Angeline Aguinaldo

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Summary

Senior Research Scientist specializing in AI planning, knowledge representation, and multi-agent reasoning for autonomous systems. Ph.D. in Computer Science (University of Maryland, 2025) with 8+ years leading applied AI research at Johns Hopkins APL. Expertise in category theory, ontologies, and formal reasoning frameworks for autonomous decision-making through large-scale, interdisciplinary collaborations.

- Principal investigator for agentic AI systems enabling multi-agent collaboration in task planning and automated report generation for mission scenarios
- Led a $2.1M analytics program delivering advanced disinformation detection and analysis capabilities over 2+ years; managed a 13-person cross-functional research team
- Developed a planning framework for cross-domain plan transfer in robotics, using category-theoretic methods and ontologies; demonstrated in simulated kitchen environments [link]
- Formalized safety and architecture guarantees for autonomous systems in NASA Advanced Air Mobility (AAM) initiatives; NASA Technical Paper in progress
- Recognized with Best Paper at AAAI URRAD 2023 [link] and IEEE T-ASE publication [2022, 2025] for foundational AI planning methods

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, Johns Hopkins Applied Physics Lab Aug 2017 – Present

- Directed the design of formal models for system interactions, safety constraints, and architecture guarantees for AAM systems using category theory and ontologies
- Led technical research in computer vision and context-aware autonomy [link], advanced disinformation detection, and bioinformatics evaluation [link]
- Supervised 8 research staff in the Human-AI Collaboration group, fostering growth in technical expertise and project leadership

Doctoral Researcher, University of Maryland Sept 2018 – May 2025

- Created a conceptual and mathematical framework enabling cross-domain plan transfer in robotics for knowledge-rich environments [slides]
- Demonstrated end-to-end plan transfer from Blocksworld to simulated kitchen robots, maintaining decision integrity across domains
- Collaborated with industry and research partners (Siemens, NIST, CMU, Topos Institute) to align methods with real-world robotics and AI needs
- Produced open-source contributions to the *AlgebraicJulia* ecosystem and published in IEEE T-ASE; presented at AAAI, ICRA, ICAPS, IJCAI, JuliaCon, AMS, and NIST [web]

Research Associate, Topos Institute May 2022 – Oct 2023

- Authored technical blog posts *"Using categorical logic for AI planning"* [link] and *"Analogies in Planning using Functorial Data Migrations"* [link], introducing categorical semantics and transfer for robot task plans
- Lead collaborative research resulting in *"A Categorical Representation Language for Knowledge-Based Planning"* [paper]
- Engaged with an international research community at the intersection of mathematics, AI, and engineering

Selected Publications

- **Aguinaldo, A.**, Patterson, E., Regli, W. (2025). Automating Transfer of Robot Task Plans using Functorial Data Migrations. *IEEE Transactions on Automation Science and Engineering*. [paper]
- **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 [link]). [paper]
- **Aguinaldo, A.**, et al. (2019). RoboCat: A Category Theoretic Framework for Robotic Interoperability. *IEEE Transactions on Automation Science and Engineering*. [paper]

Selected Talks and Presentations

- Analogical Plan Transfer in Robotics, *AMS JMM Applied Category Theory*, 2025 [slides]
- A Category Theoretic Approach to Planning in a Complex World, *Microsoft Future Leaders in Robotics and AI Seminar Series*, 2023 [video]
- Contextual affordances in context-aware autonomous systems, *NIST Compositional Structures for Systems Engineering and Design Workshop*, 2022 [slides]

Technical Skills

Topics: AI Planning, Category Theory, Knowledge Representation, Robotics
Programming: Python, Julia, MATLAB, Haskell, Java
Technologies: Azure, Docker, MongoDB, Redis, PostgreSQL, Tensorflow, PyTorch, OpenCV, GDAL, FastAPI, CrewAI, Pydantic AI, ControlFlow

Professional Service & Community Leadership

Organizer, *Applied Category Theory* and *ICRA Compositional Robotics* workshops (2022–2026)
Reviewer, *International Conference on Automated Planning and Scheduling (ICAPS)* (2025)
Co-author, *"Relational Thinking: From Abstractions to Applications"* (2024) digital book [link]