AJ Barea

(727) 262-7305 | ajbareaa@gmail.com | github.com/ajbarea | youtube.com/@ajbarea

Research Interests

Software engineering for federated learning systems, agentic AI with tool use, testing methodologies for distributed machine learning, developer experience in ML research infrastructure, and AI-assisted software development.

Education

Master of Science in Software Engineering | December 2025 | Rochester Institute of Technology, Rochester, NY

- **GPA**: 4.0/4.0
- **Capstone Research**: Enhancing Federated Learning Execution Framework (Advisor: **Dr. Leon Reznik**)
- Focus: Testing infrastructure, full-stack developer interface, CI/CD pipelines, cross-platform compatibility, and collaborative algorithm prototyping
- Relevant Coursework: Software Architecture, Software Quality Assurance, Engineering Cloud Software Systems, Self-Adaptive Systems with Reinforcement Learning, Model-Driven Development, Collaborative Software Development

Bachelor of Science in Computer Engineering | May 2022 | University of South Florida, Tampa, FL

- GPA: 3.06/4.0

Research Experience

Graduate Research Assistant | Rochester Institute of Technology | May 2025 - Present

Federated Learning Framework Enhancement - **Dr. Leon Reznik**'s Research Group

- Designed comprehensive pytest testing suite achieving 80%+ code coverage for distributed FL systems (**IntelliFL** framework)
- Built React + FastAPI web interface improving researcher onboarding time and experimental reproducibility
- Collaborated with PhD students to rapidly prototype novel aggregation strategies including Byzantine-robust methods (Krum, Bulyan, RFA, Trimmed Mean) and trust-based federated learning approaches
- Implemented dynamic dataset poisoning system enabling adversarial robustness evaluation during federated training
- Integrated transformer-based models for federated learning on text datasets spanning medical, legal, and financial domains
- Extended framework compatibility across Python 3.9-3.11 and multiple operating systems (Windows, macOS, Linux)
- Established CI pipeline and comprehensive error handling, transforming research prototype into production-ready system

Independent ML Research Projects | 2024 – 2025

- Autonomous Robot Navigation RL - Developed Q-learning and DQN framework in Webots simulator with state discretization, replay buffers, and PyTorch-based hyperparameter optimization (documented via YouTube tutorials)
- Federated Learning Security: Built evaluation system combining CLIPS rule-based expert systems, PyTorch neural networks, and federated learning techniques to assess Byzantine fault tolerance in distributed ML systems
- Natural Language Processing: Implemented news summarization system using Hugging Face Transformers (BART) with personalized recommendations via collaborative filtering (scikit-surprise)

Teaching Experience

Teaching Assistant, Software Architecture | Rochester Institute of Technology | Aug 2025 – Dec 2025

- Mentor students in software design patterns, architectural styles, quality attributes and tactics
- Lead recitation sections and office hours providing technical guidance on architecture decisions
- Taught full class session during instructor absence, receiving positive student feedback
- Grade assignments with detailed feedback emphasizing rigorous software engineering practices

Publications & Presentations

Under Review

- Korobeinikov, D., Chuprov, S., Zatsarenko, R., Barea, A.J., & Reznik, L. (2025). *Federated Learning Accuracy and Convergence in Consumer-Centric Medical Imaging*. Submitted to IEEE Consumer Communications & Networking Conference (CCNC 2026).
- Korobeinikov, D., Zatsarenko, R., Chuprov, S., Barea, A.J., & Reznik, L. (2025). *IntelliFL Framework: Optimizing Federated Learning with Metacognition for Application Design and Deployment*. Under review.
- [Authors blinded]. *IntelliFL Framework: Design and Benchmark Tool for Dependable Federated Learning*. Under review.

Presentations

- TraceFL: Debugging Federated Learning Systems - Software Quality Assurance, Rochester Institute of Technology, Fall 2025
- Control of Mobile Robots, AI Dev Tool Showdown, and ML project demos - YouTube tutorial series, 2024

Skills

- **ML/AI Frameworks**: PyTorch, Hugging Face Transformers, scikit-learn, FLOWER, Webots, reinforcement learning
- **Software Engineering**: pytest, Git, GitHub Actions, Docker, CI/CD pipelines, Terraform
- **Languages/Frameworks**: Python, React, FastAPI, Java, C++, C, SQL, JavaScript
- **Cloud & DevOps**: AWS (Lambda, EC2, S3, Rekognition, Comprehend, Translate, DynamoDB, API Gateway, CloudFront)
- **Tools**: Git, Perforce, Jira, Confluence, Bitbucket, VS Code, PuTTY, SSH
- **Systems**: Linux, Windows, macOS

Professional Experience

Software Engineer (Contract) | Lowe's Home Improvement | Remote, US | Feb 2023 – Aug 2024

Application Development Support - Distribution Management Systems

- Reduced production system errors by 150,000 daily log entries through systematic debugging and root cause analysis
- Developed full-stack internal automation tooling to streamline database queries and improve team productivity
- Authored standard operating procedures reducing new engineer onboarding time by 80%
- Delivered rigorously tested, secure code updates with comprehensive documentation
- Conducted root cause analysis for Tier 3 support, documenting solutions and collaborating with supervisors

UX Developer (Internship) | Phiquest | Tampa, FL | Mar 2022 – May 2022

- Designed wireframes for web applications, collaborating with cross-functional teams to ensure feasible, user-friendly solutions
- Engineered blockchain-based document authenticator Chrome extension using Node.js, enabling secure verification

Outreach & Service

- **Science Communication**: YouTube channel (@ajbarea) providing educational content on AI development tools, pair programming with AI assistants, and reinforcement learning tutorials - making complex ML/AI concepts accessible to students and developers worldwide
- **Open Source Contributions**: Active GitHub presence (github.com/ajbarea) with documented research projects and educational repositories