

Postdoctoral offer 2023

Explainability of predictions on sequential data

1 CONTEXTE

We consider sequential data and want to predict a property such as the remaining useful life. There are many applications, in industry 4.0 or in personalized medicine.

Predictive maintenance is an arising issue due to reduced cost of sensor deployment and improvement of machine learning techniques capacity. This research topic is particularly important in the medical and industrial fields, and is the subject of numerous studies [1].

In Intensive Care Units (ICU), it is useful to predict the length of stay of a patient to organize care.

However, even if obtained predictions are reliable, it is essential to be able to explain them, as the information provided could enable the user to better understand the causes of future failures. Numerous explainability methods are already proposed in the literature that already take into account the time dimension [2,3]. Nevertheless, only few studies have been conducted on methods such as LSTM. Moreover, we could focus on mispredictions and investigate where they come from and propose ways to improve our algorithm.

2 ORGANISATION

2.1 GOALS

Main tasks :

- Evaluation of state-of-the art methods on two application datasets in health and industry.
- Proposition of methods to improve existing method

2.2 COLLABORATION AND SUPERVISION

The person recruited will be co-directed by Nicolas Lachiche, specialist of complex data mining, and Baptiste Lafabrègue (50%), time series analysis specialist. He or she will actively collaborate with the SDC team at ICube in Strasbourg, and more particularly with Nassime Mountasir, a 2nd-year PhD student working on predictive maintenance issues and Ben Cissoko a 4th-year PhD student working on ICU data [4].

3 TO APPLY

3.1 CANDIDATE PROFILE

- PhD in Computer Science, specializing in machine learning/explainability.
- Solid knowledge of Data Science and more particularly of explainability methods. Experience in time series analysis and/or predictive maintenance would be also valuable.
- Good verbal (English or French) and written (English) communication skills.
- Interpersonal skills and the ability to work individually or as part of a project team.

3.2 GENERAL INFORMATION

- Location: Illkirch, south of Strasbourg (Pôle API, 300 Bd Sébastien Brant, 67400 Illkirch-Graffenstaden)
- Duration: One year (renewable once)

- Gross salary: 3200€/month
- To apply: Interested candidates should submit (by e-mail) their curriculum vitae, a list of publications, a letter of motivation and contact details for three references. Applications will be accepted until the position is filled. The position will start as soon as possible.
- Contact :
 - Nicolas Lachiche, nicolas.lachiche@unistra.fr
 - Baptiste Lafabregue, lafabregue@unistra.fr

4 BIBLIOGRAPHIC REFERENCES

- [1] Zonta, T., Da Costa, C. A., da Rosa Righi, R., de Lima, M. J., da Trindade, E. S., & Li, G. P. (2020). Predictive maintenance in the Industry 4.0: A systematic literature review. *Computers & Industrial Engineering*, 150, 106889.
- [2] Freeborough, W., & van Zyl, T. (2022). Investigating explainability methods in recurrent neural network architectures for financial time series data. *Applied Sciences*, 12(3), 1427.
- [3] Ates, E., Aksar, B., Leung, V. J., & Coskun, A. K. (2021, May). Counterfactual explanations for multivariate time series. In *2021 International Conference on Applied Artificial Intelligence (ICAPAI)* (pp. 1-8). IEEE.
- [4] Cissoko, M. B. H., Castelain, V., Lachiche, N. (2023). Prise en compte de données séquentielles hétérogènes dans l'apprentissage profond : application aux données de soins intensifs. EGC 2023: 663-664