AGAM GOYAL

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Education		
	University of Illinois at Urbana-Champaign, Champaign, IL	**Aug 2024 − Present**

Doctor of Philosophy (Ph.D.) in Computer Science

Areas of Focus: Mechanistic Interpretability, Computational Social Science, LLM Agents

University of Wisconsin − Madison, Madison, WI   **Sep 2020 − May 2024**

Bachelor of Science with Comprehensive Honors

Majors: Computer Science (Honors), Mathematics, and Data Science
Honors Thesis: *Learning Latent Spatiotemporal Patterns to Predict Emergent Properties of Complex Dynamical Systems* advised by Dr. Hanbaek Lyu

Honors

OpenAI Researcher Access Program Grant − $1000+   **2025**
   OpenAI API credits for supporting research.

Cohere for AI Research Grant − $2000+   **2024**
   Cohere API credits for supporting research.

Trewartha Senior Honors Thesis Research Award − $1500   **2023**
   Grant awarded to ∼18 students for an honors thesis based on significance of research proposal.

Bromley Conference Travel Award − $500   **2023**
   Grant awarded to support international travel to conferences for oral presentation.

Hilldale Undergraduate Research Fellowship − $4000   **2023**
   Grant awarded to ∼100 undergraduates for soundness and significance of research proposal.

Summer Study Scholarship − $1000   **2021, 2022, 2023**
   Scholarship awarded for summer study based on academic excellence.

Honors Summer Sophomore Research Apprenticeship Grant − $3000   **2022**
   Grant awarded to ∼25 undergraduates for soundness and significance of summer research.

IIT-JEE Advanced Qualified   **2020**
   Achieved top 1%-ile in entrance examination to IITs– top engineering institutes in India.

KVPY Fellowship Examination Qualified   **2019**
   Young Researcher Fellowship, IISc Bangalore, India.

NTSE Scholar   **2018**
   Awarded to ∼1000 grade 10 students by the Government of India for higher studies.

Publications

∘ **For a full list, see https://scholar.google.com/citations?user=lpqh8B0AAAAJ**
∘ **Equal contribution is denoted by** *

[9] **(In Preparation) Agam Goyal*** and H. Lyu*. "Learning low-rank mesoscale spatiotemporal patterns in complex dynamical systems." In Preparation (2024)

[8] **(Under Review) Agam Goyal**, C. Lambert, and E. Chandrasekharan. "Uncovering the Internet's Hidden Values: An Empirical Study of Desirable Behavior Using Highly-Upvoted Content on Reddit." arXiv preprint arXiv:2410.13036 (2024).

[7] **(Under Review) Agam Goyal***, Z. Wu*, R.P. Yim, B. Chen, Z. Xu, H. Lyu. "A latent linear model for nonlinear coupled oscillators on graphs." arXiv preprint arXiv:2311.14910 (2023)

[6] X. Zhan*, **Agam Goyal***, Y. Chen, E. Chandrasekharan, and K. Saha. "SLM-Mod: Small Language Models Surpass LLMs at Content Moderation." In Proceedings of the North American Chapter of the Association for Computational Linguistics (NAACL). 2025.

[5] Y.S. Chuang, K. Nirunwiroj*, Z. Studdiford*, **Agam Goyal**, V.V. Frigo, S. Yang, D. Shah, J. Hu,

and T.T. Rogers. "Beyond Demographics: Aligning Role-playing LLM-based Agents Using Human Belief Networks." In Findings of the Association for Computational Linguistics: EMNLP 2024.

[4] Y.S. Chuang, N. Harlalka*, S. Suresh*, **Agam Goyal**, R. Hawkins, S. Yang, D. Shah, J. Hu, and T.T. Rogers. "The Wisdom of Partisan Crowds: Comparing Collective Intelligence in Humans and LLM-based Agents." In Proceedings of the Annual Meeting of the Cognitive Science Society, 2024.

[3] Y.S. Chuang, **Agam Goyal**, N. Harlalka, S. Suresh, R. Hawkins, S. Yang, D. Shah, J. Hu, and T.T. Rogers. "Simulating Opinion Dynamics with Networks of LLM-based Agents". In Findings of the North American Chapter of the Association for Computational Linguistics (NAACL). 2024.

[2] D. Misra*, M. Chaudhary*, **Agam Goyal***, B. Runwal*, and P.Y. Chen. "Uncovering the Hidden Cost of Model Compression." In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 1611-1621. 2024.

[1] **Agam Goyal** and H. Lyu. "Tensor Decomposition to Capture Spatiotemporal Patterns of Coupled Oscillator and Opinion Dynamics". In Proceedings of the 12th International Conference on Complex Networks and their Applications. 2023.

Recent Work Experience	**Amazon: Amazon Web Services**	May 2024 - Aug 2024

Software Development Research Intern – Santa Clara, CA
- Designed an agentic RAG-based framework for context-aware source code summarization.
- Worked on semantic extraction and similarity detection in .NET Core application binary files.

