Notice of the Final Oral Examination
for the Degree of Master of Science

of

LUCAS POLSON

BSc (University of Victoria, 2019)

“Application of Machine Learning for Energy Reconstruction in the
ATLAS Liquid Argon Calorimeter”

Department of Physics and Astronomy

Thursday, June 3, 2021
10:00 A.M.
Conducted Virtually

Supervisory Committee:
Dr. Michel Lefebvre, Department of Physics and Astronomy, University of Victoria (Supervisor)
Dr. Robert Kowalewski, Department of Physics and Astronomy, UVic (Member)

External Examiner:
Dr. Wojtek Fedorko, Scientific Computing, TRIUMF

Chair of Oral Examination:
Dr. Raad Nashmi, Department of Biology, UVic

Dr. Stephen Evans, Acting Dean, Faculty of Graduate Studies
Abstract

The beam intensity of the Large Hadron Collider will be significantly increased during the Phase-II long shut down of 2024-2026. Signal processing techniques that are used to extract the energy of detected particles in ATLAS will suffer a significant loss in performance under these conditions. This study compares the presently used optimal filter technique to alternative machine learning algorithms for signal processing. The machine learning algorithms are shown to outperform the optimal filter in many relevant metrics for energy extraction. This thesis also explores the implementation of machine learning algorithms on ATLAS hardware.