THE UNIVERSITY OF BRITISH COLUMBIA

Department of Chemical and Biological Engineering

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Sub: Reference Letter for Dr. Qiugang Lu

Dear Prof. Zavala,

Let me begin by stating that Dr. Qiugang Lu is the best graduate student I had supervised or interacted with in my career so far. I have been with the Department of Chemical and Biological Engineering at the University of British Columbia since 2006 and supervised over 50 graduate students. In addition, I have interacted with many more graduate students including at MIT during my sabbatical. I have no hesitation to say that Qiugang is the very best graduate student I had supervised and is certainly on par or better than the students I had worked with at MIT. Qiugang is a rare individual who is not only technically strong but also has the drive, the passion and the attitude to succeed in his career. Given his long term aspiration to become a faculty member, I believe a postdoctoral position in your lab would be an ideal stepping stone for him. Please find below further details about Qiugang to support my observations.

Mr. Qiugang Lu has had an outstanding academic record before and after coming to the University of British Columbia. He obtained his bachelor's degree (2011) and Master's degree (2013) at Harbin Institute of Technology (HIT), China, with first-class grades (standing 1st in class). Qiugang's Masters thesis was highly novel and involved not only concrete mathematical analysis and control theory but also engineering applications. As a recognition of his outstanding academic achievements, he was awarded a Gold Medal for Master's Thesis from HIT (in 2013) and was also honored as the Excellent Graduate Student of Heilongjiang Province, China. By the time he arrived at UBC, he had already published more than 10 articles in prestigious journals and conferences.

Qiugang started his doctoral studies in the Department of Chemical and Biological at UBC in the Fall of 2013. He was the best student admitted to our department in 2013 and was therefore awarded the prestigious Four Year Fellowship (4YF) and the International Tuition Award (ITA). He received the highest grade (A+) in all the courses he had taken at UBC. In fact, he was the best student with the highest mark in a majority of the courses he had taken. He showed an amazing ability to take courses in a wide range of new and difficult research topics and yet perform at the top of his class. A unique quality of Qiugang is that he effortlessly handles more than one project at a time. In his first year as a Ph.D. student, he continued working on his research project while taking a number of required courses. Even within the research project, he was simultaneously working on two or three different aspects of the project and was also helping a couple of other students. His academic and research performance must be looked at in this light.

Qiugang's research experience on control theory and his outstanding research productivity place him in an extraordinarily strong position to conduct post doctoral studies. He is intelligent, persistent and thorough – just the right recipe for a research superstar in the making. His doctoral research was aimed at developing an autonomous controller for the paper machines. Autonomous manufacturing industries have been the dream of many researchers for decades and Qiugang had the best background to tackle this difficult problem. The outcome of this project helped to significantly reduce the cost and production losses in manufacturing industries.

For his Ph.D., Qiugang worked on a multidisciplinary collaborative project between Honeywell Process Solutions and the University of British Columbia. Honeywell Process Solutions is a Fortune 100 company that develops and commercializes technologies to address some of the world's toughest challenges in the manufacturing and other industries. The academic team consisted of myself, Prof. Philip Loewen (Mathematics, UBC), and Prof. Guy Dumont (Electrical Engineering, UBC). The engineering team at Honeywell consisted of two senior engineers – Johan Backstrom (Engineering Manager, Honeywell) and Dr. Michael Forbes (Scientist, Honeywell) and other engineers who participated on this project on a need basis. Qiugang's primary objective was to design a semi-autonomous control system that not only improved the quality of different paper grades but also minimized energy consumption and negative environmental impact. Qiugang developed a variety of algorithms for online performance monitoring and online identification of models with minimal external excitation. These algorithms are currently being tested and evaluated for incorporation into Honeywell products. Based on his work, he published several journal articles (including one in Automatica) and conference proceedings. In particular, he developed a novel identification algorithm to detect changes in the dynamic behaviour of a process. The novel feature of his algorithm is that it does not require explicit external excitation. He used a combination of an online identification algorithm and Support Vector Machines to solve this rather difficult problem.

Qiugang also spent a few months at MIT during his Ph.D. He worked with one of my collaborators – Prof. Richard Braatz. During his stay at MIT, he developed a couple of novel algorithms for fault detection and diagnosis using process data. This was not an area he worked on prior to visiting Prof. Braatz and hence both of us were pleasantly surprised at how fast he was able to build his knowledge in the area and publish papers. He finished his stint at MIT with two journal articles. An amazing achievement by any measure.

Qiugang proved to be a gifted and extraordinarily talented independent researcher. We often gave him a vaguely defined task or problem with a brief description of how it might be solved. That is all he needed to make progress on any problem and bring forward solutions. He has an uncanny ability to take a large problem break it down into simpler problems, solve them all and then put them back together to form an elegant solution. Qiugang is adept at bringing clarity, defining precise mathematical problems, and providing practical solutions that our friends in the industry not only can understand but are also eager to showcase to their clients. Qiugang, unlike many students at this state in their careers, is very thorough, thoughtful and precise.

Qiugang was a great role model for many graduate students. Qiugang worked with two junior graduate students, three professors and two control engineers with PhDs at Honeywell. He demonstrated that he can work very well in a team and contribute to the team output as well. This is clearly evidenced by the papers he has co-authored with other students. He was an enthusiastic participant in our research group meetings often asking the sharpest questions and volunteering new ideas/suggestions to help other students. His presentations at our group meetings and at conferences have always been of high quality in terms of clarity and preparation.

He is a student with prodigious academic credentials, high intellect and enormous potential to be a research superstar. My opinions about Qiugang are also shared by my colleagues at the University and our collaborators at Honeywell. Please feel free to contact me if you have any questions.

Sincerely,

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