

# Will Thompson

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## EDUCATION

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### University of Vermont

*PhD Complex Systems and Data Science*

- GPA: 4.0/4.0

Burlington VT

2022-Present

### St. John's College

*Bachelor of Arts in Liberal Arts*

- GPA: 3.92/4.0

Santa Fe, NM

2020

## EXPERIENCE

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### University of Vermont

*Graduate Research Assistant*

August 2022 – Present

Burlington, VT

- Engaged in rigorous coursework and research in complex systems, statistical physics, chaos theory, and computational social science.
- Analyzed political polarization using the non-linear voter model, deriving master equations to explore system dynamics and phase transitions influenced by conformity bias and coupling strength.
- Utilized Bayesian statistical inference and expectation maximization to deduce social dynamics from data, integrating empirical data with theoretical models in opinion dynamics.
- Mapped accessibility to critical services in the US, establishing a theoretical link between optimal facility placement and societal resilience.

### Los Alamos National Labs

*Post-Baccalaureate Researcher*

January 2021 – Present

Los Alamos, NM

- Developed a new 200+ unit photon detection system using advanced photomultiplier tubes for a 10-ton scale particle physics experiment.
- Led the development and maintenance of software for detector control and data analysis, incorporating additional sensors and enhancing functionality.
- Enhanced the data acquisition system, doubling its capacity and improving the stability of experimental data capture.
- Performed detailed analysis of particle interactions and decay rates, contributing to experimental insights.
- Implemented automated systems for operational efficiency, including shift reminders and emergency alerts.

### MITRE Corporation

*Data Scientist*

August 2020 – December 2020

Santa Fe, NM

- Applied complex systems science to develop real-world solutions for government challenges.
- Co-developed an open-source tool for agent-based modeling, facilitating genetic programming techniques.
- Analyzed satellite network structures to assess and mitigate failure cascades, enhancing system robustness.
- Conducted network and semantic analysis of judicial documents to improve the accuracy and fairness of legal searches.

### St John's College

*Head Senior Lab Assistant*

May 2019 – May 2021

Santa Fe, NM

- Directed the setup and instructional design of a tabletop quantum optics lab, enhancing educational offerings.
- Led and trained a team of 4 lab assistants in experimental protocols across atomic physics and microbiology.
- Provided personalized tutoring in advanced mathematical theories, significantly improving student comprehension.
- Created and implemented new lab experiments, influencing the curriculum and enriching student learning.

### Carnegie Mellon University

*Undergraduate Research Fellow*

June 2018 – August 2018

Pittsburgh, PA

- Initiated and executed a research project on the structural analysis of philosophical texts using NLP and machine learning techniques.

- Developed statistical models for textual analysis through random walk algorithms, presenting novel insights into text structure.
- Authored two research papers on methodology and findings, serving as first author on one, currently under peer review.

## Santa Fe Institute

June 2017 – June 2018

*Undergraduate Researcher*

*Santa Fe, NM*

- Conducted independent research using NLP and machine learning to explore the narrative function of the chorus in Greek tragedies.
- Presented research findings to a diverse academic audience, highlighting innovative approaches and potential applications in humanities research.

## GRANTS AND AWARDS

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- **Second Place, University of Vermont Computing Student Research Day**, Burlington, VT, 2023. Presented research on developing learnable asynchronous models of opinion dynamics.
- **Third Place, University of Vermont Computing Science Research Day**, Burlington, VT, 2022. Awarded for research employing evolutionary algorithms to develop robust facility placements.
- **MITRE Best Paper Incentive Prize**, 2022. Paper "The Structure and Dynamics of US Common Law" recognized as best out of hundreds published that year.
- **Large Team Distinguished Performance Award, Los Alamos National Labs**, 2022. Recognized for construction and dark matter search leadership with Coherent Captain Mills Detector.
- **Science Undergraduate Laboratory Internship (SULI) Grant**, 2020. Highly selective DOE grant for post-baccalaureate research at LANL.
- **Dean's Award for College Service, St. John's College**, Santa Fe, NM, 2020. Recognized for exceptional leadership and dedication.
- **Robert Neidorf Memorial Scholarship**, St. John's College, 2018. Awarded for commitment to liberal arts ideals and college community.
- **Award for Relating Intense Education to Life (ARIEL) Grant**, St. John's College, 2017. Funded by Santa Fe Institute to relate education to complex systems.

