Varun Budati

Blacksburg, VA | varunsb@vt.edu | +1 (571) 830-0505 | varunbudati.com
linkedin.com/in/varun-budati | github.com/varunbudati

RESEARCH INTERESTS

Stochastic control and reinforcement learning for sequential decision problems in financial markets. Market microstructure, optimal execution, and how order-level frictions propagate into aggregate risk. Applied probability and statistics, and evaluation protocols that make empirical claims in deep reinforcement learning verifiable.

EDUCATION

Virginia Tech, Blacksburg, Virginia — Aug 2023 – May 2027
B.S. in Computer Science, expected May 2027. Minors in Mathematics and in Finance. — GPA: 3.67 / 4.0

RESEARCH EXPERIENCE

Undergraduate Research Assistant, Dataism Lab for Quantitative Finance — Oct 2024 – Present
Virginia Tech. Advisor: Dr. Ali Habibnia

- Study how microstructure-level frictions in order execution propagate into systemic risk, using optimal execution as the proving ground for stochastic control and reinforcement learning.
- Formulate optimal liquidation as a Markov decision process in the Almgren and Chriss mean-variance tradition, and train Double Deep Q-Learning (DDQL) agents to balance market-impact cost against timing risk over a high-dimensional limit order book state.
- Built the evaluation protocol used across the lab's execution work: repeated independent training runs per configuration, matched controls that isolate capacity from architecture, and paired statistical tests that separate real effects from run-to-run noise.
- Wrote the verification suite auditing the pipeline end to end: numerical execution validity against its written specification, cross-campaign and cross-device reproducibility, and decomposition of which specification defect drives which measured result.
- Implemented the resumable, multiprocess campaign runner used for large training campaigns, and the Almgren and Chriss closed-form schedule and TWAP as reference baselines.

Summer Research Intern, MAOP, Virginia Tech — May 2025 – Jul 2025

- Designed an 8-category qualitative coding framework (LIWC-22 and LLM-based classifiers) and applied it to a 24,500-word corpus of introductory computer science instructional text from MIT, Berkeley, and Caltech to identify pedagogical patterns.
- Co-authored the resulting findings into a peer-reviewed paper at SIGCSE TS 2026.

Research Mentor and Assistant, REACH Lab, Virginia Tech — Mar 2024 – Jun 2025

- Synthesized 80+ articles to support a $500,000 NSF grant proposal on rural computer science education, building the lab's literature database and search protocols.
- Mentored 6 undergraduate research assistants in systematic literature review methodology.

PUBLICATIONS AND WORKING PAPERS

Peer-reviewed publication. Udenze, N. C., Budati, V., and Ogbonnaya-Ogburu, I. F. (2026). "Bridging the Code Gap: Understanding Pedagogical Patterns in CS1 Programming Courses." *Proceedings of the 57th ACM Technical Symposium on Computer Science Education (SIGCSE TS 2026)*, Vol. 2, pp. 1561–1562. doi:10.1145/3770761.3777179.

CONFERENCE PRESENTATIONS

Poster, SIGCSE Technical Symposium 2026, St. Louis, Missouri. "Bridging the Code Gap: Understanding Pedagogical Patterns in CS1 Programming Courses."

RELEVANT COURSEWORK

Mathematics: Multivariable Calculus (MATH 2204), Linear Algebra (MATH 2114), Differential Equations (MATH 2214), Applied Combinatorics (MATH 3134), Discrete Mathematics (MATH 2534), Cryptography (MATH 4175, in progress)

Probability and Statistics: Statistics for Engineering Applications (STAT 3704), Business Statistics, Analytics, and Modeling (BIT 2405), Data Playbook: Analyzing Sport (STAT 2704)

Computer Science: Machine Learning (CS 4824, in progress), AI Tools for Software Engineering (CS 5740, in progress), Data and Algorithm Analysis (CS 4104), Data Structures and Algorithms (CS 3114), Computer Systems (CS 3214), Comparative Languages (CS 3304), Computer Organization (CS 2505/2506)

