

Angeline Aguinardo

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Research Summary

AI Planning and Knowledge Representation for Autonomous Agents. My research develops formal category-theoretic frameworks for symbolic task planning, plan transfer, and agentic reasoning. This work enables agents to adapt knowledge across domains and execute complex behaviors without re-planning from scratch. I currently lead agentic AI research exploring multi-agent collaborative reasoning for automated task planning.

Education

Ph.D., Computer Science, University of Maryland, College Park (2025)

Dissertation Title: *Sequential, Hierarchical, and Analogical Plan Transfer in Robotics*

Dissertation Advisor: William Regli

Master of Science, Electrical Engineering, Drexel University (2017)

Bachelor of Science, Biomedical Engineering, Drexel University (2017)

Research Experience

Senior Research Staff Member, Human-AI Teaming Group, Johns Hopkins Applied Physics Laboratory Aug 2017 – Present

- Lead applied research in AI planning, category theory, and knowledge representation
- Principal Investigator for agentic AI project exploring multi-agent collaboration and task-planning frameworks using CrewAI
- Lead formal modeling of system interactions, safety constraints, and architecture guarantees for NASA Advanced Air Mobility (AAM) solutions
- Led \$2.1M disinformation analytics project; managed ~13 staff
- Supervise 8 staff members in Human-AI Teaming group
- Over 8 years of experience designing, building, and deploying robust AI prototype systems integrating planning, reasoning, and data processing pipelines

Doctoral Researcher, University of Maryland Sept 2018 – May 2025

- Developed a novel category-theoretic framework for knowledge-based AI planning
- Designed and implemented RoboCat: category-theoretic compiler framework for robotic programming (IEEE T-ASE 2019)
- Open-source contributor to the AlgebraicJulia ecosystem for category-theoretic modeling and planning
- Collaborations with Siemens, NIST, CMU, and Topos Institute

Research Associate, Topos Institute May 2022 – Oct 2023

- Investigated category-theoretic representations of symbolic planning domains using C-Set and double-pushout rewriting
- Authored technical blog post “*Using categorical logic for AI planning*”, introducing categorical semantics for robot task plans
- Lead collaborative research resulting in “*A Categorical Representation Language for Knowledge-Based Planning*” (AAAI URRAD Best Paper 2023)

Selected Publications

- **Aguinaldo, A.**, Patterson, E., Regli, W. (2024). Automating Transfer of Robot Task Plans using Functorial Data Migrations. *IEEE Transactions on Automation Science and Engineering*. (Under Review)
- **Aguinaldo, A.**, Patterson, E., Fairbanks, J., Regli, W., Ruiz, J. (2023). A Categorical Representation Language for Knowledge-Based Planning. *AAAI Fall Symposium URRAD* (Best Paper).
- **Aguinaldo, A.**, Regli, W. (2022). Modeling Traceability using Symmetric Delta Lenses. *ICRA Compositional Robotics Workshop*.
- **Aguinaldo, A.**, Regli, W. (2021). Graphical Model-Based Representation for Classical AI Plans using Category Theory. *ICAPS XAI Planning Workshop*.
- **Aguinaldo, A.**, et al. (2019). RoboCat: A Category Theoretic Framework for Robotic Interoperability. *IEEE Transactions on Automation Science and Engineering*.

Selected Talks and Presentations

- Analogical Plan Transfer in Robotics, *AMS JMM Applied Category Theory*, 2025
- ‘What’s the plan?’, asked my robot, *JuliaCon*, 2024
- A Category Theoretic Approach to Planning in a Complex World, *Microsoft Future Leaders in Robotics and AI Seminar Series*, 2023
- Contextual affordances in context-aware autonomous systems, *NIST Compositional Structures for Systems Engineering and Design Workshop*, 2022
- Category Theory for Automated Planning and Program Compilation in Robotics, *Topos Institute Berkeley Seminar*, 2021
- Encoding Compositionality in Classical Planning Solutions, *International Joint Conference for Artificial Intelligence (IJCAI): Workshop on Generalization in Planning*, 2021

Technical Skills

Topics: AI Planning, Category Theory, Knowledge Representation, Robotics

Programming: Python, Julia, MATLAB, Haskell, C++, Java

Technologies: Azure, Docker, MongoDB, Redis, PostgreSQL, Tensorflow, PyTorch, OpenCV, GDAL, FastAPI, CrewAI