Brian Goodluck Mmari

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EDUCATION

Princeton University (Princeton, NJ)

B.S.E: Electrical and Computer Engineering May 2025

RESEARCH & WORK EXPERIENCE

CoFactor AI, Inc, (Chicago, Illinois) Aug 2025 - Present

AI/ML Engineering Intern

- Developing ML architecture for a Computer-Assisted Coder (CAC) — predicting ICD-10-CM codes from EMR texts — and deploying it into a production microservice pipeline, boosting accuracy and cutting provider workload by 30%.
- Building data pipelines to preprocess healthcare records from MIMIC-IV and deploying Reasoning + Acting (ReAct) models into different existing architectures for optimal performance.
- Researching and documenting advanced NLP and vision techniques (e.g., DocumentAI) for internal knowledge sharing.

Veterans EZ Info, Inc. (EZ Labs), (San Diego, California) June - Aug 2025

AI Research & Innovation Associate

- Automated daily ingestion of ~10 federal opportunities using web scraping and n8n, reducing manual effort by 90%.
- Built an AWS Lambda trigger function that enables real-time email alerts via n8n, saving capture managers hours of manual search by instantly notifying them of new relevant opportunities.
- Developed a Python client for the Microsoft 365 Copilot Retrieval API with integration to SharePoint workflows, streamlining capture research and improving opportunity evaluation efficiency by 70%.

Princeton University, Self-Organizing Swarms & Robotics Group, (Princeton, NJ) Jan 2023 - May 2025

Undergraduate Researcher, *"BlueGuppy"*

PI: Prof. Radhika Nagpal, Dr. Hungtang Ko

- Designed 3 iterations of fish-like flapping robots in Fusion360: improved buoyancy by 20% and performance by 15%.
- Integrated a magnetic coil propulsion system with improved waterproofing and streamlined actuation.
- Programmed turning algorithms in C++ to enable remote control and asymmetric flapping behaviors.
- Conducted underwater experiments and analyzed turning dynamics to evaluate maneuverability.
- Co-authored abstracts for SICB 2024 (Seattle) and DFD 2024 (Salt Lake City) conferences, and a peer-reviewed publication in Bioinspiration & Biomimetics (2025).

Purdue University, RISE Lab, (West Lafayette, Indiana) May – July 2024

Summer Undergraduate Research Fellow, *"Active Aerodynamic Tail Enhances Agile Locomotion of Legged Robots"*

PI: Prof. Upinder Kaur, Dr. Jiajun An

- Engineered an active aerodynamic tail for Mini Pupper 2 and built a corresponding URDF, then simulated it in NVIDIA Isaac Sim (Omniverse) to evaluate stability before hardware testing.
- Trained physics-informed regression and LSTM models to characterize tail-induced stabilization and disturbance rejection.
- Produced agility metrics for the Mini Pupper 2, useful for understanding how quadruped robots can behave in unpredictable environments.

Polygone Systems, Inc, (Princeton, New Jersey) Jan – May 2024

R & D Engineering Fellow, *"Exploring portable applications for the Plastic Hunter"*

Research supervisor: Nathaniel Banks & Yidian Liu

- Designed an electrical system using Raspberry Pi for an Unmanned Surface Vehicle (USV).
- Wired and C++ coded a Buffer Pad system for integration into a water filtration system.
- Contributed in securing $1,973,817 from the Marine Debris Challenge to develop infrastructure for removing microplastic debris from the Hudson River Watershed.

Clear Blue Sea Organization, San Diego, California **(**Remote) June – Sep 2023

Electrical Engineer Intern, *"MicroFred"*

Research supervisor: Tim Perry

- Researched ROS-compatible GPS, IMU, and network hardware for semi-autonomous vehicle integration.
- Created wiring schematics on CircuitLab & performed circuit simulation and analysis on SPICE.
- Facilitated wireless communication between the underwater vehicle MicroFRED and its controller, enhancing semi-autonomous vehicle control.

PRESENTATIONS AND PUBLICATIONS

- Ko, H., Saro-Cortes, V., **Mmari, B**., Ni, D., Wissa, A., & Nagpal, R. (2025). BlueGuppy: Tunable kinematics enables maneuverability in a minimalist fish-like robot. Bioinspiration & Biomimetics, 20(2), 026001. https://doi.org/10.1088/1748-3190/adf2e9.
- Ko, H., Saro-Cortes, V., Sedky, G., **Mmari, B.**, Ni, D., Wissa, A., Nagpal, R., BlueGuppy: a miniature free-swimming robot for studying hydrodynamic interaction among schooling fish, American Physical Society's Division of Fluid Dynamics Annual Meeting (DFD), Salt Lake City, UT, Nov 24-26, 2024.

