**Letter of Recommendation**

Abdus Salam Azad is one of my best thesis supervisees. I know Azad since for the last 5 years. Being his mentor for such a long time, I stand as a trustworthy source to confirm Azad’s research abilities and academic accomplishments.

Azad’s work focused on the application of Genetic Algorithms (GAs) in the field of Combinatorial Optimization. Particularly he worked on the Vehicle Routing Problems (VRP), a well known combinatorial optimization problem. Our work on this topic resulted in a number of contributions. We developed a new variant for periodic multi-depot VRPs which can generate low-cost solutions than the previous formulations at the cost of a larger and harder search space. We also designed a novel algorithm to solve this variant efficiently. One common characteristic of the existing methods was to put an emphasis on greediness to find good quality solutions from the large search space. However, such greediness disrupts the balance between the exploration and exploitation of the search space. Azad came up with a simple yet novel idea of effectively introducing stochasticity in the search process to maintain the search balance. This work has been published in the reputed journal IEEE Transactions on Cybernetics (2017, Impact Factor: 8.803). An earlier version of this work also got the best thesis award in the departmental thesis poster presentation.

As Azad’s supervisor, I have found a number of good traits in him, which I am confident that can lead him to carry out quality research works. First of all, Azad is very hard working. He has been employed in our department as a Lecturer since his graduation (August 2014) and currently is on a study leave. Hence, during the whole period of his Master's Degree he was already doing a full-time job. He used to work for prolonged hours on our research after his office hours, which is of course praise-worthy. Azad’s writing ability is promising too and improved a lot during this work. Other characteristics that I value highly are his consistency and perseverance. During his research, many times new approaches failed to work as expected, which is very common in any field of research. However, he was sincere throughout the process. In each setback, he conducted a deeper analysis to get a better understanding of the problem. By running experiments and analytical analysis, he found out the shortcomings of each approach and addressed those issues to improve the algorithm further.

Azad has always been passionate in the field of Artificial Intelligence. He took two of my courses during his undergraduate degree, Artificial Intelligence, and Machine Learning. His attentiveness and participation in the class are worth mentioning. He used to be attentive in the classes and participated actively in almost every class. He obtained the highest marks in Machine Learning exam with a significant difference than the second highest score. He showed outstanding performance in the assignments as well. I remember my encounter with him during the first assignment. He had implemented the algorithm alright. However, during the viva, I wasn’t quite satisfied with his insights on the algorithm. But, I found him much well prepared in his next assignment as he was answering questions with great depth with references from research papers. For the rest of the course, I enjoyed checking his assignments as he continued to show a good understanding of the topics. He used to submit extra analyses and experiments on his reports as per my guidance.

I have also worked with Azad as a colleague as he joined as a lecturer on the same department. We co-instructed two undergraduate-level courses together: Machine Learning and Introduction to Artificial Intelligence. As a teacher, I find him dedicated and sincere. He did a great job in designing new and interesting assignments for the AI course. Azad is also very spontaneous in delivering his lectures. I particularly liked one where he engaged and guided the students to use their intuition to solve an imaginary problem faced by the tennis player Rafael Nadal. Later he revealed to the students that they had been “rediscovering” the ID3 algorithm by their intuition the whole time. Throughout the class, he was able to attract and maintain the interest of the young learners.

Finally, throughout these years Azad has been a sincere learner and has grown a strong foundation for doing novel research work. It is a great pleasure for me that he is pursuing his Ph.D. at the world-renowned university UC Berkeley. He has a long way to go and I believe he will conduct influential research in his Ph.D. Therefore, I strongly recommend him for this prestigious fellowship program which will inspire him on his journey.

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