

## EDUCATION AND ADVANCED COURSEWORK

### Dublin High School, Dublin, CA (Aug 2022–Jun 2026)

SAT: 1570/1600 | GPA: 4.55 (Cumulative); 3.88 (Unweighted)

- **Completed 10 AP Courses:** Calculus AB (5), Calculus BC (5), Chemistry (5), Computer Science A (5), Computer Science Principles (5), English Language & Composition (4), Physics C: Mechanics (4), Statistics (5), US History (5), World History (4)
- **Senior Year APs (in progress, 2026):** English Literature & Composition, Environmental Science, Government & Politics, Macroeconomics, Microeconomics

### Harvard Summer School (Online) (Jun–Aug 2025)

Deep Reinforcement Learning (**A**), Instructor: Dmitry Kurochkin; Discrete Mathematics (**A-**), Instructor: Rebecca Neeson

- **Deep Reinforcement Learning:** Explored Markov Decision Processes, Bellman equations, dynamic programming; Implemented SARSA, Q-learning, DQN, REINFORCE, A2C algorithms in Python; Built FNNs, CNNs, RNNs/LSTMs with PyTorch for function approximation in high-dimensional spaces
- **Discrete Mathematics:** Led 4 study groups; solved 50+ proof problems using induction, contradiction, contrapositive, and bijection; covered logic, set theory, combinatorics, graph theory, modular arithmetic, RSA cryptography, recurrence relations, asymptotics, and probability theory

### UC San Diego Extended Studies (Online) (Oct–Dec 2024 / Oct–Dec 2025)

Linear Algebra (**A-**), Bosko Celic; Ordinary Differential Equations (**A-**), Bosko Celic

- **Linear Algebra:** Studied Gaussian elimination, matrix theory, determinants, eigenvectors/eigenvalues, diagonalization, vector spaces, orthogonalization, least squares; Completed 12+ MATLAB/Python projects implementing QR decomposition, SVD, PCA; Applied concepts to PageRank, Markov chains, neural network optimization, gradient descent in high dimensions
- **Ordinary Differential Equations:** Studied 1st/2nd-order ODEs (separable, linear, exact), series solutions, power/Frobenius series, Laplace IVPs, and matrix systems with equilibria/stability; implemented Euler and Runge-Kutta solvers in Python; applied to spring-mass systems, RC/RLC circuits, population dynamics, heat conduction, and SIR models.

### UC Berkeley Extended Studies (Online) (Jun–Jul 2024)

Multivariable Calculus (**A+**), Faizan Riazati

- Multivariable Calculus: Studied functions of several variables, vector-valued functions, partial derivatives, multiple integrals (Cartesian, polar, cylindrical, spherical), Jacobians; Applied Lagrange multipliers for constrained optimization; Mastered vector calculus (gradient, divergence, curl, line/surface integrals, Green's, Stokes', Divergence theorems)

## RESEARCH AND ROBOTICS

### Independent Researcher (May 2025–Oct 2025)

"Evaluating Leadership Assignment Strategies in Multi-Agent AI Systems" with Dr. Samar Sabie, Cornell University

Developed Python web interface simulating 8-room escape scenarios to test fixed vs. dynamic leadership in 3-agent AI teams (Ollama Mistral 7B); built role negotiation system for agent leadership transition; published paper to Oxford Journal of Student Scholarship

**Abstract:** This research investigates fixed versus dynamic leadership assignment in multi-agent AI systems through an escape room simulation where three AI agents navigated an 8-room environment with locked corridors, NPCs, and collaborative puzzles. Using Ollama's Mistral 7B model, a functional role negotiation system enabled agents to transition between leader, follower, and undecided states. Results show fixed hierarchy achieved superior average performance (2.66 vs 2.32 points, ~14.7% advantage) through reduced coordination overhead and predictable task allocation, while dynamic negotiation demonstrated adaptive capabilities with agents identifying contextually appropriate leaders and exhibiting enhanced exploration strategies. The research contributes a working implementation of AI-driven coordination with robust fallback systems and indicates coordination strategy should be task-dependent: fixed hierarchies optimize efficiency in stable environments while dynamic negotiation provides adaptability in scenarios requiring innovation and flexible responses, advancing understanding of multi-agent coordination trade-offs with practical implications for autonomous systems and distributed computing.

