

South Dakota
School of Mines & Technology
Department of Physics
501 E. Saint Joseph St.
Rapid City, SD 57701

February 3, 2018

Dear SD School of Mines & Technology,

It recently came to my attention that your institution has an opening for an Assistant or Associate Professor of Physics position in your department. I would like to apply for the position.

I received my Ph.D. in experimental neutrino physics from the University of Hawaii at Manoa in April, 2016. During my graduate studies, I worked on event track reconstruction and particle ID techniques in KamLAND (Kamioka Liquid Scintillator Antineutrino Detector), a monolithic liquid scintillator neutrino detector in Kamioka, Japan. Through my work, I single handedly opened the doors to a never before explored capability of scintillator detectors to conduct indirect dark matter searches by looking for directional neutrino signals from the core of the Sun and Earth. According to my understanding, my work is the first ever physics application of directional neutrino reconstruction in scintillator. A paper for this is currently under preparation.

Nevertheless, topological event reconstruction in scintillator is fundamentally limited because the reconstruction is done using the smeared information of isotropically emitted scintillation photons collected by photomultiplier tubes (PMTs) along the perimeter of the detector volume. Liquid Argon Time-Projection-Chamber (LArTPC) technology that will be used by the DUNE (Deep Underground Neutrino Experiment) far detector at Sanford Lab is the next generation endeavor to employ topological event imaging at an unprecedented level of precision, using the ability to drift ionization charge to a read-out plane. Although there has been much effort to demonstrate the feasibility of the detector technology itself, development of reliable event imaging algorithms will be crucial to the success of DUNE. I believe that my experience with topological event imaging in an extremely difficult medium, such as scintillator, puts me in a unique position to play a leading role in the effort to develop reliable reconstruction algorithms in LArTPCs.

In addition, throughout my academic career, I have been heavily involved in teaching and mentoring students. My philosophy for teaching is motivation through curiosity and mastering through repetition. When teaching at the undergraduate level, it is especially important to never get bogged down by the equation or numbers. When I begin a class or introduce a new concept to students, I never begin with equations. I always first show them the experiment itself or introduce the context in an illustrative way. This is to engage the students' interest and entice their curiosity to develop a long lasting motivation before starting to learn. Repetition is the key to mastering a topic. No matter how gifted one may be, no one able to master everything instantaneously in a single trial. On the other hand, this also means that even if one is not naturally gifted at something, it can be mastered through diligent repetition.

In conclusion, my innovative endeavors in topological neutrino event reconstruction, as well as my experience in successfully teaching/mentoring students at both the undergraduate and graduate levels, makes me a unique candidate to apply for your position. I believe I can make a significant impact to your team of academic and scientific prowess at SD School of Mines & Technology.

Thank you for your consideration.

Best wishes,

Michinari Sakai

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