- **Mmari B.G**, Kaur, U., An J., Active Aerodynamic Tail Enhances Agile Locomotion of Legged Robots in Challenging Natural Environments, Summer Undergraduate Research Symposium, West Lafayette, Indiana, July 25, 2024.
- Ko, H., **Mmari, B.G.**, Ni, D., Nagpal, R., Designing a miniature fish robot – an aquatic analog for hexbugs. Society for Integrative and Comparative Biology National Meeting (SICB), Seattle, WA, Jan 2-6, 2024.

PROJECTS

Swarm Navigation Optimization System May 2025

Numerical and Monte Carlo Methods in Engineering and Scientific Computing, *Course project*

- Designed a potential field planner for static environments with a large number of agents and obstacles.
- Applied Simulated Annealing to improve path quality by 30% and avoid local minima in dense environments.

Semantic Usenet Explorer April 2025

Introduction to Machine Translation, *Course project*

- Embedded archived Usenet posts using dense vectors with Hugging Face's MiniLM transformer.
- Built a semantic search system with UMAP dimensionality reduction for faster retrieval.
- Integrated a Retrieval-Augmented Generation (RAG) pipeline with the GPT-4o model via AzureOpenAI for dynamic responses.

Autonomous Cars Simulator Dec 2024

Introduction to Machine Translation, *Course project*

- Implemented and optimized path planning algorithms (RRT, A*, Dijkstra, BFS, DFS) in a Pygame-based car simulation using Python.
- Implemented a sky view mode, enhancing visualization for improved analysis and debugging.
- Benchmarked algorithmic performance across multiple algorithmic simulations, evaluating pathfinding accuracy.

Predicting forest fires along trail routes in the Table Mountains Feb – May 2024

Research Projects in Data Science, *Course project*

- Aggregated dataset from AllTrails, NOAA, and NASA FIRMS using geospatial clustering algorithms.
- Selected minimal false negatives as metric; chose Histogram-Based Gradient Boosting Classifier over Logistic Regression and Random Forests.

Autonomous Truck Driving & Obstacles Avoidance Feb – May 2024

Intelligent Robotic Systems, *Course project*

- Developed iLQR policy and receding horizon planner with onboard perception, secured 3rd place in lap time.
- Implemented safety filter to monitor and prevent unsafe driver actions.

Car Lab Sep - Dec 2023

Robotic and Autonomous Systems Lab(ECE302), *Course project*

- Implemented PI control system for ramp navigation; designed power, video, motor boards, and Programmable System-on-Chip(PSOC).
- Developed wireless flex-sensor gloves for vehicle control; integrated hall-effect sensor for speed measurement.

TEACHING & MENTORSHIP

Princeton McGraw Center *(Princeton, NJ)* Sep – Dec 2022; Jan – May 2025

McGraw Center Tutor

- Offered individualized and group study tutoring in introductory mathematics courses i.e Linear Algebra and Multivariable Calculus.

Princeton School of Engineering & Applied Science *(Princeton, NJ)* August 2024 - May 2025

Bachelor of Science and Engineering Student Interactor

- Provided perspectives to current first-year students on managing course loads, balancing academics and extracurriculars, and finding academic support.
- Supported students by encouraging attendance at information sessions, organizing study breaks, and advising on course enrollment strategies.

Rose Castle Foundation *(Cumbria, England)* October 2023

Princeton Rose Castle Society member

- Participated in a 7-day training program with other invitees of different faiths to learn the skills of ‘disagreeing well’, where I learnt resilience and reconciliation across divides.
- Organized coffee chats and open spaces at Princeton, mentoring students in these skills and facilitating discussions on sensitive topics.

Matriculate (*Remote)* June 2022 - June 2023

Princeton Matriculate Advising Fellow

- Mentored two high-achieving , low-income students through college and financial aid applications.
- Enabled one secure admission and the CARE program at Florida State University and the other gaining admission to Stony Brook University.

Freshman Scholars Program*(Princeton, NJ)* July - Aug 2022

Foundations of Engineering Course Fellow

- Mentored 15 incoming freshmen during laboratory sessions and office hours, assisting with problem sets and engineering projects.
- Troubleshooted drone flight behaviors, refined 3D-printed components, and conducted MATLAB-based computational analysis to optimize flight paths and payload capacity, enabling successful aerial rescue missions.

HONORS & AWARDS

- **Charlotte Mangum Student Support Program, Departmental Excellence in Engineering Funding, Undergraduate Fund for Academic Conferences**: Awarded in total $1200 to present my research.
- **Princeton Pathways to Graduate School Program:** Selected from a competitive pool into the 2024 cohort.
- **National Society of Black Engineers Conference Invitation:** Granted free travel and accommodation by the Computer Science and Mechanical and Aerospace Engineering Departments to attend the NSBE conference in Kansas City, MO 2023.