

ESR Project title: Semi-supervised edge energy consumption anomaly detection and classification [ESR8]

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Institution: KU Leuven, Belgium

Application deadline: May 31, 2021

ESR Project Description:

The researcher will compare energy consumption models based on model and data-driven approaches and noisy run-time state observations. As prediction is in general more difficult than anomaly detection, (1) a first objective will be to determine normal and abnormal energy consumption profiles. Energy consumption anomalies could be hardware failures, as well as abnormal communication environment conditions (such as jammers or signal blockers). (2) A second objective will then be to label or classify the anomalies, first unsupervised and later with expert feedback. Expert feedback will be possible by training the model to work with interpretable features. (3) In a third objective, the normal energy consumption profiles will be used for energy consumption prediction. These models will work on the interpretable features, so ideally derived prediction models will be explainable to users and algorithm designers. Strong interaction with the other ESR working on resource optimization algorithms will be needed to understand how such algorithms work and where they can complement the learned models by this ESR.

Expected Results:

- (1) Energy profiling for edge sensors with focus on dense visible light communication (36 nodes) and Bluetooth Low-Energy (70 nodes) testbeds;
- (2) Energy consumption anomaly detection and classification;
- (3) Framework for semi-supervised energy consumption anomaly detection; (4) energy consumption prediction.

Supervision and Mobility Program:

Once hired, the candidate will:

- be working at KU Leuven, performing full-time research under the supervision of Prof. Sofie Pollin.
- will be enrolled in the PhD program at KU Leuven, under the supervision of Prof. Sofie Pollin.
- will additionally pursue two secondments at CEA and TNOR, for a respective duration of 5 and 5 months.

Required, Preferred and Desired Prerequisites/Skills:¹

¹ **Required**, means mandatory to pass the eligibility check. **Preferred**, means highly welcome and recommended. **Desired**, means additional, not strictly needed, but still very much appreciated.



- **Required:** At the time of recruitment, the applicant must not have lived in Belgium for more than 12 months in the previous 36 months (3 years).
- **Required:** No more than 4 years spent in research/work activities after the achievement of the MS degree.
- **Preferred:** A Master's degree in Telecommunications, Computer Science, Data Science or equivalent.
- **Preferred:** Very good communication skills in oral and written English.
- **Preferred:** Background in wireless communication, performance modelling or optimization
- **Preferred:** Open-mindedness, strong integration skills and team spirit.
- **Desired:** good command of the Python programming language.
- **Desired:** previous training MS-level training on machine learning techniques.