

Sanjay Srinath

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Education:

University of Massachusetts Amherst, Amherst, MA

Expected May 2028

- B.S. in Physics and Mathematics
- Member of Commonwealth Honors College
- Current GPA: 4.0/4.0

Experience:

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- **Undergraduate Research | University of Massachusetts Amherst** January 2026 - August 2026
 - Replicated an experimental thin-film interferometry method to quantitatively measure the thickness evolution of a gravity-draining soap film from video.
 - Developed an automated video-analysis pipeline using computer vision, RGB chromaticity matching, a physics-based thickness-to-color model, and dynamic programming to recover film thickness without manual frame annotation.
 - Analyzed the film's drainage over time, recovering thickness profiles from 13 experimental frames and measuring spatial thicknesses up to $\sim 1.1 \mu\text{m}$.
 - **Mathematics Tutor | Russian School of Mathematics** December 2021 - Present
 - Provided individualized mathematics instruction to students over five years, adapting explanations and problem-solving approaches to different learning styles.
 - Communicated complex mathematical concepts through intuitive examples and step-by-step reasoning to strengthen student understanding and independence.

Projects:

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- **Course-Specific AI Tutor | Python, FastAPI, SQLite, ChromaDB, OpenAI API** *Independent Project | 2026*
 - Developed a course-specific AI tutoring platform using retrieval-augmented generation (RAG) to answer questions and guide students using their uploaded course materials.
 - Built a document ingestion and retrieval pipeline for PDF parsing, chunking, vector embedding, and semantic search across isolated course knowledge bases.
 - Engineered a full-stack application with FastAPI, SQLite, and JavaScript supporting document uploads, persistent courses and conversations, source-grounded responses, and interactive course management.
 - **Higgs Boson Machine Learning Analysis | Python, scikit-learn, pandas, NumPy, matplotlib** *Independent Project | 2026*
 - Developed machine-learning classifiers to distinguish Higgs boson signal from background using 818,000+ simulated particle-collision events from the ATLAS Higgs Challenge dataset.
 - Built and evaluated multiple classification models using train/test validation and metrics including ROC-AUC, precision, recall, and F1 score, optimizing a random forest model to achieve 0.91 ROC-AUC.
 - Investigated model behavior using feature importance, permutation importance, correlations, and partial dependence analysis to identify influential physical variables and interpret learned relationships.

Skills

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- **Programming & Computing:** Python, Java, C++, JavaScript, HTML/CSS, SQL, Jupyter, Git/GitHub, scientific computing, numerical methods
 - **Data Science & Machine Learning:** NumPy, pandas, SciPy, Matplotlib, scikit-learn, data preprocessing, exploratory data analysis, supervised learning, model evaluation, feature analysis, data visualization
 - **Software & AI:** FastAPI, SQLite, REST APIs, relational and vector databases, full-stack web development, LLM APIs, retrieval-augmented generation (RAG), vector embeddings, semantic search
 - **Physics & Research:** Experimental design, computational and mathematical modeling, quantitative analysis, uncertainty analysis, scientific literature review, technical writing and presentation
 - **Relevant Coursework:** Classical Mechanics, Electromagnetism, Quantum Mechanics, Computational Physics, Multivariable Calculus, Ordinary & Partial Differential Equations, Linear Algebra, Fourier Analysis, Complex Analysis