Amazon: Alexa   May 2023 - Sep 2023
Software Development Engineer Intern – Austin, TX
- Developed a sample application in React Native and AVS SDK for Alexa voice features testing.
- Incorporated into CI/CD pipeline to speed up internal QA testing of new features by $\sim 15\%$.

NSF REU at UW-Madison   Jun 2022 - Aug 2022
Machine Learning Researcher – Madison, WI
- Developed a latent linear framework based on supervised matrix factorization for interpretable prediction of synchronization of coupled oscillator dynamics on underlying networks.
- Paper: *"A latent linear model for nonlinear coupled oscillators on graphs." arXiv:2311.14910*

Invited Talks   *"Supervised Nonnegative CP Decomposition of Tensors with Provable Convergence Guarantees"*
- **Oral Presentation. Undergraduate Symposium (Apr 2024)**

"Reprogramming under constraints: Revisiting efficient and reliable transferability of lottery tickets"
- **Extended Talk. Google Brain Sparsity Reading Group (Oct 2023)**
- **Lightning Talk. ML Collective Open Research Jam (Oct 2023)**

"LLM Group Dynamics: A New Approach to Social Simulations"
- **Lightning Talk. 2023 Wisconsin Institute for Discovery Symposium (Nov 2023)**

Presentations and Posters

Latent Linear Model for Nonlinear Dynamics Data [Poster Presentation].
5th annual Research Bazaar, UW–Madison's Data Science Hub, 2024

Nonnegative Tensor Decomposition to Capture Spatiotemporal Patterns of Complex Dynamics on Underlying Networks [Oral Presentation].
International Conference on Complex Networks and their Applications, 2023 (CNA '23)

How Do They Synchronize? Interpretable Feature Learning For Coupled Oscillators [Poster Presentation].
Madison Experimental Mathematics (MXM) Labs Open House, 2022.

Reviewing Experience	The Web Conference (WWW) 2025, CHI 2025	**2025**
	LLM Agents Workshop and DMLR Workshop @ ICLR'24 (Exceptional Reviewer)	**2024**

Teaching Experience	**COMP SCI 320: Data Science Programming - II** *Undergraduate Teaching Assistant, UW-Madison*	**Spring 2023** Instructor: Dr. Meena Syamkumar
	LIS 461: Data Ethics and Policy *Course Grader, UW-Madison*	**Spring 2022** Instructor: Dr. B. Ian Hutchins
	COMP SCI/ECE/ME 539: Artificial Neural Networks *Undergraduate Teaching Assistant, UW-Madison*	**Fall 2021, Spring 2022** Instructor: Dr. Yu-Hen Hu
	Center for Academic Excellence (CAE) *Academic Tutor: Calculus and Microeconomics, UW-Madison*	**Fall 2021**

Relevant Coursework

COMPUTER SCIENCE:
Graduate Courses: Computational Social Science, Advanced Social and Information Networks
Signal Processing and Deep Learning: Signal Processing, Artificial Neural, Computer Vision
Theoretical Machine Learning: Linear and Nonlinear Optimization, Learning Theory
Systems: Big Data Systems, Databases, Operating Systems

MATHEMATICS AND STATISTICS:
Analysis, Abstract Algebra, Probability Theory, Random Processes, Networks Science, Data Modeling

Select Course Projects

COMP SCI 639: Computer Vision   Fall 2022
GitHub Link: https://github.com/AGoyal0512/VR-Toolkit
- Developed a Virtual Reality Toolkit (VR-Toolkit) software stack that would help people with low vision to identify objects, see images and read better by providing them the ability to enhance their overall viewing experience.
- The users can do this by changing the size of text by magnification, contrasting colors in images, and by generating captions for these images. Further, in order to mitigate dealing with issues related to reading these captions, we also implement a text-to-speech framework.
- **Tools:** Image Processing, Optical Character Recognition, `OpenCV`, `tesseract`

COMP SCI 524: Optimization   Spring 2022
GitHub Link: https://github.com/AGoyal0512/Madison-Metro-Optimization
- Used the Minimum-Cost network flow problem and linear optimization to model Madison Metro bus transit services and optimize it to reduce travel times and improve flow for passengers, while also reducing costs for the authorities.
- Our results indicate that not every existing route is the optimal one based on the current passenger trends and distances between stops. Rather, there exists a subset of these that would be a better option for Madison Metro to consider including in their new bus transit plan.
- **Tools:** Linear Programming, Network Flow, Julia `Clp` Optimizer

Community Involvement	**Cohere for AI**	August 2022-Present
	ML Collective	Jan 2022-Present

Extra Curricular	**Google Developer Student Club, UW-Madison** *Vice President*	 June 2021 - May 2023
	AI Club, UW-Madison *Reading Group Lead and Organizer*	 January 2021 - May 2021
	TechKriti Open School Championship, IIT-Kanpur, India *Overall Winner*	 December 2020
	Technothlon International School Championship, IIT-Guwahati, India *Event Winner*	 October 2020