

# Christopher Zosh

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## Education:

PhD in Economics, Binghamton University [Fall 2019 - Present]

- Complex Systems Summer School, Santa Fe Institute, Summer 2022
- Behavioral Macro and Complexity Summer Course - Cars Hommes, Tinbergen Institute, Summer 2021

BA in Math and Economics, University at Buffalo, Magna Cum Laude [Fall 2014 - Spring 2018]

## Research Interests:

Agent-based Computational Economics, Game Theory, Behavioral economics, Public Economics, and Complex Systems

## Research Papers:

**L** - Papers on learning, **G** - Papers on governance/coordination behavior, **A** - Papers using agent based models

### “Predicting behavior in beauty contest games with simulated learning” (L, A)

*This paper investigates the relative ability of case-based decision theory to forecast out of sample play in the beauty contest game compared to rational and boundedly rational decision theories (such as K-level reasoning), some other common learning models, and potential reduced form alternatives. The case-based predictions are generated from an agent-based model simulating play of the game where each computer agent is specifically calibrated to individual players in the game. Preliminary results suggest that case based decision theory is better able to predict choices made in the lab when social learning is incorporated into the model. Further, I provide some evidence that the in-sample best fitted parameters have more external validity than those fitted to the alternative models considered.*

Status: *In development.*

### “Learning to govern common-pool resources” (L, G, A)

with Todd Guifoos, Andreas Pape, and Peter DiCola.

*Inspired by the work of Elinore Ostrom, we aim to better understand the emergence of one of her fundamental design principles for sustainable governance: graduated sanctions. We explore a dynamic model of governance over a common pool resource (an investment game), in which a social planner learns to implement policy which maximizes social welfare, and players learn to make optimal investment decisions in the face of current policy. We intend to extend this work to see when different policy formation mechanisms affect (voting rules) perform better or worse at yielding solutions close to socially optimal ones.*

Status: *In development.*

### “Emergence of monitoring in games with multi-level selection” (G, A)

with Todd Guifoos, Andreas Pape, and Peter DiCola.

*Inspired by the work of Elinore Ostrom, we aim to better understand the emergence of one of her fundamental design principles for sustainable governance: monitoring. In this paper, we extend a simple*

*model of multi-level selection introduced by Traulsen and Nowak (PNAS 06) by allowing agents to experiment with different history contingent strategies. We aim to better understand under what conditions monitoring emerges and persists as a dominant feature of player strategies.*

Status: *In development.*

**“An agent-based model of the collective action dynamics of goal-driven groups” (G, A)**

with Jeremy Blackburn, Barrett Brenton, Robert Dinapoli, Carl Lipo, Pamela Mischen, Andreas Pape, William Rand, Hiroki Sayama, and Brooke Foucault Welles.

*In this paper we present an agent-based model of collective action dynamics in which individuals voluntarily associate with goal-driven groups to induce social change. This is part of a larger agenda to develop a class of models, informed by literature and specialists from a wide range of disciplines, which capture the salient dynamics of interest group formation, action, and the role that online and offline factors play in facilitating or inhibiting interest group agendas. Furthermore, we hope to partner with voluntary community organizations to develop a toolkit for organizations and policy makers alike for promoting social sustainability.*

Status: *In development*

**“Explaining Human classification learning using spiking neural networks” (L, A)**

with J. David Schaffer and Andreas Pape

*In this paper, we utilize a relatively new type of dynamic network in which neurons and synapses are modeled explicitly, called a spiking neural network, and evaluate its ability to solve classification learning problems. With this project we aim to better understand the merits and limitations of this new form of computation, better understand the observed difficulty in solving different categories of SHJ tasks, and hopefully to evolve a spiking neural network capable of high levels of categorization accuracy when faced with various permutations of prompts.*

Status: *In development.*

**“Bootstrapping parameter estimates in Agent-Based Models” (A)**

with Andreas Pape and more...

*In this paper, we provide a hands-on guide on how to bootstrap parameter estimates for various agent-based models, as was done in Guilfoos, Pape 2008. We hope to discuss in detail how different data features and the use of different meta-heuristics play a role in the application of this technique.*

Status: *In development.*

**“Case based reasoning in the RBC model” (L, A)**

with Hang Yuan and Andreas Pape

*In this paper, we incorporate a common learning algorithm (Case Based Reasoning) into an agent based implementation of the Real Business Cycle model, with a simple modification to agent reasoning to account for attribution of present circumstances in part to past actions. As is common with boundedly rational macro models, we compare how well the exhibited dynamics of the model match typical features of real world macro data, compared to the baseline RBC and other alternative models of boundedly rational agents. Finally, we discuss how this might be extended to other more sophisticated models of macro-dynamics.*

Status: *In development.*

## Teaching:

Binghamton University, Department of Economics, Research Assistant [Spring 2021 - Present]

Ithaca College, Department of Economics, Instructor of Record

- Econ 122 - Principles of Micro (2 sections, Fall 2022)

Binghamton University, Department of Economics, Teaching Assistant / Grader [Fall 2019 - Present]

- Econ 670 - Agent Based Policy Modelling (TA, Spring 2023)
- Econ 160 - Principles of Micro (TA, Fall 2019 - Spring 2020)
- Econ 613 - Macroeconomic Theory 1 (TA, Fall 2020 / Fall 2021)
- Econ 556 - Advanced Data Analysis (Grader, Spring 2021)
- Econ 483 - Economics of Immigration (Grader, Spring 2021)
- Econ 442 - Financial Economics (Grader, Summer 2022)

Binghamton University, Department of Economics, Tutor/Informal Instructor [Summer 2021 - Present]

- Econ 611 - Microeconomic Theory 1 (Game Theory), comprehensive exam review (Summer 2021)
- Econ 613 - Macroeconomic Theory 1, comprehensive exam review (Summer 2022)

## Other:

- Student coordinator (volunteer) for the Fourth Northeast Regional Conference on Complex Systems, Binghamton University (Spring 2021)