



**ESR Project title:** Energy-efficient hierarchical learning architectures for local and global optimization goals [ESR2]

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**Institution:** University of Padova, Italy

**Application deadline:** May 31, 2021

### **ESR Project Description:**

The objectives of this project are to (1) develop a hierarchical learning architecture (in particular, exploiting the federated reinforcement learning paradigm) that leverages data collected at different time scales by peripheral, edge and core network nodes towards performing local and system-wide optimization tasks; (2) determine the performance requirements of the communication system so as to support the learning architecture; (3) assess the performance of the learned architectural models for edge computing in selected technical scenarios in terms of energy efficiency for the mobile users and infrastructure nodes.

### **Expected Results:**

(1) The definition of a hierarchical learning architecture, consisting of three learning layers: peripheral (run by mobile end nodes), access (implemented at the edge nodes), central (hosted in the cloud); (2) The definition of objectives and actions space for the different learning layers; (3) The identification of effective interaction schemes to enforce cooperation among the learning layers in order to achieve local and global optimization goals; (4) The assessment of the robustness of the learning architecture to impairments, such as packet losses, random delays, and outage periods; (5) The assessment of the energy-efficiency performance of the proposed learning architecture in selected scenarios.

### **Supervision and Mobility Program:**

Once hired, the candidate:

- will work at UNIPD, performing full-time research under the supervision of Prof. Andrea Zanella.
- will be enrolled in the PhD program at UNIPD, under the supervision of Prof. Andrea Zanella.
- will additionally pursue two secondments at Purdue University, and TREL, for a respective duration of 6 and 4 months.

### **Required, Preferred and Desired Prerequisites/Skills:<sup>1</sup>**

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<sup>1</sup> **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 Italy 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.
- **Required:** A Master's degree in Telecommunications Engineering, Computer Science, Data Science or equivalent.
- **Preferred:** Very good communication skills in oral and written English.
- **Preferred:** good programming skills.
- **Preferred:** solid background in mathematics and probability theory.
- **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.
- **Desired:** experience in academic or industrial project development.

#### **Additional requirements for this position**

**Required:** a declaration that the obtained MS degree is equivalent to a five-year MS degree in the EU and that it grants access to the Doctoral (PhD) Study Program in the Country where it has been issued. This declaration will be mandatory if the applicant is selected, and must be available by the starting date of the contract. Prospective applicants are encouraged to make the necessary arrangements to obtain it.