

Call for Applications for PhD in Electrical
Communication Engineering:
Advanced Self-Optimization Solutions for Next
Generation Cellular Networks

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Context

Next generation cellular networks (5G and beyond 5G) will face the challenge not only to sustain the growing mobile traffic but also to address a great variety of requirements by various industries. Among the expected use cases, we find intelligent transportation, e-health, industrial automation, virtual reality. There is thus a need to dynamically adapt the network to various sometimes contradictory objectives. In this context, Machine Learning (ML) and Artificial Intelligence (AI) appear as key solutions to benefit from the huge amount of data generated by the network itself and to allow a self-optimization of the network. Even if ML/AI has been successfully applied in many fields, next generation networks will require custom algorithms to meet their objectives. On one side, ML/AI have already allowed to make important breakthroughs for wireless communications [2], but its potential has not been fully exploited for the self-organization of fully automated networks. On the other side, ML suffers sometimes from a lack of interpretability of the results, of performance guarantees, and the difficulty to gather training data.

PhD Objectives

The objective of the proposed thesis is to design, develop, and assess the performance self-organization algorithms for beyond 5G networks based on ML/AI techniques. In particular, we will focus on an industrial and machine automation context, in which millimetre wave small cells are deployed for serving closed loop control applications that require low latency and ultra reliability [1]. In this scenario, there is a challenge in providing fast beam training and tracking to allow seamless mobility for robots and machines. The organization of the work during the PhD can proceed as follows: 1) State-of-the-art on beam management and ML/AI for network self-organization; 2) Propose new ML/AI cross-layers algorithms; 3) Evaluate and optimize in relevant beyond 5G scenarios.

Required Skills

The ideal candidate for this position has a strong background on wireless networks and expertise in mathematics. Also, good communication skills, both oral and written English, are required; french knowledge is not mandatory. We expect also the candidate to have notions of research techniques (documenting and reporting, work organization, independent working, creativity).

Practical Information

The PhD student you will join the Nokia Bell Labs, Nozay (near Paris) and will be spend a part of his time in the university. He will be registered as a PhD student at Telecom Paris, Institut Polytechnique de Paris. The duration of the PhD is 3 years, and it is expected to start during the first trimester of 2020.

How to Apply

Potential candidates should send a CV, his Master grades, his Master thesis and references in PDF to the email addresses: marceau.coupechoux@telecom-paris.fr and chung_shue.chen@nokia-bell-labs.com

References

- [1] Gilberto Berardinelli, Nurul H Mahmood, Ignacio Rodriguez, and Preben Mogensen. Beyond 5g wireless irt for industry 4.0: Design principles and spectrum aspects. In *2018 IEEE Globecom Workshops (GC Wkshps)*, pages 1–6. IEEE, 2018.
- [2] D. Gunduz, P. de Kerret, N. D. Sidiropoulos, D. Gesbert, C. R. Murthy, and M. van der Schaar. Machine learning in the air. *IEEE Journal on Selected Areas in Communications*, 37(10):2184–2199, Oct 2019.