### Navigation & Autopilot Engineer, AquaSentinels, California Coast (Jan 2025–Present)

Autonomous Underwater Vehicle for Kelp Forest Restoration

#### SDG 14 Aqua Sentinels

- Engineered autonomous BlueRobotics AUV integrating Raspberry Pi 5, Coral Edge TPU, Navigator autopilot (6-axis IMU, magnetometers, barometer), T200 thrusters, sonar altimeter, and camera to survey kelp forests and detect invasive purple sea urchins; awarded UN SDG14 "Life Under Water" and DEDA Entrepreneurship Awards. Geotagged 2000+ sea urchins in 10k+ square feet.
- Computer Vision:** Implemented YOLOv8n on Coral Edge TPU for real-time sea urchin detection in low-visibility conditions; trained custom model on underwater images using transfer learning; Optimized for TensorFlow Lite inference on edge device
- Autonomous Navigation:** Developed SLAM-based navigation using slam\_toolbox for 2D occupancy grid mapping; built autonomous pipeline with GUI-driven path planner executing Nav2 waypoint navigation, PID controllers for position and heading, obstacle avoidance, emergency safety procedures
- Geotagging System:** Created system projecting detection coordinates into SLAM map frame with timestamp/position/confidence logging; Developed Python scripts generating heatmaps of urchin distribution for marine conservation teams

## EDUCATIONAL TECHNOLOGY

### Founder & Developer, MathicForge (Aug 2024–Present)

Interactive Mathematical Learning Platform

<https://github.com/s-jeelani/mathicforge>

- Created platform with 16+ interactive React/TypeScript animations teaching advanced math: geometry (Triangle Inequality, Shoelace Theorem, Power of a Point, Euclidean Algorithm, Inclusion-Exclusion), number theory/combinatorics (Pigeonhole Principle, Chicken McNugget Theorem, Fermat's Little Theorem, Hockey Stick Identity, Generating Functions), probability (Birthday Paradox), analysis (AM-GM Inequality)
- Built reusable component framework (Next.js, Framer Motion, Tailwind CSS), reducing animation development time by 60%

### Solo Developer & Designer, Polar Precision (Apr–May 2024)

Interactive Polar Calculus Educational Unity Game

[Play on itch.io: [salif500.itch.io/polar-precision](https://salif500.itch.io/polar-precision)]

- Developed Unity game teaching polar calculus: limaçons, rose curves, cardioids, lemniscates, spirals; players apply coordinate systems, arc length, and area integration to solve puzzles
- Designed all pixel art assets in Aseprite (characters, environments, UI, math overlays); Composed original soundtrack and sound effects
- Implemented real-time polar equation visualization with dynamic curves and instant feedback; Built challenge progression introducing calculus concepts: polar plotting → arc length → area → optimization

### Full-Stack Developer, Youth Coding Workshops, Dublin, CA (Jun 2022–Sep 2023)

Space Odyssey Competitive Programming Event Platform

- Architected full-stack web app for competitive programming event with real-time scoring, live leaderboards, secure test case evaluation (Flask REST API, Docker sandboxes)
- Integrated AWS S3 for storage and AWS Lambda for serverless execution; Designed responsive Bootstrap front-end with live WebSocket for instant leaderboard updates
- Implemented OAuth authentication, role-based access control; created event management system with challenge configuration, registration, real-time tracking, automated result compilation
- Developed Discord bot automating breakout room assignments by skill and programming language; Integrated YouTube API for embedded tutorials

## AWARDS, SKILLS & INTELLECTUAL ENGAGEMENT

### Awards

- **USACO Gold Division**—Top 8% of 9,000+ high school competitors nationwide; Advanced to Gold tier for exceptional algorithmic problem-solving in graph algorithms, dynamic programming, advanced data structures
- **AIME Qualifier**—Qualified by scoring in top 5% on AMC 10/12 among 300,000+; invitation-only competition for top problem solvers
- **UN SDG14 "Life Under Water" Award**—International award for AquaSentinels AUV ocean conservation technology
- **DEDA Entrepreneurship Award**—Winner for AquaSentinels scalable, impactful business model
- **AP Scholar with Distinction**—Average score of 4+ on all AP Exams and scores of 4+ on 8+ exams; earned through 13 completed APs
- **National Merit Semi-Finalist**—Top 1% of 1.5M PSAT test-takers; Selection Index 221 (PSAT 1510/1520)

**Programming Languages:** Python, Java, C/C++, C#, JavaScript/TypeScript, HTML/CSS, MATLAB, SQL

**Tech Stack:** React/Next.js, Flask, PyTorch, TensorFlow Lite, OpenCV, AWS (S3, Lambda), Docker, ROS2, Unity, Git

**Specialized Skills:** Computer Vision (YOLOv8, SLAM), Reinforcement Learning, Multi-Agent AI, Autonomous Navigation

**Certifications:** Codecademy Python 3 Programming (Sep 2022), Codecademy Java Programming (Jan 2023); self-study: Fast.ai Deep Learning, MIT OCW (6.034 AI, 18.06 Linear Algebra), 3Blue1Brown

**Books:** *How AI Ate the World* (Roth); *AI: A Modern Approach* (Russell/Norvig); *Deep Learning* (Goodfellow et al.); *RL: An Introduction* (Sutton/Barto); *CLRS Algorithms*; *Concrete Mathematics* (Knuth et al.); *Modern Robotics* (Lynch/Park); regular reading of arXiv papers (ML, multi-agent systems)

**Interests:** Open-source ML contributions; competitive programming (Codeforces, LeetCode); music composition (15+ songs); pixel art (Aseprite); wrestling (varsity, 300+ hrs)