SIMON GUICHANDUT

Ph.D. - Researcher - Math & Computation

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SUMMARY

I am a recent Ph.D. graduate in Astrophysics, with a Bachelor in Engineering Physics. I have a strong background in data analysis, mathematical modeling, and high-performance numerical simulations. I am highly curious, willing to learn fast, and eager to take on challenging projects. I am a strong team player and am experienced in communicating technical and complex concepts to wide audiences.

SKILLS

Languages: Python, Matlab, Bash, C++, SQL, LaTeX

Technologies: Git, NumPy, SciPy, Matplotlib, Pandas, scikit-learn, Excel/Sheets

Platforms: Unix/Linux, High-performance clusters (HPC), Google Cloud, AWS

- Fully fluent in english and french -

EXPERIENCE

McGill University

Graduate Researcher **2018 – 2024**

· Conducted multiple research projects, from literature review, developing methods and data analysis, to writing scientific papers and publishing in high impact research journals.
· Methods include: Numerical simulations (Python, Fortran, C++), high-performance computing, pen-and-paper calculations.
· Presented results in multiple international events (invited seminars in universities, physics conferences).

Stony Brook U.

Visiting Researcher **2023**

· Developed and ran multidimensional fluid simulations, using high-performance computing resources.
· Open-source development and continuous integration of fluid codes (MAESTROeX, pyro).

McGill University

Graduate teaching assistant **2018 – 2024**

· Tutorials, grading of assignments & exams for 6 undergraduate and graduate physics courses.
· Prepared and performed guest lectures on advanced astrophysics topics.

Outreach coordinator **2021**

· Lead coordinator for "AstroMcGill", a student-led group for the promotion of astronomy & astrophysics.
· Organized multiple events with ∼50-150 attendants including: public lectures, trivia nights, and festivals.

RECENT PROJECTS

Data Science/ML

Will My Flight Be Late? **Erdös Data Science Bootcamp (Online) - 2023**

Collected data from 20 million US domestic flights over 10 years. Analyzed statistics of late flights over the years. Trained **classification models** (Logistic Regression, Random Forest, XGBoost) to predict whether a given flight will be late depending on several factors. Built a **web app** where users can input their flight info and get a prediction. github link. certification link.
— `scikit-learn` • `pandas` • `selenium` • `seaborn` • `streamlit`

Physics simulation

Stellar explosions in 2 and 3 dimensions **Stony Brook University - 2023**

Moved to Long Island for 4 months to work on **massively parallel fluid simulations** of stellar explosions using open-source C++ code. Used **20k node-hours** on *Perlmutter* supercomputer. Wrote several scripts in C++/Python that were merged into the main codebase. Numerical methods include: **finite differencing, operator splitting, adaptive mesh refinement**. github link. paper link.
— HPC • C++ • `git`

Physics simulation

Stellar explosions in 1 dimension **McGill - 2022**

Learned and utilized open-source Fortran code (MESA) to model the ignition, growth and radiation from explosions on exotic stars. **Explained peculiar NASA X-ray telescope observation from 2019**. Ran code in parallel on canadian supercomputer, with **custom bash scripts for automation**. github link. paper link.
— HPC • Fortran • Bash

Physics model

Outflows from neutron stars **McGill - 2021**

Developped a model for fluid dynamics in a star's atmosphere in general relativity. Wrote a **∼4000 line python solver from scratch** with a command line interface. Numerical methods include: **shooting methods for boundary value problems, gradient descent optimization**. github link. paper link.
— `scipy` • `numpy`

Hackathon project

Disease-spreading and contact tracing simulator **McGill Physics Hackathon 2020**

Code written in 24 hours. Models the spread of a disease in a population within a particles-in-box simulation. Implements a contact-tracing network via breadth-first-search. github link.
— `numpy` • `matplotlib`

EDUCATION

2018 - 2024

M.Sc. & Ph.D. - Physics **McGill University**

Fully funded with competitive national scholarships. 4.0 GPA.

2014-2018

B.Eng. - Engineering physics **Polytechnique Montréal**

Internships in neuroscience & biomedical physics. 3.85 GPA, Excellence mention.