TECHNICAL PROJECTS

- **PolyHub, prediction market and sports pricing engine** (2026). FastAPI service that de-vigs quoted odds against a sharp-book consensus, sizes only positive expected-value positions under bankroll constraints, and forward-tests edge through a SQLite closing-line-value journal. Includes a CSV-driven backtester validated by a synthetic self-test, with 96 passing tests.
- **Commodities derivatives pricing engine** (2025). Backed a multi-leg natural gas trade thesis (short Jan '26 Waha basis) by calibrating a modified Ornstein-Uhlenbeck temperature process ($\kappa = 0.29$, $R^2 = 0.40$) and running 10,000 Monte Carlo paths through a cubic B-spline seasonal volatility surface to price heating-degree-day exotic options.
- **minibash, a Unix shell in C** (2025). Shell implemented across 41 C source files with its own lexer and recursive-descent parser for the shell grammar, job control and POSIX signal handling, and custom linked-list and hash-table primitives.
- **Almgren and Chriss execution engine with Q-learning.** Implemented the Almgren and Chriss optimal execution framework and augmented the closed-form liquidation schedule with a Q-learning agent that adapts the trajectory to real-time order-book state, with a Streamlit interface for policy analysis.
- **Black and Scholes option pricer with Greeks.** Priced European calls and puts and computed delta, gamma, vega, theta, and rho; recovered implied volatility by numerically inverting the pricing function against observed market prices.
- **ShadeFinder, geospatial shadow modeling** (2025). Python and Streamlit application projecting building shadows from solar position and OpenStreetMap footprint data (OSMnx, Pysolar, Shapely, Folium), with real-time OpenWeatherMap climate integration.

HONORS AND AWARDS

- **IMC Prosperity 3** (2025). Placed 15th in the United States out of more than 12,600 teams in an international algorithmic trading competition.
- **National Mathematics Olympiad**, Kuwait (2022). Winner.

LEADERSHIP AND SERVICE

Co-President, FinTech Club, Virginia Tech May 2026 – Present

- Lead a 100+ member club, directing its market and research pods: teams of four to six students who build a semester-long project with faculty involvement and present it at an end-of-semester showcase.
- Run an industry speaker series and take part in Hokies on Wall Street, the club's annual trek to meet financial firms in New York. Rebuilt the club website. Previously elected Treasurer, managing the club budget.
- Led a faculty-advised replication of Evans and Archer (1968) under Dr. Daniel Rodriguez, isolating systematic risk through random asset sampling and hyperbolic curve fitting, and carrying out the analysis end to end.

Student Summer Ambassador, MAOP, Virginia Tech 2025

- Delivered seminars to incoming engineering cohorts, in partnership with Virginia Tech's CEED, on securing and contributing to faculty research.

ADDITIONAL EXPERIENCE

Creative Application Developer, Intern, Amricani Cultural Centre (DAI), Kuwait Jun 2021 – Sep 2021

- Built interactive web applications making museum exhibits accessible to children, deployed on the museum floor through custom-placed QR codes linked to the institution's domain.
- Worked with the Centre's Director to translate the coinage and 18th-century art exhibits into a guided educational model, including sequential visitor pathing and accompanying physical puzzle materials.

TECHNICAL SKILLS

Languages: Python, C, Java, SQL, R, JavaScript

Scientific and ML libraries: PyTorch, NumPy, Pandas, SciPy, Statsmodels, Scikit-learn, Matplotlib

Tools: Git, Docker, Linux, AWS, FastAPI, Streamlit, LaTeX

CERTIFICATIONS AND LANGUAGES

Certifications: Akuna Capital Options 201; CFA Institute Practical Skills Module, Python Programming Fundamentals; Financial Analysis (Power BI)

Languages: English (fluent), Hindi (conversational), Telugu (conversational), Sanskrit (reading), Arabic (basic)