ESR Project title: Edge network function activation and placement via neuro-inspired algorithms [ESR3]

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Institution: University of Padova, Italy

Application deadline: **May 31, 2021**

ESR Project Description:
The human brain learns to allocate and position specific functions in an unsupervised manner through processes involving cooperation and competition among neighbouring neurons. This has been studied, e.g., for neural clusters that are trained in the cerebral cortex to recognize images and perform sound-to-meaning mapping. Usually, such neural areas exhibit structure, while minimizing the energy consumption needed for their creation, maintenance and use. Some attempts have been made to mimic the unsupervised learning occurring in the human brain through Artificial Neural Networks (ANN), e.g., self-organizing maps and growing neural gas networks. With this project, we would like to build a parallel bridging neuro-science and the allocation of network function in edge computing networks. The objectives are: (1) use unsupervised ANN algorithms for the allocation and placement of computing functions in edge networks; (2) test and compare ANN-based algorithms against classical mathematical optimization driven solutions (e.g., from ESR1).

Expected Results:
(1) decrease in the energy consumption and processing time required for the placement of network functions; (2) enable online operation/adaptation of edge networks; (3) achieve near-optimal placement and activation of network functions.

Supervision and Mobility Program:
Once hired, the candidate:
- will work at the University of Padova, performing full-time research under the supervision of Prof Michele Rossi.
- will be enrolled in the PhD program at the University of Padova, under the supervision of Prof Michele Rossi.
- will additionally pursue two secondments at Imperial College London and Italtel, for a respective duration of 5 and 5 months.

Required, Preferred and Desired Prerequisites/Skills:[1]
- **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).

[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:** 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:** Open-mindedness, strong integration skills and team spirit.
- **Preferred:** Strong background in mathematics, probability and optimization theory.
- **Preferred:** MS-level training on modern machine learning techniques.
- **Preferred:** Good programming skills (Python and related machine learning libraries).
- **Desired:** Previous exposure to neuromorphic computing and brain-inspired computation.
- **Desired:** Prior experience of successfully conducting research and publishing results in top scientific journals and/or conferences.

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.