

Motivational letter for PhD project in Active Deep Learning for Nano-sensor systems

Dear Phillip John Binning

This is my motivational letter for the PhD project in Active Deep Learning for Nano-sensor systems at DTU Compute's Sections for Cognitive Systems and IDUN center of excellence.

Together with Professor Jan Larsen and Senior Researcher Tommy Sonne Alstrøm, I have planned the research in two parts. The first part of research is methodological and will be leveraging the state-of-the-art active learning techniques build in frameworks of deep neural network and variational generative models. The second part of the research will be applying the achieved methods and my knowledge in data processing, physics and biology in the framework of Nano Sensor and users-in-the-loop systems in close cooperation with the projects at the IDUN center of excellence. I see myself fit for this challenge, as fundamental research in understanding and building complex intelligent systems have been the overarching goal through my studies.

I see no boundaries between the different academic topics of research, when it comes to reaching new scientific findings and technological achievements, which is why I studied a bachelor in Biophysics at the University of Copenhagen to understand the nature of networks behind intelligent behavior and gained an even greater multidisciplinary profile during my Master, where machine learning was applied in cognitive science, musical genre recognition, melody generation and identification of new cell types from single cell transcriptomes.

This multidisciplinary profile will help me in communicating results and ideas beyond my own field of study with analogies and concepts from a broad range of research areas.

Complex machine learning models and our hypothesis generation are data driven, so how and what data is collected is crucial for the generalisation performance due to experimental bias and the balance in different classes of data points. Therefore it is important for me to be a part of the data collection from beginning to end, using my broad knowledge of the different fields of research involved in it.

I will be using my broad educational background and cognitive science in developing users-in-the-loop machine learning applications. Here gathering domain knowledge in an efficient way, also means considering the human perception, attention and range of knowledge, so the quality and density of information in the data can be kept high and effort and cost spend by the user low.

I have won a poster presentation competition at the exam in "02581 Computational Data Analysis". After this I have written three top-grade projects, in the format of unpublished research articles and posters, and now my Master's thesis on the topic of deep generative models under the supervision of Prof. Ole Winther at DTU CogSys. I am well experienced in structuring a research project and in scientific writing. Ole Winther recommended me as a good candidate for this PhD project.

Best regards

- Maximillian Fornitz Vording

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