

# David Rushing Dewhurst

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## Education

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### University of Vermont

Burlington, VT

*Ph.D. Complex Systems and Data Science (GPA 4.0/4.0)*

*May 2018 - May 2020 (expected)*

- Fully funded by the MITRE Corporation through DARPA award #W56KGU-17-C-0010 from May 2018 until September 2019; fully funded by MassMutual Center of Excellence in Complex Systems and Data Science from September 2019 until present.
- Co-founder of UVM - MITRE Computational Finance Laboratory

### University of Vermont

Burlington, VT

*M.S. Mathematics (GPA 4.0/4.0)*

*September 2016 - May 2018*

- M.S. thesis in functional analysis: “Some results on a class of functional optimization problems”
- Received J. Kenney award as the top mathematics graduate student
- Fully funded by graduate teaching fellowship, taught Calculus I

### Mathematical Sciences Research Institute / University of Montreal

Montreal, PQ, Canada

*Séminaire de Mathématiques Supérieures: Contemporary Dynamical Systems*

*July 2017*

- Full financial support from MSRI

### University of Vermont

Burlington, VT

*B.A. Economics, Mathematics, and Political Science (GPA 3.3/4.0)*

*September 2011 - May 2016*

- Member of Omicron Delta Epsilon (economics international honor society)

## Experience

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### UVM - MassMutual Center of Excellence in Complex Systems and Data Science

Burlington, VT

*Research fellow*

*September 2019 - present*

Design research initiatives in sociotechnical time series data mining, analysis, and modeling.

- Represent UVM in finance working group focusing on algorithmic trading of FX assets

### The MITRE Corporation

Burlington, VT

*Computer science graduate fellow*

*June 2017 - September 2019*

Design research in computational finance, create DARPA deliverables, and write scientific publications.

- Leverage nonparametric statistical procedures and design new signal processing algorithms to analyze petabytes of high-frequency financial data
- Lead-authored comprehensive studies of U.S. equities markets that ultimately received press coverage in the Wall Street Journal, studies were subsets of DARPA project deliverables that ultimately lead to creation of new program
- Facilitate DARPA strategy exercises as member of white-cell team, generate and summarize insights for DARPA program managers

### Tax Foundation

Washington, DC

*Taxes and growth fellow*

*June 2015 - August 2015*

Analyzed tax policy using computational macroeconomic models and advised senior decisionmakers

- Conducted cross-sectional econometric analysis of economic factors affecting foreign direct investments
- Authored actionable policy analyses and editorials featured on Tax Foundation website

### Cato Institute

Washington, DC

*Financial regulation researcher*

*September 2014 - December 2014*

Conducted research on the effects of financial regulation on systemic risk and crises

- Wrote white paper on the links between the Basel II accords and 2008 financial crisis

## Publications

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9. **Dewhurst, D.R.**, Li, Y., Bogdan, A. and Geng, J., 2019. Evolving ab initio trading strategies in heterogeneous environments. arXiv preprint arXiv:1912.09524.
8. Dodds, P.S., Minot, J.R., Arnold, M.V., Alshaabi, T., Adams, J.L., **Dewhurst, D.R.**, Reagan, A.J. and Danforth, C.M., 2019. Fame and Ultrafame: Measuring and comparing daily levels of being “talked about” for United States’ presidents, their rivals, God, countries, and K-pop. arXiv preprint arXiv:1910.00149. (Submitted for publication.)
7. **Dewhurst, D.R.**, Danforth, C.M. and Dodds, P.S., 2019. Noncooperative dynamics in election interference. arXiv preprint arXiv:1908.02793. (Submitted for publication.)
6. **Dewhurst, D.R.**, Alshaabi, T., Kiley, D., Arnold, M.V., Minot, J.R., Danforth, C.M. and Dodds, P.S., 2019. The shocklet transform: A decomposition method for the identification of local, mechanism-driven dynamics in sociotechnical time series. arXiv preprint arXiv:1906.11710. (Submitted for publication.)
5. **Dewhurst, D.R.**, Arnold, M.V. and Van Oort, C.M., 2019, July. Selection mechanisms affect volatility in evolving markets. In Proceedings of the Genetic and Evolutionary Computation Conference (pp. 90-98). ACM.
4. **Dewhurst, D.R.**, Van Oort, C.M., Ring IV, J.H., Gray, T.J., Danforth, C.M. and Tivnan, B.F., 2019. Scaling of inefficiencies in the US equity markets: Evidence from three market indices and more than 2900 securities. arXiv preprint arXiv:1902.04691. (Submitted for publication.)
3. Tivnan, B.F., **Dewhurst, D.R.**, Van Oort, C.M., Ring IV, J.H., Gray, T.J., Tivnan, B.F., Koehler, M.T., McMahon, M.T., Slater, D. and Veneman, J., 2019. Fragmentation and inefficiencies in US equity markets: Evidence from the Dow 30. arXiv preprint arXiv:1902.04690. (Accepted, *PLoS ONE*)
2. **Dewhurst, D.R.**, Danforth, C.M. and Dodds, P.S., 2018. Continuum rich-get-richer processes: Mean field analysis with an application to firm size. *Physical Review E*, 97(6), p.062317.
1. Dodds, P.S., **Dewhurst, D.R.**, Hazlehurst, F.F., Van Oort, C.M., Mitchell, L., Reagan, A.J., Williams, J.R. and Danforth, C.M., 2017. Simon’s fundamental rich-get-richer model entails a dominant first-mover advantage. *Physical Review E*, 95(5), p.052301.

## Contributed talks

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2. **Dewhurst, D.R.** (July, 2019). Selection mechanisms affect volatility in a market of evolving agents. Presented at the Genetic and Evolutionary Computation Conference (GECCO 2019), Prague, Czech Republic.
1. **Dewhurst, D.R.** (May, 2019). Fragmentation and inefficiencies in US equities markets: A network perspective. Presented at the 4th workshop on Statistical Physics for Financial and Economic Networks at NetSci 2019, Burlington, VT, USA.

## Technical skills

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I design complex research programs that leverage massive datasets subject to flexible project requirements in dynamic solution spaces.

- **Analytical:** ordinary and partial differential equations; real, complex, and functional analysis; continuous and global optimization; nonparametric and Bayesian statistics; probability theory and stochastic processes
- **Computational:** Object-oriented and functional programming; petabyte-scale data analysis using distributed computing techniques and resources (e.g., MapReduce, Spark, Dask); agent-based modeling (financial and other domains); Monte Carlo methods for simulation, search, and optimization; machine and deep learning methods, network analysis; linear and nonlinear time series analysis
- **Programming languages and software:** Python (expert), MATLAB/Octave (intermediate), C (working), R (working), \*T<sub>E</sub>X (T<sub>E</sub>Xnician), Bash (working), RHEL, Torque/PBS, Git