PhD Position in Machine Learning for Communications

Telecommunications Circuits Laboratory, EPFL, Switzerland

We are inviting applications for a fully-funded 4-year PhD position in **Machine Learning for Communications** at the Telecommunications Circuits Laboratory (TCL) of the École Polytechnique Fédérale de Lausanne (https://tcl.epfl.ch). The group currently consists of one professor, two post-docs, and five PhD students and it offers a unique mix of expertise in signal processing for telecommunications and VLSI circuit design, as well as strong links to many other world-class academic and industrial groups.

Project Overview

The field of communications is traditionally built on precise mathematical models that are well understood and have been shown to work exceptionally well for many practical applications. Unfortunately, communication systems designers have been forced to push the boundaries to such an extent that in many applications conventional mathematical models and signal processing techniques are no longer sufficient to accurately describe the encountered complex scenarios. Specifically, there is an increasing number of cases where rigorous mathematical models are either not known or are entirely impractical from a computational perspective. Machine learning methods can come to the rescue as they do not require rigid pre-defined models and can extract meaningful structure from large amounts of data to provide useful results. This PhD position allows for research on a variety of topics, such as:

- **Applications:** In the field of communications we already know how to solve many problems optimally, it is crucial to carefully identify the applications where machine learning is actually beneficial and not a (needlessly complicated) re-invention of the wheel.
- **Hardware Implementation:** The stringent latency, throughput, and energy-efficiency requirements of communications systems can only be met by using specialized circuits for each application, rather than the existing general machine learning hardware architectures.
- **Adaptability:** In wireless communications the transmission environment can change rapidly over time. Machine learning algorithms need to be able to adapt, either through appropriate offline training or through low-complexity and fast-converging online training.

Candidate Profile

The candidate should hold a Master's degree in a relevant topic (e.g., Electrical Engineering or Computer Science) with an excellent academic record. Proficiency in spoken and written English is necessary and good writing, presentation, and organizational skills are desired. The ideal candidate should have a strong background in at least two of the following topics:

- Signal processing for telecommunications (e.g., demodulation and detection, ECC, OFDM).
- Applied machine learning (e.g., neural networks and backpropagation).
- Digital hardware design (e.g., RTL design, functional simulation, synthesis and PAR).

A programming background is also required with experience in at least some of the common programming languages and tools for signal processing (MATLAB, C, python), applied machine learning (python, Keras, PyTorch), and digital circuits design (VHDL, Verilog, FPGA and ASIC synthesis/PAR tools).

Application Process

Applications should include the following information:

1. A full CV including the contact details of two references.
2. A cover letter explaining the candidate's research interests, an explanation for why they are applying for this position, and any other relevant information.
3. A grade transcript of Master-level courses.

Candidates should send their applications to Dr. Alexios Balatsoukas-Stimming (alexios.balatsoukas@epfl.ch). Applications are open until **February 28, 2019** and will be evaluated on an ongoing basis.