Max HIRSCH

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🎓 EDUCATION

May 2023
August 2019
	Carnegie Mellon University, PITTSBURGH, Pennsylvania
	> M.S. Mathematical Sciences
	   > Thesis : An Energy-Stable Finite Element Scheme for the Q-tensor Model of Liquid Crystals Subject to an Electric Field
	   > Advisor : Professor Franziska Weber
	> B.S. Mathematical Sciences
	> GPA : 4.00/4.00

January 2023
September 2022
	L'École Polytechnique Fédérale de Lausanne, LAUSANNE, Switzerland
	> Exchange Semester
	   > Semester Project : Continuous Time Stochastic Gradient Descent for Parameter Identification in Multiscale Diffusion
	   > Advisor : Professor Fabio Nobile

🔍 RESEARCH EXPERIENCE

September 2022 May 2022	**Undergraduate Researcher, EPFL CHAIR OF COMPUTATIONAL MATHEMATICS AND SIMUATION SCIENCES** Advisor : Prof. Jan Hesthaven and Dr. Federico Pichi > Developed MLniCS, a code library for building physics-informed neural networks (PINNs) for reduced order parameterized partial differential equations. > Designed greedy algorithm using PINN loss function to sample parameter space for data augmentation for supervised training of neural networks which solve parameterized PDEs. > Designed algorithm for approximating assembled reduced order nonlinear terms in parameterized PDEs by an affine expansion using neural networks.
August 2021 May 2021	**Undergraduate Researcher, CMU DEPARTMENT OF MATHEMATICAL SCIENCES** Advisor : Prof. Franziska Weber > Designed energy stable finite difference and finite element schemes for a system of partial differential equations, the Q tensor flow model, describing the flow of liquid crystals.
August 2021 May 2020	**Research Assistant, UNIVERSITY OF ALBERTA DEPARTMENT OF MATHEMATICAL AND STATISTICAL SCIENCES** Advisor : Prof. Jay Newby > Estimated particle densities in videos using convolutional neural networks, achieving 6% error in estimates of the total number of particles from these densities. > Used Monte Carlo methods for maximum likelihood estimation of the diffusion constant arising from the master equation describing particle motion.

🎓 TEACHING

December 2021 August 2020	**Teaching Assistant, CARNEGIE MELLON UNIVERSITY, Pittsburgh, PA** > Matrices and Linear Transformations, Fall 2020 > Integration and Approximation, Spring 2021 > Matrices and Linear Transformations, Fall 2021

🎓 TALKS

Fall 2022	EPFL Chair of Computational Mathematics and Simulation Sciences Seminar, *Applications of MLniCS : A Library for Physics-Informed Machine Learning for Parametric Problems*
November 2021	Finite Element Circus at Penn State, *Finite Elements for the Q-Tensor Flow of Liquid Crystals*

💼 WORK EXPERIENCE

August 2019 May 2019	Data Science Intern, MATRIX RETAIL, Hickory, NC › Created a new scalable sales forecasting algorithm for high-dimensional data which automatically tunes parameters, trains, and forecasts with bootstrapped prediction intervals for over 1000 retail stores to reduce the time of the former forecasting algorithm by 300% without sacrificing accuracy. › Enabled more efficient evaluation of forecasts by creating a graphical user interface for running the forecasting algorithm and visualizing the resulting forecasts and prediction intervals.

💻 PROJECTS

TETRIS REINFORCEMENT LEARNING (PROJECT LEADER)   SPRING 2020-FALL 2020

Led a Data Science Club project group in which we trained a reinforcement learning model with the REINFORCE algorithm and Monte Carlo tree search to play tetris.

DUKE DATAFEST RUGBY PLAYER HEALTH PREDICTION   APRIL 2019

Implemented a neural network, random forest, and support vector machine to determine the effect of a workout on Canadian women's rugby players health with over 70% accuracy.

MATHWORKS MATH MODELING CHALLENGE (1ST PLACE IN TECHNICAL COMPUTING)   MARCH 2019

Classified likely high school student drug users based on demographic data with average accuracy of 77% across all drugs in the study. Implemented the Metropolis-Hastings algorithm as part of a model to predict the spread of drug use in high school students.

REDUCING EXAM CONFLICTS WITH HILL CLIMBING (IMPLEMENTED FALL 2019)   FEBRUARY 2019

Designed a hill climbing algorithm which reduced the number of exam conflicts at the North Carolina School of Science and Mathematics to half the number of conflicts while maintaining schedule structure. Implemented for the 2019 fall trimester.

🎓 HONORS AND AWARDS

May 2022	Richard A. Moore Award for outstanding scholastic achievement, CMU Dept. of Mathematical Sciences
April 2022	Grant to attend HYP2022 Conference on Hyperbolic Problems
March 2022	ThinkSwiss Research Scholarship
February 2022	EPFL Research Internship Scholarship of Excellence
May 2021	Richard A. Moore Award for outstanding scholastic achievement, CMU Dept. of Mathematical Sciences
November 2019	CMU Data Science Club November Challenge Winner
May 2019	CMU Quantitative Social Science Scholar (QSSS)
March 2019	MathWorks Math Modeling Challenge (M3C) Honorable Mention, 1st Place in Technical Computing
February 2019	Mathematical Contest in Modeling (MCM) Honorable Mention

☰ SKILLS

Programming	**Python**, C, MATLAB, SML, Java
Libraries	Pandas, **Numpy**, Scikit Learn, Matplotlib, Numba, **PyTorch**, TensorFlow
Tools	Git, Vim, LaTeX