Ryn Gray

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Research Profile

Researcher bridging art and science through data visualization and mathematical modeling. My research develops computational and visual approaches for understanding complex graph-structured systems, with interests spanning graph visualization, computational knitting, ontology, and machine learning.

Education

University of Colorado at Boulder August 2015 – May 2019
B.S. in Computer Science and Applied Mathematics

University of Arizona August 2019 – May 2024
Ph.D. in Computer Science

Publications

- **Ryn Gray**, Jarod Kaltenbaugh, Jaimie Murdock, Cale Crowder, Elliot Fowler. "Ontology Metrics for Generated Ontologies." *The 3rd Symposium on AI Trustworthiness and Risk Assessment for Challenged Contexts (ARTACC) 2026*
- **Ryn Gray**, Ryan Roche, Portia Cooper, Ena Nayak, Brendan Donahoe, Jaimie Murdock, Douglas C. Crowder. "Ellmo at LLMs4OL 2026 Tasks Flagship, Reuse, and Taxonomy." *3rd LLMs4OL Workshop at ISWC 2026.*
- Ryan Roche, **Ryn Gray**, Jaimie Murdock, Douglas C. Crowder. "Ellmo at LLMs4OL 2025 Tasks A and D: LLM-based Term, Type, and Relationship Extraction." *2nd LLMs4OL Workshop at ISWC 2025.*
- **Kathryn Gray**, Mingwei Li, Reyan Ahmed, Md. Khaledur Rahman, Ariful Azad, Stephen Kobourov, Katy Börner. "A Scalable Method for Readable Tree Layouts." *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, 2023.
- **Kathryn Gray**, Mingwei Li, Reyan Ahmed, Md. Khaledur Rahman, Ariful Azad, Stephen Kobourov, Katy Börner. "A Map-based Interactive System for Visualizing Large Networks with Semantic Zooming." *Workshop on Map-based Interfaces and Interactions (MAPII).*
- **Kathryn Gray**, Mingwei Li, Reyan Ahmed, Stephen Kobourov. "Drawing Evolving Trees." *Graph Drawing*, September 2022.
- **Kathryn Gray**, Daniel Ries, Joshua Zollweg. "Low-shot, Semi-supervised, Uncertainty Quantification Enabled Model for High Consequence HSI Data." *2022 IEEE Aerospace Conference (AERO)*, March 2022.
- Mason Sun Yin, **Kathryn Gray**, Scott Perry, Stephen Kobourov. "Drawing Graphs on the Sphere." *Proceedings of the International Conference on Advanced Visual Interfaces*, Article 17, pages 1–9, September 2020.
- **Kathryn Gray**, Daniel Smolyak, Sarkhan Badairli, George Mohler. "Coupled IGMM-GANs for Deep Multimodal Anomaly Detection in Human Mobility Data." *ACM Transactions on Spatial Algorithms and Systems*, Volume 6, Issue 4, August 2020.

Research in Progress

- **A Graph Model and a Layout Algorithm for Knitting Patterns** — Ryn Gray, Brian Bell, Stephen Kobourov.
- **Wooly Graphs: A Mathematical Framework for Knitting** — Ryn Gray, Brian Bell, Diana Sieper, Stephen Kobourov, Falk Schreiber, Karsten Klein, Seokhee Hong.
- **Edge Metrics for Generated Ontologies** — Ryn Gray, Jarod Kaltenbaugh, Jaimie Murdock.

Research Experience

Sandia National Laboratories — Postdoctoral Researcher 2024 – Present

- Ran research for LLMs4OL Challenge 2025 and 2026, including creating LLM-based generation methods and hybrid LLM/NLP methods
- Methods for understanding ontologies, metrics including by-edge-type metrics, visualizations based on finding missing data and understanding edges
- Supporting projects across domain areas with visualization and data analysis

Sandia National Laboratories — Intern June 2021 – 2024

- Created visualizations for ontology data to provide simple ways to discover issues within complex systems.
- Created machine learning models for target detection using low-shot learning and semi-supervised learning techniques.
- Combined Siamese Networks with virtual adversarial training and expert averaging adversarial training to improve robustness to unlabeled data and small amounts of target data.

University of Arizona — Graduate Research Assistant August 2019 – May 2024

- Developed multi-level map-like graph visualizations that are crossing-free, contain no label overlap, and are compact.
- Extended graph visualization methods to dynamic tree visualization while maintaining crossing-free, overlap-free, compactness, and stability.
- Worked on projects including ant locomotion modeling, CatSat imaging, and spherical graph visualization.
- Mentored and supported undergraduate student research.

Teaching Experience

University of Arizona — Teaching Assistant / Guest Instructor August 2019 – May 2024

- Guest instructed classes in Data Structures and Data Visualization.
- Held office hours and graded coursework.

University of Colorado — Learning/Course Assistant August 2016 – May 2017

- Supported students in Calculus 1, Calculus 2, Data Structures, Matrix Methods, and the Art of Computational Thinking.
- Created solutions, held office hours, and graded homework.

