Daniel Hortelano Roig

daniel.hortelanoroig@materials.ox.ac.uk +44 7506 558137
St Anne's College, 56 Woodstock Rd, Oxford, OX2 6HS United Kingdom
Canadian & Spanish citizenship

EDUCATION

University of Oxford, *Department of Materials*, Oxford, United Kingdom — Oct 2019 – Dec 2022
Doctor of Philosophy (D.Phil.) in Materials – Supervisors: Dr. E. Tarleton and Professor A. Wilkinson
- Developing state of the art computational dislocation-based models of metal plasticity.
- Simulating cracking in advanced engineering alloys such as those in nuclear reactors for submarine propulsion.

University of Oxford, *Mathematical Institute*, Oxford, United Kingdom — Class of 2019
MSc in Mathematical and Theoretical Physics – with Distinction (Highest attainable classification)

University of Guelph, *College of Physical and Engineering Sciences*, Guelph, ON, Canada — Class of 2018
Bachelor of Science in Theoretical Physics
Cumulative GPA: 3.85; Physics & Math GPA: 3.95; Dean's Honours List 2015 - 2018

AWARDS & DISTINCTIONS

- J.B. Reynolds Graduation Medal in Physics – Awarded to graduating student with the highest physics cumulative average (2018)
- Marie Curie Scholarship in Physics – Awarded to fourth year physics student with highest cumulative average (2018)
- Undergraduate Summer Research Award — NSERC National Research Scholarship (2016, 2017, and 2018)
- University of Guelph Entrance Scholarship (2014)

RESEARCH & WORK EXPERIENCE

Mathematical Institute, University of Oxford, Oxford, United Kingdom — Oct 2018 – Jun 2019
Supervisor: Dr. Georgy Kitavtsev, Dr. Andreas Münch, and Dr. Dirk Peschka
Master's Dissertation (Derivation and numerics of thin-film models with moving contact lines for binary mixtures)
- Derived the equations of motion of an evolving viscous binary mixture droplet using Onsager's variational principle.
- Established the connection between the equations of motion of thin-film droplets with their respective gradient flow dynamics.
- Applied an Arbitrary Lagrangian-Eulerian based algorithm to model thin-film droplets with moving contact lines.
- Numerically modeled a thin-film mono-fluid using finite element methods on Python and Matlab.

Department of Physics & Astronomy, University of British Columbia, Vancouver, BC — May 2018 – Oct 2018
Supervisor: Dr. Colin Gay and Dr. Alison Lister
Physics Researcher, 50 hours/week
- Implemented a novel Tree-LSTM deep neural network architecture to tag Lorentz boosted top jets in the ATLAS calorimeter.
- Added to Delphes simulation code in C++; collaborated with CERN infrastructure through gitlab.
- Extracted energy deposits (constituents) in a specific order and hierarchy specified by the anti-kt algorithm.
- Produced visualizations of jet tree structure produced by anti-kt algorithm using igraph on Python.
- Used Python to preprocess constituents in preparation for training; used HDF5 datasets to deal with large memory requirements.
- Implemented GPU-accelerated training loop using PyTorch; used data science techniques to drastically lower training time.
- Future goals lie in evaluating tagging performance, optimize hyperparameters, and improving speed.

Department of Physics, University of Guelph, Guelph, ON — Sep 2017 – Apr 2018
Supervisor: Dr. Eric Poisson
Undergraduate Senior Year Physics Research Course (Honours Thesis)
- Studied the effects of external gravitational fields on rotating neutron stars in the framework of Post-Newtonian theory.
- Constructed a density profile of a perturbed neutron star with a polytropic equation of state using Python.
- Solved multi-dimensional non-linear systems of differential equations in Python and Maple to calculate Love numbers.
- Applied fluid perturbation theory, orbital dynamics, and thermodynamics for mathematical derivations.

Department of Physics, University of Guelph, Guelph, ON — May 2016 – Aug 2017
Supervisor: Dr. Carl Svensson
Physics Researcher, 50 hours/week
- Studied nuclear decay simulations of Argon 34 to predict actual experiments performed at TRIUMF, Vancouver.
- Learned how to manipulate programming framework of GRIFFIN detectors on GEANT4 with C++.
- Used ROOT to analyze and construct histograms from simulation data; used Deepview for simulation visualizations.

ADDITIONAL SKILLS

- Proficiency in C++, Python, Matlab, Unix, Mathematica, Maple, PyTorch, & HDF5 datasets; excellent general programming skills.
- Native bilingual in English & Spanish, limited proficiency in French and Catalan.