



Offre n°2024-07542

PhD Position F/M Multimodal Speech Analysis for Early Detection of Crohn's Disease Flares through Deep Learning Methodologies.

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

Contexte et atouts du poste

Context

Inflammatory bowel diseases (IBD), particularly Crohn's disease (CD), pose significant challenges to healthcare systems and patients due to their chronic and unpredictable nature (Strober et al. 2007). CD affects a substantial portion of the population in France and Europe, with considerable impacts on patients' quality of life and healthcare resources. Within the framework of the I-DEAL project, the main goal is to address the unmet needs of CD patients by enabling early intervention and promoting a return to a normal life through innovative remote monitoring solutions. One of the objectives of the I-DEAL project is to develop a home-based system for early detection of CD flares, that enable timely intervention and improve the management of CD patients, ultimately enhancing their quality of life.

Mission confiée

Objective of the Thesis

The objective of the thesis is to characterize pain flares through facial expressions and modifications in speech patterns using NLP and machine learning techniques. This will be achieved by analyzing video recordings of multiple patients, with each recording annotated by a physician to indicate the patient's condition at the time of recording. The goal is to extract features from these recordings that capture the nuances of pain flares, enabling the development of classification models capable of identifying and classifying pain flare states accurately.

Principales activités

The missions of the PhD encompass several key scientific objectives. Firstly, active participation in the collection of audiovisual data from patients, with a specific focus on eliciting the pronunciation of predefined sentences. Secondly, employing advanced techniques for feature extraction, particularly linguistic features derived through sentiment analysis, while simultaneously annotating the dataset with pertinent medical information. Thirdly, the utilization deep learning methodologies, such as ResNet CNN, BLSTMs (Tsai et al. 2017) or Time delay neural network (TDNN), to facilitate the training of classification models on the processed data (Fontaine et al. 2022, De Sario et al. 2023, Othman et al. 2021, Littlewort et al. 2007). Finally, an integral aspect involves evaluating the efficacy of the developed methodology by rigorously analyzing model performance and validating its capacity to accurately discern levels of Crohn's Disease severity based on speech and visual modalities.

Bibliography

- De Sario, G. D., Haider, C. R., Maita, K. C., Torres-Guzman, R. A., Emam, O. S., Avila, F. R., ... & Forte, A. J. (2023). Using AI to Detect Pain through Facial Expressions: A Review. *Bioengineering*, 10(5), 548.
- Fontaine, D., Vielzeuf, V., Genestier, P., Limeux, P., Santucci-Sivilotto, S., Mory, E., ... & DEFI study group. (2022). Artificial intelligence to evaluate postoperative pain based on facial expression recognition. *European Journal of Pain*, 26(6), 1282-1291.
- Littlewort, G. C., Bartlett, M. S., & Lee, K. (2007, November). Faces of pain: automated measurement of spontaneous facial expressions of genuine and posed pain. In *Proceedings of the 9th international conference on Multimodal interfaces* (pp. 15-21).
- Othman, E., Werner, P., Saxon, F., Al-Hamadi, A., Gruss, S., & Walter, S. (2021). Automatic vs. human recognition of pain intensity from facial expression on the X-ITE pain database. *Sensors*, 21(9), 3273.
- Strober, W., Fuss, I., & Mannon, P. (2007). The fundamental basis of inflammatory bowel disease. *The Journal of clinical investigation*, 117(3), 514-521.
- Tsai, F. S., Weng, Y. M., Ng, C. J., & Lee, C. C. (2017, October). Embedding stacked bottleneck vocal features in a LSTM architecture for automatic pain level classification during emergency triage. In *2017 Seventh International Conference on Affective Computing and Intelligent Interaction*

Compétences

- MSc degree in speech processing, NLP, computer vision, machine learning, artificial intelligence or in a related field.
- Strong programming skills in Python/Pytorch and any related framework.
- Prior experience with speech, or video processing is an asset.
- Excellent collaboration and communication skills to work effectively with interdisciplinary teams of researchers.

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération

2100€ gross/month the 1st year

Informations générales

- **Thème/Domaine** : Language, Speech and Audio
Scientific computing (BAP E)
- **Ville** : Villers lès Nancy
- **Centre Inria** : [Centre Inria de l'Université de Lorraine](#)
- **Date de prise de fonction souhaitée** : 2024-10-01
- **Durée de contrat** : 3 years
- **Date limite pour postuler** : 2024-05-19

Contacts

- **Équipe Inria** : [MULTISPEECH](#)
- **Directeur de thèse** :
Ouni Slim / slim.ouni@loria.fr

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Consignes pour postuler

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

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