



ESR Project title: Energy-efficient edge computing for sustainable metropolitan areas [ESR5]

Contact names:

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Application deadline: May 31, 2021

ESR Project Description:

The goal of this project is the generation of high-resolution dynamic maps of the urban population in order to capture the time-varying density of people across metropolitan areas, by combining multiple and heterogeneous data sources. To do so, energy efficient ML solutions for data gathered from the mobile network infrastructure and the Geographical Information System (GIS) will be studied. Human mobility will be investigated: i) to detect and classify spatial and temporal patterns in urban settings, including different types of urban anomalies, and, ii) to identify dependencies between urban population dynamics and the spatial structure of the cities (e.g., layout of roads, transport system networks, neighbourhood categorization, presence of points of interests) as well as exogenous events.

Expected Results:

(1) A theoretical analysis of energy-efficient ML algorithms for pattern recognition; data mining platform for real-time monitoring of urban areas combining mobile and GIS data;
(2) The computation of spatial human mobility maps with high time and space accuracy;
(3) The comparison of urban dynamics for different European cities; quantitative evaluation of the proposed solutions for different Smart City applications and comparison with traditional urban monitoring tools (e.g., cartography, traffic cameras, smart sensors).

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 Imperial College London and ACISA (Spain), for a duration of 5 months each one.

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 Spain for more than 12 months in the previous 36 months (3 years).
- **Required:** No more than 4 years spent in research activities after the achievement of the MS degree.
- **Preferred:** A Master's degree in Cartography, Geoinformatics, Computer Science, Data Science, Telecommunications or equivalent.
- **Preferred:** Knowledge on machine learning, data mining, GIS or mobile networks.
- **Preferred:** Ability and motivation to conduct high-quality research, including publishing the results in relevant venues.
- **Preferred:** Strong programming skills (e.g., Python, R, Java, C/C++).
- **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:** Working experience in the areas of data mining and GIS is an advantage.
- **Desidered:** Knowledge on Spatio-temporal data analysis and Optimization Theory is an advantage.