

# 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 developing scalable algorithms and formal methods, such as **category theory**, for decision-making, planning, and execution in knowledge-rich environments. Proven track record of **transferring research into operational prototypes** through interdisciplinary collaborations.

- Principal investigator for agentic AI systems enabling **multi-agent systems** for 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 theory 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 Fall Symposium 2023 [[link](#)] and IEEE T-ASE publications [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 formal model design for system interactions, safety constraints, and architecture guarantees in human-AI air mobility 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, e.g. 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 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. Automating Transfer of Robot Task Plans using Functorial Data Migrations. IEEE Transactions on Automation Science and Engineering (2025) [[paper](#)]
- **Aguinaldo, A.**, Patterson, E., Fairbanks, J., Regli, W., Ruiz, J. A Categorical Representation Language for Knowledge-Based Planning. AAAI Fall Symposium URRAD (Best Paper [[link](#)]) (2023) [[paper](#)]
- **Aguinaldo, A.**, et al. RoboCat: A Category Theoretic Framework for Robotic Interoperability. IEEE Transactions on Automation Science and Engineering (2019) [[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](#)]
- Category theory for automated planning and program compilation in robotics. Topos Berkeley Seminar (2022) [[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 Special Session AMS JMM (2026)
- Co-author, “Relational Thinking: From Abstractions to Applications” (2024) digital [[book](#)]
- Local Organizer, Applied Category Theory (ACT) conference (2023)
- Co-organizer, ICRA Compositional Robotics: Mathematics and Tools (2023)
- Reviewer, International Conference on Automated Planning and Scheduling (ICAPS)