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NLP for Maintenance in Industry 4.0

Votre rôle

Manufacturing companies in the Industry 4.0 era are increasingly looking to implement Predictive Maintenance (PdM) to predict failures, classify faults, and optimize maintenance tasks. Artificial Intelligence (AI), particularly Machine Learning (ML) techniques, are applied to build such prediction, classification, and optimization models. One of the challenges in the transition to Industry 4.0 is to use historical maintenance data to improve maintenance policies. This provides valuable information about machine failures and what operations were performed to repair them. Using this data, models can be established to identify different KPIs such as the mean time to repair and the mean time between failures.

Nevertheless, records of maintenance operations tend to be non-structural text data recorded by operators. Different techniques have been used for the analysis of text data, such as the use of RNN or LSTM. However, recently there has been a great interest in Natural Language Processing (NLP) models based on Transformers (such as BERT and XLNet) that have allowed to reach SOTA in different text classification tasks.

The work to be done in this internship will consist of **1) Using NLP techniques to identify and classify machine failures and maintenance operations recorded on historical maintenance data**. The student will work on the classification of the different procedures and breakdowns that appear in the maintenance log. These descriptions are in French and can be written formally or informally, so it is essential to apply techniques that allow generalization to new descriptions. **2) Based on the classification of different types of failures, and on maintenance time stamps (when the interventions started, their duration...), the student will have to propose data-driven models to improve maintenance policies and decision making**. Once the failures and their procedure have been identified, the student should use this data to propose failure models based on the time between failures.
These models will be used to improve maintenance policies to prevent the unexpected occurrence of failures. In addition, using the data from the procedures in the description, the student should propose a decision-making system based on the failure models to not only prevent the occurrence of failures, but to minimize the repairing time and maximize the time between failures.

Ce stage pourra se poursuivre par une thèse, sous réserve de validation interne.

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Vous serez amené à effectuer les tâches suivantes :

- Survey the scientific literature in the relevant research domains (ML, NLP, Industry 4.0, Maintenance)
- Investigate new approaches to failure classification using real text-based maintenance records.
- Develop data-driven models to estimate machine or component failures.
- Validate the results obtained with real historical data.
- Disseminate results through scientific publications.

L'équipe dans laquelle vous travaillerez

- Marcelo Ruiz: Doctoral Researcher
- Dr. Sylvain Kubler: Superviseur
- Prof. Yves Le Traon: Directeur de l'équipe de recherche SerVal

Votre profil

- Student in computer science, university or engineering school, with a background in statistics, machine learning or/and data analysis.
- Good knowledge of programming languages (Python / Matlab) as well as data processing frameworks (Pandas, Numpy), data visualization (Matplotlib, Seaborn) and Machine Learning/Deep Learning (Scikit-learn, Tensorflow, Keras, Torch).
- Good interpersonal skills and strong team spirit.
- Fluent written and verbal communication skills in English and French are required.

Ce qui vous attend au SnT...

Des infrastructures passionnantes et des laboratoires uniques. Sur les deux campus du SnT, nos chercheurs peuvent se promener sur la lune au LunaLab, construire un nanosatellite ou contribuer à améliorer les véhicules autonomes. Les chercheurs du SnT s'engagent dans des projets axés sur la demande. Grâce à notre programme de partenariat, nous travaillons sur des projets avec plus de 45 partenaires industriels.

Faites partie d'une famille multiculturelle. Au SnT, nous comptons plus de 60 nationalités. Tout au long de l'année, nous organisons des événements de renforcement de l'esprit d'équipe, des activités de mise en réseau, etc.

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En résumé

- Type de contrat : Stage 4 à 6 mois
- Début du stage : Selon disponibilité
- Temps de travail: Plein temps 40.0 heures par semaines
- Location: Luxembourg
- Gratification : ~ 1200€ mensuel

Comment postuler ?

Les candidatures doivent comprendre :

- CV
- Lettre de motivation

Merci d'envoyer ces documents à :

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À propos de l'université du Luxembourg...

L'Iniversité du Luxembourg cherche à recruter des chercheurs au SnT (Interdisciplinary Centre for Security, Reliability and Trust).

Le SnT mène des recherches interdisciplinaires sur les systèmes et services ICT (Information and Communication Technologies) sûrs, fiables et dignes de confiance, souvent en collaboration avec des partenaires industriels, gouvernementaux ou internationaux. Le SnT est actif dans plusieurs projets de recherche internationaux financés par le programme Horizon2020 et l'Agence spatiale européenne. Pour plus d'informations, vous pouvez consulter : https://wwwfr.uni.lu/snt