

Curriculum Vitae Nathan Gold

Personal

Address Department of Mathematics and Statistics
York University, 4700 Keele Street
Toronto, Ontario, M3J 1P3, Canada

Telephone +1 (416) 736 - 2100 Ext. 20196

E-mail ngold5@mathstat.yorku.ca

Webpage <https://www.nathangold.org>

Research Interests

Computational physics, fluid and particle dynamics, fractional differential equations, stochastic partial differential equations, biophysical problems, high performance computing, stochastic control, financial markets, machine learning, heart rate variability, analysis of EEG and ECG data

Education

Ph.D., York University Current
Applied Mathematics
Advisor: Prof. Huaxiong Huang
NSERC Postgraduate Doctoral Scholar

Honours B.A., York University 2015
Applied Mathematics, Department of Mathematics and Statistics
First Class with Distinction
Member of Dean's Honour Roll
Member of Chair's Honour Roll, Department of Mathematics and Statistics

Experience

University of Tokyo, Tokyo, Japan 06/2017 - 08/2017
Visiting Researcher, Fluids Engineering Laboratory,
Department of Mechanical Engineering
Supervisor: Prof. Shu Takagi

- Developed mathematical models for bottom up construction of physics based simulation techniques
- Wrote highly-parallel software to implement simulations of mesoscale fluid-solid interactions in biological system
- Constructed continuous stochastic models of mesoscale physics interactions of particle dynamics

Université Pierre et Marie Curie, Sorbonne, Paris, France

05/2016 - 08/2016

Inria, Paris, France

Mitacs Globalink Researcher, Laboratoire Jacques Louis-Lions (UPMC)

REO Group (Inria)

Supervisor: Dr. Marc Thiriet

- Developed mathematical models of cardiovascular, metabolic, and neural dynamics in hypoxic biological systems
- Wrote original software to compute numerical solutions of partial and ordinary differential equations
- Authored scientific research papers to summarise model results for publication

TMX Group, Toronto, Canada

10/2015 - 05/2016

NSERC Engage Research Fellow, eXplore TMX Innovation Lab

Supervisor: David Orzell, Chief Commercial Officer CDS

- Developed predictive analytic software in Python, MATLAB, C, and Apache Spark using machine learning, statistical, and applied mathematics techniques
- Analyzed over 25TB of financial data from the TSX, Over-the-Counter exchange, and derivative markets
- Prepared weekly presentations and monthly reports for senior management detailing analytic results

Concord, New York City, United States

09/2015 - 12/2015

Machine Learning Advisor

- Spearheaded data science team in the design and implementation of machine learning algorithms for stream processing
- Oversaw project development and goal scheduling on a weekly basis
- Advised and instructed data science team in theoretical constructs of machine learning and algorithm performance test cases

York University, Toronto, Canada

05/2013 – 09/ 2016

Machine Learning Researcher, Department of Mathematics and Statistics

Supervisors: Prof. Huaxiong Huang and Prof. Steven Wang

- Developed algorithms to analyze biological time series and image data
- Created change point detection algorithms for financial time series
- Wrote software implementations of proposed algorithms in Python, MATLAB, and Modern Fortran
- Constructed mathematical and statistical models of fetal neurological and cardiovascular variability

Frasch Lab, Université de Montréal, Montréal, Canada
University of Washington, Seattle, United States
Statistical Researcher, Department of Obstetrics-Gynecology,
Faculty of Medicine, CHU Sainte-Justine Research Center
Department of Obstetrics & Gynecology, School of Medicine
Supervisor: Dr. Martin G. Frasch

05/2014 – Present

- Performed statistical analysis on collected experimental data
- Designed new change point detection algorithms for fetal ECG and EEG data
- Investigated fetal heart rate variability under adverse pathological conditions

York University, Toronto, Canada
Research Assistant, Computational Fluid Dynamics
Department of Mathematics and Statistics
Supervisor: Prof. Michael Haslam

05/2012 – 09/2012

- Implemented numerical solvers for nonlinear partial differential equations
- Investigated non-newtonian nature of blood flow in vessels
- Produced primary simulations for further analysis

Research Funding

- Mitacs Globalink Research Award - Inria - for research in France (2016), \$5000 CAD with 1600€, *Mathematical Modelling of Fetal Cardiovascular, Neurovascular, and Metabolic Response to Umbilical Cord Occlusions*
PI with Huaxiong Huang (PI) and Marc Thiriet (PI)

Honours and Awards

NSERC Postgraduate Doctoral Scholarship, 2017-2020
Natural Science and Engineering Research Council of Canada

- Monetary value of \$63,000 (\$21,000 per annum)

Ontario Graduate Scholarship - Declined, 2017
Government of Ontario and York University

- Monetary value of \$15,000

Irvine R. Pounder Award, 2015
York University, Toronto, Canada

- Highest grade point average in Department of Mathematics and Statistics

Abe Karrass / Donald Solitar Mathematics Award, 2015
York University, Toronto, Canada

- Most outstanding student with an interest in mathematics education
- Monetary value of \$2000