## PUBLICATIONS

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### Preprints

- **W.H.W. Thompson**, Z. Wojcinski, S. DeDeo, "Levy Flights of the Collective Imagination." Available at arXiv:1812.04013 [cs.SI]. Available: <https://arxiv.org/abs/1812.04013>
- G. Salmon, **W.H.W. Thompson**, S. DeDeo, "Consilience and the cultural evolution of conceptual networks in London's Royal Society," in Proc. R. Soc. B (in review).

### Peer Reviewed Journals

- N.W. Landry, **W. Thompson**, L. Hébert-Dufresne, J.-G. Young, "Reconstructing networks from simple and complex contagions." Phys. Rev. E, vol. 110, no. 4, L042301, 2024. Available: <https://doi.org/10.1103/PhysRevE.110.L042301>
- A.A. Aguilar-Arevalo et al., "Testing meson portal dark sector solutions to the MiniBooNE anomaly at the Coherent CAPTAIN Mills experiment." Phys. Rev. D, vol. 109, no. 9, 095017, 2024. Available: <https://doi.org/10.1103/PhysRevD.109.095017>
- A.A. Aguilar-Arevalo et al., "Axion-Like Particles at Coherent CAPTAIN-Mills." Phys. Rev. D, vol. 107, no. 095036, 2023. Available: <https://journals.aps.org/prd/abstract/10.1103/PhysRevD.107.095036>
- A.A. Aguilar-Arevalo et al., "First Leptophobic Dark Matter Search from Coherent CAPTAIN-Mills." Phys. Rev. Lett., vol. 129, 2022. Available: <https://link.aps.org/doi/10.1103/PhysRevLett.129.021801>
- A.A. Aguilar-Arevalo et al., "First dark matter search results from Coherent CAPTAIN-Mills." Phys. Rev. D, vol. 106, 2022. Available: <https://link.aps.org/doi/10.1103/PhysRevD.106.012001>
- M. Koehler et al., "The structure and dynamics of US common law." Front. Phys., January 2022. Available: <https://doi.org/10.3389/fphy.2021.695219>

## Conference Proceedings

- **W. Thompson**, et al. “Evolving Robust Facility Placements,” in Proceedings of the Companion Conference on Genetic and Evolutionary Computation. New York, NY, USA: Association for Computing Machinery, Jul. 2023, pp. 775–778. doi: 10.1145/3583133.3590712.
- Alex Isherwood et al. Modeling Macaque Fighting Dynamics with the Evolutionary Model Discovery Framework to Understand Its Application and Utility, Proceedings of the 2022 Conference of The Computational Social Science Society

