KyungHyun Cho November 26, 2013

Letter of Introduction

I started my master's study in Sep., 2009 in the Master's Programme of Machine Learning and Data Mining provided by the Aalto University School of Science. The courses of the program were specifically tailored to improve my understanding and knowledge on machine learning, especially focusing on advanced probabilistic models and the state-of-the-art learning methods. Through these courses, I was able to familiarize myself with machine learning research.

Soon after commencing the master's program I was chosen as an honor's student by the department and began participating in the Bayes' group under the supervision of Prof. Juha Karhunen, Dr. Tapani Raiko, and Dr. Alexander Ilin.

My research focus during the master's program was on an emerging field called *deep learning* which studies more complex machine learning models that involve multiple layers of latent variables. Recent scientific reports from researchers have shown that remarkable improvements can be achieved in various tasks when deep learning replaces conventional shallow architectures.

I, under the excellent supervision, was able to tackle important problems in deep learning and propose a set of improved learning methods for restricted Boltzmann machine, which is a basic building block for deep models, in several peer-reviewed conferences. My supervisors and I as well as other researchers who have reviewed my work generally agree that these improvements are important to deep learning.

It is now natural to extend my research effort to deeper and more complex models that are essential parts of deep learning. Based on the achievements I made on RBMs I feel confident that my future research will improve the whole field of deep learning greatly.

Experience of past two years assures me that the Department of Information and Computer Science at the Aalto University is an excellent place for me to continue my effort into conducting research on deep learning and other advanced research topics. Finnish Doctoral Programme in Computational Sciences (FICS) to which the department belongs is a well-known graduate school that excellently supports and guides post-graduate students studying computational science in Finland. Hence, it will be a great chance and honor for me to be supported by FICS throughout my doctoral research.

Machine learning research is at the heart of collaborations among mathematics, statistics, computer science, biology, neuroscience, computer vision, and many other fields of science and technology. The researcher should not be isolated in theories of machine learning from other possible application areas, and must always be ready to participate in solving real problems using machine learning techniques.

Deep and complex machine learning models unfortunately have not been adopted widely by researchers from other fields, unlike simple, shallow models such as independent component analysis and self-organizing maps. I feel obliged to promote the use of the deep and complex models in order for other fields to take advantage of them, in addition to the theoretical research of them.

My future career, thus, will be pursued in both directions simultaneously. Deep and complex probabilistic models will be studied in-depth continuously while I will put my effort also in promoting and encouraging the adoption of these advanced techniques and models by researchers and industry professionals in other fields such as medicine, security, finance, and manufacturing.