Hassan Shahid

ACADEMIC AND ENGINEERING CURRICULUM VITAE

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RESEARCH PROFILE

Independent high school researcher interested in applying mathematical physics and advanced geometry to engineering systems. Technical work includes idealized robot-control models, topology-conditioned stochastic dynamics, and conceptual synthesis in electromagnetic confinement.

EDUCATION

Gainesville High School | Gainesville, Florida • Class of 2028

Completed advanced coursework: AP Calculus AB, AP Calculus BC, AICE Physics AS

Coursework in progress: AICE Physics A-Level, AP Chemistry, AP Computer Science A, AP Microeconomics, AP Macroeconomics

INDEPENDENT RESEARCH MANUSCRIPTS

Geometric Control, Actuator Feasibility, and Algebraic Equilibria in a Four-Wheel X-Drive Robot | 2026

- Developed an analytical study of a symmetric four-wheel X-drive, including the wheel-speed map, feasible chassis velocities under motor limits, and a Riemannian metric induced by wheel effort.
- Formulated a logarithmic pose-error feedback law on SE(2) and examined local convergence under ideal assumptions; studied polynomial equilibrium models and numerical integrations.
- Identified calibration, sensing, wheel slip, and physical testing as unresolved requirements before assessing performance on VEX V5 hardware.

Persistent Homology and Stochastic Dynamics: Stability in Financial Modeling | 2026

- Investigated an analytical framework in which persistent-homology summaries of cross-asset correlation structure serve as lagged inputs to stochastic price models.
- Developed mathematical stability estimates for changes in persistence features and stochastic model paths, including a four-asset analytical example.
- Distinguished mathematical sensitivity results from untested forecasting hypotheses; outlined empirical validation and negative-control methods.

Topology in Electromagnetic Confinement: Literature Review and Conceptual Synthesis | 2026

- Completed an independent literature review and conceptual synthesis concerning topology and electromagnetic confinement.

TECHNICAL PROJECT EXPERIENCE

Radio Kit Assembly and Functional Test | Summer 2026

- Assembled a radio kit from supplied parts using a soldering station and verified working transmission and reception.

ENGINEERING INITIATIVE

Exodus Industries | Founder and CTO • 2026–present

- Leading the early concept-stage direction of an aerospace engineering initiative with interests in modular avionics, electronics, and systems integration.

TECHNICAL BACKGROUND

Mathematical methods: Calculus, differential equations, kinematics, geometric control, Lie-group methods, persistent homology, stochastic dynamics

Physics subjects studied: Electromagnetism, classical mechanics, thermodynamics, plasma physics, quantum physics

Electronics and robotics: Soldering, radio hardware assembly and testing, familiarity with VEX V5 hardware, control-system modeling

Research methods: Literature synthesis, hand calculations, analytical derivations, technical manuscript preparation

RESEARCH INTERESTS

Geometric control of autonomous systems; electromagnetism and confinement; topological data analysis; resilient avionics architectures; mathematical modeling of uncertain systems.