

# Angeline Aguinaldo

angeline.m.aguinaldo@gmail.com | angelineaguinaldo.com | Github: aaguinal

## Summary

**Senior Research Scientist** bridging formal methods and machine learning. Expert in AI planning, category theory, and multi-agent systems, with experience designing LLM-based agentic AI architectures and deploying ML-based decision-making systems for real-world applications.

- **Principal Investigator** for a \$1M+ research project developing **LLM-based agentic AI systems** for **human–AI collaboration** in task planning and automated report generation; leading the design of a multi-agent orchestration framework using CrewAI and Pydantic AI, integrating symbolic planning with large language models
- Technically led the development of **computer vision pipelines** and **scalable ML infrastructure** to deliver daily AI-enabled disaster response products to FEMA during Hurricanes Florence (2018) and Dorian (2019), generating 1 m resolution flood maps and critical infrastructure detections across 2,000 km<sup>2</sup> of multispectral imagery [\[link\]](#)
- Developed a **planning method** for **cross-planning-domain transfer** in autonomous agents using category theory; demonstrated transfer from Blocksworld to a simulated Kitchen domain with medium-complexity ontology [\[link\]](#)
- Recognized with **Best Paper Award** at AAAI Fall Symposium 2023 [\[link\]](#) and published IEEE Transactions on Automation Science and Engineering [\[2022, 2025\]](#)

## 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

- Led a \$2.1M analytics program delivering weekly misinformation detection products for 2+ years by managing a 13-person cross-functional team and building high-throughput text clustering and similarity search pipelines (500–1,000 docs/sec)
- Directed migration and modernization of a federal public health data platform (supporting 3–5M weekly queries and 100M+ annual visits), re-hosting a full-stack Java application and services into Azure cloud-native solutions with <1k launch errors by leading a joint team of 9 engineers and collaborators
- Built the open-source META [\[repo\]](#) [\[paper\]](#) system to optimize metagenomic workflows, benchmarking 12 leading classifiers and exposing >100× runtime differences and 700× memory variation through scalable simulation and interactive analysis
- Managed and collaborated on formal model development for NASA’s Advanced Air Mobility initiative, coordinating design of safety constraints and architecture guarantees using category theory and ontologies; NASA Technical Paper in progress
- Managed and mentored 8 research staff in the Human-AI Collaboration group, fostering technical expertise and cultivating future project leaders

## Doctoral Researcher, University of Maryland

Sept 2018 – May 2025

- Collaborated with industry and research partners (Siemens, NIST, CMU, Topos Institute) to align formal 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], “Analogies in Planning using Functorial Data Migrations” [link]) introducing categorical semantics for robot task plans
- Led collaborative research with Topos Institute, University of Florida, and University of Maryland, resulting in an AAAI paper: “A Categorical Representation Language for Knowledge-Based Planning” [paper]

## 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]

## 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, Agentic AI

**Programming:** Python, Julia, MATLAB, JavaScript, Haskell, Java

**Technologies:** Azure, Docker, Kubernetes, MongoDB, PostgreSQL, Redis, RabbitMQ, TensorFlow, PyTorch, OpenCV, GDAL, FastAPI

## 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)