## TALKS

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- **W. Thompson** et. al, “ Inferring Interaction Kernels In Stochastic Opinion Dynamics Models” Presented at NetSci, Quebec City, Quebec, Jun. 2024.
- **W. Thompson**, “Understanding Polarization In the Higher Order Non-Linear Voter Model” Presented at Dynamics Days, Davis, CA, Jan. 2024.
- **W. Thompson**, “The Emergence of Polarization in the Non-Linear Voter Model on Higher Order Networks.” Presented at the Joint Mathematics Meeting, San Fransisco, CA, Jan. 2024.
- T. Gebhart, L. Huynh, V. Modisette, **W. Thompson**, M. Tian, A. Wiedemann, P. Chodrow, H. Z. Brooks. “Inferring Interaction Kernels for Stochastic Agent-Based Opinion Dynamics.” Presented at the Joint Mathematics Meeting, San Francisco, CA, Jan. 2024.
- **W. Thompson**. “The Emergence of Inequality with Two Models of Social Dynamics.” Oral presentation at Dartmouth College Applied Math Seminar Series, Hanover, NH, Oct. 2023.
- **W. Thompson**. “Understanding Polarization with the Non-Linear Voter Model on Higher Order Networks.” Oral presentation at Vermont-KIAS Workshop on Higher Order Interactions, Burlington, VT, Sept. 2023.
- **W. Thompson**. “Learnable Asynchronous Opinion Dynamics.” Oral presentation at Vermont Computer Science Research Day, Burlington, VT, Sept. 2023.
- **W. Thompson**. “Polarization with the Voter Model on Hypergraphs.” Oral presentation at Contagions in Complex Social Systems, Burlington, VT, Aug. 2023.
- L. Yotsukura, et al. “Her behavior was disgusting’: Emotion and Morality in Online Complaint Discourse.” Oral presentation at 18th Annual International Pragmatics Conference, Brussels, Belgium, Jul. 2023.
- **W. Thompson**, et al. “Evolving Robust Facility Placements.” Oral presentation at Genetic and Evolutionary Computation Conference, Lisbon, Portugal, Jul. 2023.
- **W. Thompson**. “Coherent Captain Mills Dark Matter Search.” Oral presentation at Magnificent CEvNS, Virtual Conference, Oct. 2021.
- **W. Thompson**. “Searching for Light Dark Matter with Coherent Captain Mills.” Oral presentation at University of New Mexico NUPAC Colloquia Series, Albuquerque, NM, May 2021.

## OUTREACH SERVICE

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- Peer Reviewer for submission to Physical Review E, November 2024
- “Introduction to Network Science” A 1-hour guest lecture delivered as an invited speaker for the graduate-level course: *Data Science 1* at UVM. November 18, 2024, Burlington, Vermont.
- “Percolation - The Mathematics of Making Coffe” A 1-hour guest lecture delivered as an invited speaker for the undergraduate research seminar at Vermont State University. October 29, 2024, Johnson, Vermont.
- “Stochastic Cellular Automata” A 1-hour guest lecture delivered as an invited speaker for the graduate-level course: *Modeling of Complex Systems* at UVM. October 2, 2024, Burlington, Vermont.
- “Universality and Percolation - The Coolest Idea in the History of Ideas” A 1-hour lecture delivered as an invited speaker for the undergraduate course: *Chaos, Fractals, and Dynamical Systems*. April 24, 2024, Burlington, Vermont.
- “Percolation - The Mathematics of Making Coffee” - A 20-minute talk delivered at the Vermont Science Olympiad. April 17, 2024, Burlington, Vermont.

- Peer Reviewer for submission to *NPJ Complexity*, March 2024.
- “Percolation - The Mathematics of Making Coffee” - A 1-hour talk delivered as an invited speaker at UVM’s *MATHCOUNTS Math Olympiad*. March 25, 2024, Burlington, Vermont.
- “Searching for Dark Matter in the Desert” - Article contributed to *The Minimum Wager*, a Santa Fe-based publication. April 2022.

## PROJECTS

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### Strategy Mining

August 2020 – December 2020

- Open-source genetic programming framework allows evolution of agent based models. Compatible with NetLogo and MASON
- Github: <https://github.com/mitre/strategy-mining>

## TECHNICAL SKILLS

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**Programming Languages:** Julia, Python, C++

**Frameworks and Libraries** PyTorch, ROOT

**Other:** UNIX systems, MySQL, MongoDB

## REFERENCES

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### Peter Dodds

Professor

University of Vermont

Vermont Complex Systems Center

pdodds@uvm.edu

### Richard Van De Water

Staff Scientist

Los Alamos National Labs

P-2 Pure and Applied Physics

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### Simon DeDeo

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### Matthew Koehler

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