Two Ph.D. positions at the University of Zurich

We are searching for two highly motivated Ph.D. students who are interested in exploring data science and machine learning in the field of particle physics. In a large high energy physics experiment at CERN, hundreds of petabytes of raw data is generated every year. Complex pipelines are used in order to filter, store, and analyze this data. In the past few years, machine learning has become a very vibrant field in particle physics with research spanning from generative machine learning to anomaly detection. These techniques are now a fundamental part of particle physics experiments. Fast machine learning on FPGAs is used to filter the data, graph and convolutional neural network based inference networks are used to reconstruct events from the decays, and then machine learning is used to filter events as well as search for new physics.

Working at the intersection of computer science and high energy physics, the candidates will develop and implement machine learning algorithms for the analysis of complex data generated by high-energy physics experiments (especially the LHCb experiment at CERN). These data present unique computational challenges owing to the complexity, non-uniformity, and sheer scale of the data.

Possible topics include:
1. Generative machine learning (such as variational inference and normalizing flows) for fast simulation in particle physics
2. Event reconstruction with graph neural networks
3. Detector optimization with reinforcement learning
4. Anomaly and new physics detection

Our group is also involved in non-physics data science-related projects (for example, we are exploring machine learning based causal inference in the field of epidemiology). As their side projects, the candidates will also have a chance to work in these areas.

The candidates will earn a yearly stipend of approximately CHF 50,000 (gross). Zurich is an excellent and diverse city to live in and offers one of the best personal and professional environments globally. The city is well connected within Europe and provides easy connections to the beautiful Swiss Alps.

Qualifications
1. A master’s degree (or about to be acquired) in data science, computer science, particle physics, or a related discipline is encouraged. Background or a degree in particle physics is not required.
   a. For exceptional candidates without a master’s degree, we will also consider fast-track Ph.D. program applications directly from bachelors.
2. Knowledge & experience in machine learning (publications are not required)
Application

If this sounds exciting to you, please email Dr. Shah Rukh Qasim (shah.rukh.qasim@cern.ch) with Prof. Dr. Nicola Serra (nicola.serra@cern.ch) and Dr. Patrick Owen (powen@physik.uzh.ch) in cc with the following documents:

1. Curriculum vitae
2. Research statement (maximum two pages)
3. Email address of two people who can provide a letter of recommendation
   a. If you are interested in the fast-track Ph.D. program (without the master’s degree), please ask your referees to email the reference letters directly to us instead of providing us their emails
4. Latest transcript

The position will remain open until filled. Applications received before 23 January 2024 will receive full consideration. If you have any further questions about the position, informal inquiries are also welcome to be addressed to shah.rukh.qasim@cern.ch.