

## Statement of Purpose

This statement of purpose aims to present you my candidacy for the IST internship position. My name is Dilraj Ghuman and I am finishing my undergraduate bachelor in mathematical physics with a minor in pure mathematics at the University of Waterloo, in Canada, this May.

I have had two main research experience positions. My first research position was during the Fall of 2017, from September to December, at SNOLAB in Sudbury, Canada. SNOLAB is a research facility primarily focused on experimental particle physics with a laboratory located two kilometres underground. This provides a unique low background environment for sensitive experiments. I worked under Chris Jillings and Pierre Godel on the DEAP experiment, which attempts to discover dark matter. Majority of my work was building code in C++ and on the detector calibration.

My second research position was at TRIUMF during the summer of 2018, from May to August, in Vancouver, Canada. TRIUMF is Canada's particle accelerator centre and hosts research in particle and nuclear physics, and much more. I worked under the supervision of Thomas Lindner and Mark Scott in the T2K collaboration, which is a neutrino experiment based in Japan. My work was primarily focused on working with the GEANT4 simulation software for an extension that is being added to the T2K experiment, and checking if path reconstruction could be done more accurately in the case of multiple events occurring close to one another.

After completing two experimental research positions in physics, I realised my interests lie elsewhere. Even though my positions have helped me acquire diverse skills, such as getting familiar with research, working in a collaboration, analysing and presenting my results, the research area I am truly interested in is geometry. I have taken courses accordingly and greatly enjoyed the subject. As such, I would be interested in working with a Geometry/Topology group at IST Austria.

I have already contacted Professors Herbert Edelsbrunner and Tamas Hausel, both of whom work in geometry. Professor Edelsbrunner has replied positively and has said he would welcome me to his group with the goal of me learning geometry and topology during the internship. Professor Tamas Hausel has described to me a possible project for which he would be accepting students.

My interest in IST lies in the opportunity it offers me. As I am finishing my undergraduate studies and will begin a master's next fall, it will help me gain research experience in the area that really interests me. Having looked into the advances in Geometry and Topology in the last few years, I have stumbled across the research in mathematics done at IST Austria, and I have found that I am actually quite interested in the work done in the Geometry and Topology department. I have read some papers published by the Edelsbrunner group and the research they have been doing recently appeals to me. I would welcome the opportunity to work with the Edelsbrunner group.