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April 30, 2023

Selection Committee  
Quantum Computing Boot Camp

**Recommendation for Bhashitha Dharmasena**

Dear Members of the Committee,

It is my great pleasure to write a recommendation letter for Bhashitha Dharmasena. Bhashitha is an exceptional graduate student in physics and I am confident that he is very well prepared for the Quantum Computing Boot Camp at Jefferson lab

First, I find it appropriate to introduce myself and my relevant qualifications. I currently serve as a professor of physics at the University of Virginia. I have conducted research in experimental nuclear and particle physics for over twenty years. I currently supervise six graduate students, a post-doc and a research scientist in my research group. I obtained my Bachelor's degree in physics from the Massachusetts Institute of Technology (MIT) in 1993, and my PhD in nuclear physics from MIT in 1999. I have conducted research in experimental nuclear physics at the Thomas Jefferson National Accelerator Facility (Jefferson Lab) for over 27 years.

Bhashitha is a highly intelligent young researcher with a deep understanding of physics, mathematics and engineering. I first got to know Bhashitha in 2019 when I was trying to recruit a couple of highly talented mechanical engineering graduate students into one of my future projects which involves a large amount of mechanical engineering design, optimization and fabrication aspects. Bhashitha came very highly recommended and I was impressed by his resume and qualifications; especially with the broad research exposure he has had. He was among the top 1% of the engineering students in Sri Lanka. It is highly unusual for engineering graduates in Sri Lanka to go to graduate school in physics; one main attraction Bhashitha found in physics graduate school and joining my group was the possibility to use data science in the analysis of large nuclear physics data sets. When I made the admission offer to Bhashitha, I made it clear to him that succeeding in graduate level physics courses and passing the qualifying exam would be highly challenging for him since he had not taken any advanced undergraduate physics courses such as quantum mechanics (QM) and electromagnetism (EM). This is what makes the B and B+ grades he obtained for first year graduate physics courses so impressive; he was competing with other graduate students who had taken up to one year of undergraduate versions of those courses such as QM, EM as well as statistical physics. I find it remarkable that he was able to do very well in these highly abstract graduate level physics courses and then go on to pass the physics qualifying exam in his first attempt. This shows not only his high intelligence and well developed analytical abilities, but also his intellectual adaptability to a completely new subject. After Bhashitha got used

physics graduate studies, he improved his performance to all A's in the second year showing what is he is truly capable of.

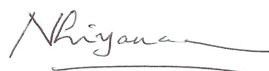
Bhasitha is currently preparing for his PhD thesis project to develop software and hardware techniques to achieve the high rate operational conditions essential for the success of Super Bigbite (SBS) experimental program at Jefferson lab. The experiments in this program are designed to explore the ground-state structure of the nucleons - protons and neutrons - with unprecedented precision through nucleon elastic form factor measurements. The form factor measurements allow us to construct a "snap shot" of the nucleon in its ground state. The success of the experiments in this program depends on our ability to operate the experiments, gather the required data and interpret that data, under extremely high background rate conditions. The particle tracking detector system in these experiments consists of up to 8 high precision large area tracking layers. During the experiments a few hundred particle tracks per second corresponding to the events of interests leave hits on these tracking layers. At the same time about several billion background hits per second are also registered on these layers. Many of these background hits fall into false tracks which closely mimic good tracks. Bhasitha's thesis project is to exploit correlations in time and space coordinates to identify the good tracks with high precision and efficiency while rejecting the bad hits and tracks. Given the sheer amount of data, billions of hits per second collected over years, this is truly big data. And this analysis can really benefit from data science. Bhasitha will collect this data at Jefferson lab in the spring and would be ready to the analysis by the summer.

Bhasitha is a very deep thinker. He is very independent and is very quick to grasp advanced concepts when they are described to him. When he is confronted with a challenging problem in the lab, he takes some time to think about the problem and understand it while raising deep questions related to the issue. Often he would point out problems the senior members of the group had overlooked and would make very smart suggestions to solve difficult problems. Over the last two years I have come to respect his questions and his suggestions very much. Once Bhasitha comes up with a way to solve the issue, he works on it with an excellent understanding, accuracy and efficiency that surprises experienced observers.

Based on his ability to understand concepts of physics and mathematics, his well-developed analytical abilities, and his highly advanced technical abilities I rank Bhasitha in the highest 5% of graduate students participating in research at Jefferson lab from major research universities. This is a group of over 200 physics graduate students that I have collaborated in research projects at Jefferson lab in the past 24 years. This group also includes two of my former students who are now research scientists at Facebook and another student who is now a data scientist at Woven planet, the self driving car company owned by Toyota.

Overall, Bhasitha is a very intelligent young researcher with highly advanced analytical and technical skills. It has truly been a pleasure having him in my experimental group. The quantum computing boot camp comes at an ideal time for him as he will be starting his data analysis. Bhasitha has my strong recommendation to attend this camp.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Nilanga', with a horizontal line underneath.

Nilanga Liyanage  
Professor of Physics