LinDave Institute — Instructor June 2014, July 2015

- Developed curriculum and taught beginning circuitry and programming to students ages eight to thirty.
- Helped establish a program that continued to reach underprivileged students in California for several years.

Additional Experience

Arizona Swing Cats — President 2023–2024, Vice President 2021–2022 August 2021 – Present

- Served as creative director for the Tucson Swing Festival, a three-day event featuring live music, national-level instructors, competitions, and collaborations with dance groups throughout Tucson.
- Coordinated volunteers, scholarships, and instructors.
- Organized weekly and monthly dance events, managed finances, applied for funding, and instructed lessons.

University of Colorado — Research Assistant August 2018 – May 2019

- Analyzed methods for avoiding flash crashes in the electric grid given algorithms for Nest thermostats and small timestep price changes.
- Created a mathematical model and used numerical methods to simulate the electric grid with smart home thermostats.

University of Colorado — Discovery Learning Apprentice August 2018 – May 2019

- Analyzed statistical significance and correlations related to relocation risk following natural disasters.
- Worked with graduate researchers to analyze post data after earthquakes.

Indiana University Purdue University at Indianapolis — Research Experience for Undergraduates June 2018 – September 2018

- Used bidirectional generative adversarial networks to detect anomalies in human mobility data.
- Improved previous methods using IGMM to account for multimodal data.
- Presented work at the REU Symposium for Data Science at the IEEE Conference on Big Data.
- Full paper published in ACM Transactions on Spatial Algorithms and Systems.

Engineers Without Borders, Rwanda — Secretary, PR Director November 2016 – May 2019

- Worked with villages in Rwanda to build water catchment systems.
- Conducted survey data analysis and supported communications within the team.
- Maintained and created social media presence as PR Director.

Knit On, Scratch On — Founder August 2013 – August 2014

- Designed and fabricated knitted items that interacted with Scratch, including a piano scarf, piano glove, memory game, and knitted button designs.
- Presented a poster at the Scratch Conference in 2014.

Presentations

- **Talk**. "Metrics for Generated Ontologies" *AAAI Symposium, ATRACC*, November 2026.
- **Talk**. "ELLMO at LLMs4OL 2026" *LLMs4OL Workshop at ISWC, 2026*, October 2026.
- **Talk**. "Metrics for Improving Generated Ontologies." *CWRU & Tohoku Symposium*, August 2026.
- **Poster**. "Generating Ontologies from Text Data." *Annual New Mexico Postdoc Research Symposium*, March 2026
- **Talk**. "ELLMO at LLMs4OL 2025" *LLMs4OL Workshop at ISWC, 2025*, October 2025.
- **Talk and Session Head**. "Wooly Graphs: A Mathematical Framework for Knitting." *The First International Symposium of Nonbinary Scientists*, Mathematics Session, November 2025.
- **Talk**. "A Scalable Method for Readable Tree Layouts." *IEEE Visualization (VIS)*, 2023.
- **Talk**. "A Map-based Interactive System for Visualizing Large Networks with Semantic Zooming." *Workshop on Map-based Interfaces and Interactions (MAPII).*
- **Talk**. "Low-shot, Semi-supervised, Uncertainty Quantification Enabled Model for High Consequence HSI Data." *IEEE Aerospace Conference (AERO)*, March 2022.
- **Poster**. "Coupled IGMM-GANs for Deep Multimodal Anomaly Detection in Human Mobility Data." *IEEE Conference on Big Data*, 2019.

Technical Skills

- **Programming:** Python, JavaScript, SQL, MATLAB, HTML, LaTeX, C/C++

- **Data Science & Machine Learning:** NumPy, scikit-learn, PyTorch, TensorFlow, Keras, DGL; semi-supervised learning, low-shot learning, generative adversarial networks, anomaly detection, uncertainty quantification
- **Graph & Network Computing:** NetworkX, graph algorithms, graph drawing, graph layout, ontology modeling, network analysis, graph modeling, dynamic graphs, knowledge graphs
- **Visualization & HCI:** D3, Gephi, yEd, Unity; data visualization, information visualization, interactive visualization, visual analytics
- **Mathematical & Computational Methods:** mathematical modeling, numerical methods, graph theory, computational geometry, topological modeling
- **Development & Research Tools:** Git, Conda, Docker, VirtualBox, SPARQL/SHACL, Vim, Inkscape, GIMP

Awards and Scholarships

- ARCS (Achievement Rewards for College Scientists) Scholar, 2021–2022.
- CU Esteemed Scholars Sewell Scholarship, 2015–2019.
- Zayo NCWIT Scholarship, 2015–2019.
- Mathematical Contest in Modeling (MCM): Meritorious, 2019; Honorable Mention, 2018; Successful Participant, 2017.
- Most Creative Hack, T9 Hacks, 2017.
- NCWIT Aspirations in Computer Science Runner Up, 2015.