TITLE

Post-hoc attention with class activation mapping for fault classification of rotary machinery

LAB & PEOPLE

- Name of the hosting lab: UAlg Machine Learning group as part of the Center of Intelligent Systems /IDMEC/LAETA
  General activities of the lab: Machine Learning
  Website: https://csi.idmec.tecnico.ulisboa.pt/
  Number of staff / PhD:
- Supervisor name and contact: José Valente de Oliveira (jvo@ualg.pt)

TOPIC OF THE INTERSHIP

- Scientific context of the internship (max 20 lines)

Attention mechanisms are a hot topic in deep learning.

The main objective of the thesis is to classify faults of real-world rotary machinery (e.g., gearboxes and wind-turbines) and to develop a post-attention mechanism [1] that allows us to know in which regions of the feature space the classifier focus its attention for making its decision.

The input is either a wavelet packet transform (WPT) or a spectrogram of a vibration signal.

Computing infrastructure

The work will be developed using the Pytorch or TensorFlow programming platforms for machine learning on a 4-GPU machine.

References
Bolei Zhou, Aditya Khosla, Agata Lapedriza, Aude Oliva, Antonio Torralba,"Learning Deep Features for Discriminative Localization"(2015) https://arxiv.org/abs/1512.04150

Ziqiang Pu, Diego Cabrera, Chuan Li, and José Valente de Oliveira, "Sliced Wasserstein cycle consistency generative adversarial networks for fault data augmentation of an industrial robot", Expert Systems with Applications (2022 Impact Factor: 8.665).

Ziqiang Pu, Diego Cabrera, Chuan Li, and José Valente de Oliveira, "VGAN: General- izing MSE GAN and WGAN-GP for robot fault diagnosis", IEEE Inteligent Systems, (2022 Impact Factor: 3.405) Vol. 37 Issue 3, pp. 65–75, 2022.

- Tasks and duties entrusted to the student:

Tasks	Description
A	Analysis of the problem
B	Related work
C	Implementation and tests
D	Analysis and discussion of results
E	Dissemination and writing of the thesis

- Skills to be acquired or developed: Data analysis, Fault diagnosis, Scientific writing

PROFILE OF THE DESIRED STUDENT

- Minimum level of study required: Master Student
- Field(s) of study: Computer Science
- Scientific skills: Machine Learning, Programming
- Language skills required: English

THE INTERNSHIP ASSIGNMENT:

Desired duration of the internship (in months): 6 months
Desired Starting date of the mission: September
Indicative weekly schedule: *35h / week*
Remuneration: *Not available*
Erasmus grant: Application should be made by the student at the sending institution
Internship agreement: *an internship agreement will be signed.*

To SEA-EU students:
If you're interested please send your CV and letter of motivation to the scientist in charge, jvo@ualg.pt.