Publications

- [1] X. Ye, **N. Gold**, X. Wang, H. Huang (2017) “*Bayesian online changepoint detection and prediction of the US Dollar Index*”, submitted to International Journal of Forecasting.
 - [2] **N. Gold**, Q. Wang, M. Cao, H. Huang (2017) “*Liquidity and volatility commonality in the Canadian Stock Market*”, submitted to Mathematics-in-Industry Case Studies.
 - [3] **N. Gold**, M.G. Frasch, C. Herry, A.J.E. Seely, B.S. Richardson, X. Wang (2017) “*Real-time changepoint detection for noisy biological signals*”, under review in Frontiers in Computational Physiology.
 - [4] X. Ye, **N. Gold**, H. Huang (2016) “*A Study of RMB Exchange Rate Volatility Change Points Based on Bayesian Online Change Point Detection*”, Proceedings of the International Conference on Management Science and Engineering 2016.
 - [5] M.J. Panaggio, P.-W. Fok, G.S. Bhatt, S. Burhoe, M. Capps, C.J. Endholm, F. El Moustaid, T. Emerson, S.-L. Estock, **N. Gold**, R. Halabi, M. Houser, P.R. Kramer, H.-W. Lee, Q. Li, W. Li, D. Lu, Y. Qian, L.F. Rossi, D. Shutt, V.C. Yang, Y. Zhou (2016) “*Prediction and optimal scheduling of advertisements in linear television*”, Technical report for Clypd, Inc.
 - [6] **N. Gold**, Q. Wang, M.G. Frasch, H. Huang, M. Thiriet, S.X. Wang (2016) “*A mathematical model of fetal cardiovascular and metabolic responses to umbilical cord occlusions*”, Reproductive Sciences, **23** (1).
 - [7] Q. Wang, **N. Gold**, M.G. Frasch, H. Huang, M. Thiriet, S.X. Wang (2015) “*Mathematical Model of Cardiovascular and Metabolic Responses to Umbilical Cord Occlusions in Fetal Sheep*”, Bulletin of Mathematical Biology, **77** (12), 2264 - 2293.
 - [8] M.G. Frasch, L.D. Durosier, **N. Gold**, M. Cao, B. Matuszewski, L. Keenlside, Y. Louzoun, M. Ross, B. Richardson (2015) “*Adaptive shut-down of EEG activity predicts critical acidemia in near-term ovine fetus*”, Physiological Reports, **3** (e12435).
 - [9] **N. Gold**, X. Wang, C. Herry, M.G. Frasch (2015) “*Prediction of Fetal Cardiovascular Decompensation During Labour From Heart Rate Variability: Validation in Fetal Sheep Model of Human Labour*”, Reproductive Sciences, **22** (1).
 - [10] S. Drapeau, **N. Gold**, X. Yu (2017) “*Asymptotic investing strategies of central counter parties*”, in preparation.
 - [11] **N. Gold**, M.G. Frasch (2017) “*Non-invasive detection - recognition of acidemia from fetal heart rate during labour with Hidden Markov Models*”, in preparation.
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Presentations

- [1] “*Change-point detection for noisy non-stationary biological signals*”, Workshop on Waves in Neural Media, Focus Program on Multi-scale Modelling of Wave Structures in Tissues, Fields Institute, Toronto, September 8th, 2017.
- [2] “*Broker and Trader Analysis - The TMX Group*”, Fields-China Joint Industrial Problem Solving Workshop in Finance, Fields Institute, Toronto, May 12th, 2017.
- [3] “*Mathematical Modelling of Fetal Cardiovascular and Metabolic Response to Acidemia During Labour*”, Mathematical Modelling in Medicine/Biology Workshop, Yau Mathematical Sciences Center, Sanya, December 14th, 2016.

- [4] “*Mathematical Modelling of Fetal Cardiovascular and Metabolic Response to Acidemia During Labour*”, Inverse Problems and Image Analysis Seminar, Fields Institute, Toronto, November 11th, 2016.
 - [5] “*Mainstreet Research: Improving online polling results*”, Fields Industrial Problem Solving Workshop, Fields Institute, Toronto, August 19th, 2016.
 - [6] “*A mathematical model of fetal cardiovascular and metabolic responses to umbilical cord occlusions*”, Society for Reproductive Investigation 63rd Annual Scientific Meeting, Montréal, March 17th, 2016.
 - [7] “*Risky Business: Localized Factor Model for Credit Risk Analysis*”, Graduate Student Mathematical Modelling Camp, Rensselaer Polytechnical Institute, June 19th, 2015.
 - [8] “*TMX Group: Identification of Causal Factors Between Liquidity and Volatility*”, The 2015 Big Data Industrial Problem Solving Workshop, Fields Institute, Toronto, May 29th, 2015.
 - [9] “*Prediction of fetal cardiovascular decompensation during labour from heart rate variability*”, Society for Reproductive Investigation 62nd Annual Scientific Meeting, San Francisco, March 27th, 2015.
 - [10] “*Prediction of Fetal Cardiovascular Decompensation During Labour From Heart Rate Variability: Validation in Fetal Sheep Model of Human Labour*”, Canadian National Perinatal Research Meeting 2015, Montebello, February 24th, 2015.
 - [11] “*Estimating long-term risk using short-term data*”, Fields-Mprime Industrial Problem Solving Workshop, Fields Institute, Toronto, August 15th, 2014.
 - [12] “*Physiological fetal distress pattern due to umbilical cord occlusion: data driven modelling*”, Problem Solving Workshop on Neurovascular Coupling and Developing Brain, Fields Institute, Toronto, July 25th, 2014.
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