

Thomas Flynn

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RESEARCH INTERESTS Optimization, machine learning, change detection; applications of machine learning to computer system design and scientific imaging

CURRENT POSITION *Assistant Computational Scientist*, Brookhaven National Lab June 2020 - Present
Computational Science Initiative

EDUCATION *Ph.D.*, Graduate Center of CUNY Fall 2011 - Fall 2017
Computer Science
Advisor: Felisa Vázquez-Abad
Dissertation Title: "Gradient estimation for attractor networks"

B.A., Hunter College Fall 2006 - Fall 2010
Major 1: Computer Science
Major 2: Mathematics

RESEARCH EXPERIENCE *Postdoctoral Researcher*, Brookhaven National Lab January 2018 - Present
Computational Science Initiative
Supervisor: Shinjae Yoo
Research Topic: Scientific machine learning, online change point detection.

Graduate Research Assistant Fall 2015 - Fall 2017
Graduate Center of CUNY.
Advisor: Felisa Vázquez-Abad

- Gradient estimation for Markov chains and stochastic neural networks; change detection; optimization for attractor networks.

Undergraduate / Graduate Research Assistant Fall 2009 - Fall 2015
Hunter College / Graduate Center of CUNY
Advisor: Ioannis Stamos

- Change detection applied to pointwise classification of 3D point clouds.
- Developed software to aid in visualization and organization of 3D data.

PUBLICATIONS

UNDER REVIEW ◦ T. Flynn. Gradient descent using duality structures.

JOURNAL ARTICLES ◦ T. Flynn. A persistent adjoint method with dynamic time-scaling and an application to mass action kinetics. *Numerical Algorithms* (forthcoming).

- T. Flynn, F. Vázquez-Abad. A simultaneous perturbation weak derivative estimator for stochastic neural networks. *Computational Management Science*, vol. 16, no. 4, October 2019.
- T. Flynn. Forward sensitivity analysis for contracting stochastic systems. *Advances in Applied Probability*, vol. 50, no. 1, March 2018.
- T. Flynn. Time-scale separation in recurrent neural networks. *Neural Computation*, vol. 27, no. 6, June 2015.

CONFERENCE PROCEEDINGS

- T. Flynn, K. Yu, A. Malik, N. D’Imperio, and S. Yoo. Bounding the expected running time of nonconvex optimization with early stopping. *36th Conference on Uncertainty in Artificial Intelligence (UAI)*, 2020.
- T. Flynn, S. Yoo. Change detection with the kernel cumulative sum algorithm. *58th IEEE Conference on Decision and Control (CDC)*, Nice, Dec. 11-13, 2019.
- T. Flynn, O. Hadjiliadis, I. Stamos, and F. Vázquez-Abad. Data driven stochastic approximation for change detection. *Winter Simulation Conference (WSC)*, Las Vegas, Dec. 3-6, 2017.
- T. Flynn. Convergence of one-step adjoint methods. *22nd Symposium on Mathematical Theory of Networks and Systems (MTNS)*, Minneapolis, July 12-15, 2016.
- T. Flynn, O. Hadjiliadis, I. Stamos. Online Classification in 3D Urban Datasets Based on Hierarchical Detection. *International Conference on 3D Vision (3DV)*, Lyon, Oct. 19-22, 2015.
- I. Stamos, O. Hadjiliadis, H. Zhang and T. Flynn. Online algorithms for classification of urban objects in 3D point clouds. *The second 3DIMPVT (3D Imaging, Modeling, Procession, Visualization and Transmission) Conference*, Zürich, Oct. 13-15, 2012.

WORKSHOP ABSTRACTS

- T. Flynn. Rigorous Neural Network Training with the Duality Structure Gradient Descent Algorithm. *14th Annual New York Academy of Sciences Machine Learning Symposium*. New York, Mar. 13 2020.
- T. Flynn, J. H. Park, L. Li, S. Yoo, A. Hoisie. Memory Performance Modeling with Machine Learning. *Workshop on Modeling and Simulation of Systems and Applications (ModSim)*. Seattle, Aug. 14-16 2019.
- T. Flynn, S. Yoo. Change detection with the kernel cumulative sum algorithm. *7th International Workshop in Sequential Methodologies*, Binghamton, June 18-21, 2019.
- T. Flynn. Gradient descent using Finsler duality structures. *10th NIPS Workshop on Optimization for Machine Learning*, Long Beach, Dec. 8, 2017.
- T. Flynn. Measure valued differentiation for stochastic neural networks, *WSC Ph.D. Colloquium*, Las Vegas, Dec. 3, 2017

- SELECTED TALKS**
- Rigorous training methods for neural networks via Finsler duality structures. Brookhaven National Laboratory, September 21st, 2017.
 - Forward sensitivity analysis for contracting stochastic systems. Modeling and Optimization: Theory and Applications (MOPTA), Lehigh University, August 16th 2017.
 - Convergence of one-step adjoint methods. 22nd Symposium on Mathematical Theory of Networks and Systems (MTNS), University of Minnesota, July 15th 2016.

- SUPPLEMENTARY COURSES**
- Center for Brains, Minds, and Machines June 2014
- Participated in NSF-funded summer course on neuroscience, computation, and artificial intelligence, hosted at the Marine Biological Laboratory, Woods Hole MA.

- TEACHING EXPERIENCE**
- Adjunct Lecturer* Fall 2012 - Fall 2017
 City University of New York (Multiple colleges)
- Undergraduate teaching of introductory computer science and programming courses.
 - Taught courses on Python, C++, and x86 Assembly.
 - Duties include lecturing, designing syllabi, assignments, and examinations.

- Quantitative Reasoning Fellow* Fall 2015 - Spring 2016
 School of Professional Studies (SPS) of CUNY
- Tutored students in quantitative reasoning across a wide range of courses, including undergraduate and masters students, through in-person meetings, video chat, and email.

- Teaching Assistant* Spring 2011
 Hunter College
- Graded assignments for an upper-level undergraduate C++ class.

- COURSES TAUGHT**
- CS 14, Computers and Assembly Language Programming, Kingsborough Community College, Spring 2017, Fall 2017
 - CSCI 135, Software Analysis and Design I, Hunter College, Spring 2014, Fall 2014, Spring 2015
 - CSCI 127, Introduction to Computer Science, Hunter College, Spring 2014
 - CIS 211, Computer Information Systems, Lehman College, Fall 2013
 - CIS 166, Computer Programming for Information Processing I, Lehman College, Fall 2012, Spring 2013

- PROFESSIONAL AFFILIATIONS**
- INFORMS Optimization Society
 - Mathematical Optimization Society

**OTHER
EXPERIENCE**

Webmaster and programmer Fall 2007 - Fall 2009
Lamont-Doherty Earth observatory at Columbia University

- Developed a PHP-based system for the real time archival and visualization of meteorological data.

**ADDITIONAL
SKILLS**

- Proficient in C++, familiar with Java, Python, and Common Lisp/Scheme.
- Experienced with high performance computing, including CUDA and MPI.