



**ESR Project title:** Orchestration of deep learning models for communication and computing across EH edge nodes [ESR4]

**Contact names:**

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**Institution:** CTTC, Spain

**Application deadline:** May 31, 2021

**ESR Project Description:**

This project aims at designing and implementing distributed machine learning (ML) algorithms for edge devices with limited computational resources and energy budget from renewable energy. The algorithms may exploit distributed databases and servers to store the data (workload) and/or the computing models across multiple machines. The coordination among distributed, decentralized and concurrent algorithm steps must be achieved in spite of unreliable mobile communication links and intermittent ambient energy supply.

**Expected Results:**

(1) A theoretical analysis of implementable and low-complexity distributed and/or decentralized ML algorithms at the edge; (2) Study how to carry out the entire learning process at the edge (including both training and inference); (3) A distributed control infrastructure and algorithm for communication and computing resource optimization in the presence of nodes powered by renewable energy; (4) A quantitative evaluation of the proposed solutions for selected application scenarios.

**Supervision and Mobility Program:**

Once hired, the candidate:

- will work at CTTC, performing full-time research under the supervision of Dr. Paolo Dini.
- will be enrolled in the PhD program at UPC, under the supervision of Prof. Mario García Lozano.
- will additionally pursue two secondments at Carnegie Mellon University (Pittsburgh, USA) and Telenor ASA (Oslo, Norway), for a duration of 5 months each.

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

- **Required:** At the time of recruitment, the applicant must not have lived in Spain for more than 12 months in the previous 36 months (3 years).

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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:** No more than 4 years spent in research activities after the achievement of the MS degree.
- **Preferred:** A Master's degree in Data Science, Computer Science, Telecommunications or equivalent.
- **Preferred:** Knowledge on machine learning and optimization theory.
- **Preferred:** Ability and motivation to conduct high-quality research, including publishing the results in relevant venues.
- **Preferred:** Programming skills (e.g., C/C++, Python, TensorFlow, Keras, PyTorch, SciKit, NumPy, R).
- **Preferred:** Very good communication skills in oral and written English.
- **Preferred:** Creativity, good sense of initiative, open-mindedness, strong integration skills and team spirit.
- **Desidered:** Knowledge on cloud computing and mobile networking.
- **Desidered:** Experience on data mining, data analysis and deep learning is an advantage.