech representations and machine learning tools, and derive new ones [8]. This analysis will lead to a second phase where the machine learning models will be extended to account for the temporal component with longitudinal dataset.

Machine Learning is increasingly used in the medical setting. One of the major issues is monitoring patients in their homes using powerful, automatic diagnostic tools based on non-intrusive sensors. In particular, neurodegenerative diseases are a public health priority (World Health Organization, 2008). In Europe, they affect about 10 million people, and cognitive, psycho-behavioral and motor related disorders cause hospitalization and a burden for carers whose cost to society is estimated at 263 billion US dollars per year [1]. In this project, we target Huntington’s disease (HD), rare neurodegenerative disease (7000 patients in France) of genetic origin, having no effective treatment. There is a 100% reliable genetic diagnosis before the declaration of clinical symptoms, therefore the Huntington Disease is a model of neurodegenerative disease with broad cognitive disorders spectrum to develop monitoring tools.
Among other symptoms, the disease causes alterations in the capacity of speech production [2, 3] at different linguistic levels: articulation, rhythm, vocabulary, syntax, as well as a degradation of social interaction.


Collaboration :
La personne recrutée sera en lien avec l’équipe de Neuropsychologie Interventionnelle (NPI), INSERM U955 E01, Mixed research unit (INSERM, UPEC, ENS), Paris, France.

Responsabilités :
La personne recrutée a la charge de faire un doctorat.

Pilotage/Management :
La personne recrutée aura la responsabilité de travailler avec une équipe de stagiaires, orthophonistes, psychologues, médecins et ingénieurs dans le cadre du projet hospitalier.

Main activities
Principales activités :
- concevoir et conduire des expériences
- analyser les résultats
- écrire des articles
- les présenter dans des conférences
- rédiger la thèse de doctorat

Skills
Compétences techniques et niveau requis :
Strong skills in speech processing, neural network models, machine learning. Advanced programming skills in Computer languages like python/C++ and knowledge of tools like Kaldi/Pytorch/LibSVM. Motivation to work in an interdisciplinary project at the frontiers of computer science, psycholinguistics and neurology.

Langues :
French, anglais

Compétences relationnelles :
très bonnes

Benefits package
- Restauration subventionnée
- Transports publics remboursés partiellement

Remuneration
Les 2 premières années : 1985 € brut mensuel
La 3ème année : 2085 € brut mensuel