Sreya Vangara

svangara@stanford.edu — Stanford University

Profile

AI-for-science researcher and Stanford Mechanical Engineering Ph.D. Candidate developing intelligent systems for energy, battery, and critical-materials discovery. At the SLAC–Stanford Battery Center, my work integrates LLM-based scientific reasoning, knowledge graphs, multimodal experimental data, and physics-informed machine learning to accelerate materials discovery and laboratory decision-making. My background spans national-laboratory research, public-sector technology policy, critical-minerals advisory work, and global engineering initiatives.

Education

Stanford University - *Ph.D. Candidate, Mechanical Engineering* *2023–Present*
Knight-Hennessy Scholar; NSF Graduate Research Fellow; Quad Fellow; Stanford EDGE Fellow

Tsinghua University - *M.M.Sc., Global Affairs* *2022–2023*
Schwarzman Scholar; PepsiCo Foundation Henry M. Paulson, Jr. Fellow

MIT - *B.S., Mechanical Engineering; B.S., Electrical Engineering and Computer Science* *2018–2022*
MIT Henry Ford II Scholar; Rhodes Finalist; Tau Beta Pi; Pi Tau Sigma; Eta Kappa Nu

Selected Impact & Leadership

Scientific AI for Battery Research (SpectraQuery): Lead **SpectraQuery**, a SLAC–Stanford LLM platform for battery science that connects operando spectroscopy, structured databases, and literature to produce ∼10-second evidence-grounded answers with ∼80–86% query correctness and ∼93–97% grounding.

AI for Critical Materials and Magnets (DOE Genesis Mission): Develop **MagQuery** AI infrastructure for CM2US, linking materials databases, scientific literature, and knowledge graphs to accelerate rare-earth-efficient magnet discovery.

Climate-Resilient Infrastructure (Guyana): Helped lead a State Department-sponsored Guyana project that converted 166 stakeholder interviews into ARK, an AI-enabled automated koker system for flood mitigation and coastal agricultural resilience.

Critical Minerals and Climate Policy: Invited advisor to the White House Quad Committee on Critical Minerals & Climate, advising on critical-minerals supply chains, clean-energy investment, and Indo-Pacific energy security.

Global Engineering and Entrepreneurship: Led or supported engineering and education initiatives in Mexico, Hong Kong, Kazakhstan, Israel/Palestine, Kenya, and Madagascar, spanning water systems, youth innovation, and clean-energy transition planning.

Research Experience

Stanford University / SLAC National Accelerator Laboratory - *Ph.D. Candidate* *2023–Present*
Advisors: Prof. Eric Darve, Dr. Jagjit Nanda, Prof. Steven Chu

- Lead **SpectraQuery**, a SLAC–Stanford scientific AI platform connecting high-throughput battery experiments with literature; achieved ∼80–86% structured-query correctness and ∼93–97% grounding across 30 expert-curated queries.
- Architect **MagQuery** AI infrastructure for CM2US under the DOE Genesis Mission, linking materials databases, scientific literature, and knowledge-graph reasoning to accelerate rare-earth-efficient magnet discovery.
- Build multimodal AI methods for battery research, integrating operando Raman spectroscopy, microscopy, electrochemistry, voltage profiles, particle-level spatial maps, and scientific text to identify degradation mechanisms.
- Conducted experimental battery-materials research on **hBN membranes** for lithium-metal and zinc aqueous batteries, targeting dendrite suppression, hydrogen-evolution mitigation, and stable electrochemical interfaces.

The Economist, Beijing - *Research Associate, Technology Policy* *2022–2023*

- Conducted primary-source technology policy research in Beijing on China's semiconductor industrial strategy, navigating Chinese academic, industry, and policy networks during a period of escalating U.S.–China technology competition.
- Contributed to a 10-interview expert research program, personally leading interviews with venture-capital, startup, foreign investment banking, and university research stakeholders across China's semiconductor ecosystem.
- Synthesized 148 sources and original datasets spanning patent activity, funding rounds, public-company data, National IC Fund investments, import/export statistics, and Chinese industrial policy documents from 2006–2023.

Commonwealth Fusion Systems - *Nuclear Research Associate, Energy Critical Materials* *2020–2022*

- Developed characterization workflows for **REBCO high-temperature superconductors**, a critical material platform for high-field fusion magnets and commercial fusion energy scale-up.
- Built and refined microscopy, image-analysis, and data-processing methods to evaluate superconducting tape quality, identify defects, and reduce bottlenecks in materials screening for fusion coil development.
- Presented fusion-materials research at APS Division of Plasma Physics and the Sherwood Fusion Theory Conference.

Selected Publications

Published Review Article: *Feedback, physics, and forecasts: The emerging paradigm of machine learning-driven battery research*, *MRS Energy & Sustainability* *2026*

arXiv Preprint: *SpectraQuery: A Hybrid Retrieval-Augmented Conversational Assistant for Battery Science* *2026*

Patent: *Currency Sorting Mechanisms and Methods*, U.S. Patent #10672213 *2020*

Leadership, Diplomacy & Global Service

White House Quad Committee on Critical Minerals & Climate - *Invited Advisor* *2023–2024*

- Invited to advise a White House Quad initiative on critical minerals and climate, contributing technical-policy analysis on Indo-Pacific energy security to senior policymakers and diplomatic officials from Quad nations.
- Assessed strategic investment priorities for critical-minerals supply chains and clean-energy manufacturing, with emphasis on U.S.-aligned cooperation, energy security, and reduced dependence on vulnerable supply networks.

U.S. State Department - Caribbean Climate Resilience - *Policy & Technical Lead, Guyana* *2023–2024*

- Led policy, stakeholder-discovery, and technical strategy for a U.S. Department of State-sponsored climate-resilience project in Guyana, conducting 166 stakeholder interviews, including 64 in-country interviews.
- Co-developed ARK – an Automated Retrofitted Koker system combining sensor suites, automated winches, hydropower, and AI-enabled water-level prediction to support flood mitigation and climate-resilient agriculture.

Nevada Clean Energy Fund - *Energy Consultant, USA* *2023–2025*

- Provided pro-bono technical-policy analysis for clean-energy transition planning with Nevada Tribal Nations, bridging tribal sovereignty, federal energy policy, climate finance, and technology deployment.

Middle East Entrepreneurs of Tomorrow - *Mentor, Jerusalem, Israel* *2023*

- Mentored 24 Israeli and Palestinian students across two youth-led startup teams in a Jerusalem-based entrepreneurship program designed to build technical leadership, venture-creation skills, and cross-community collaboration.

Synapse National Nonprofit - *Director of DEI, USA* *2020–2022*

- Directed DEI and accessibility strategy for a 700-member nonprofit operating across 27 university chapters to support individuals with traumatic brain injury and neurological conditions.
- Advocated before collegiate ADA and accessibility boards on behalf of students with disabilities, supporting institutional improvements in accommodations, disability rights, and inclusive campus policy.

Tatirano Social Enterprise - *Technical Consultant, Madagascar* *2020–2022*

- Supported clean-water engineering work in Tolagnaro, Madagascar, expanding long-term water access through rainwater harvesting, desalination stills, local service models, and women-centered implementation.
- Designed low-cost household water purification solutions adapted to local material availability and maintenance needs.

Industry Experience

Five Rings Capital - *Software Engineering Intern* *2020*

- Built low-latency C++ components for proprietary trading systems, translating real-time market data into signal-generation, execution logic, and backtesting workflows for high-frequency trading strategies.

Microsoft Corporation, Azure Machine Learning - *Machine Learning Extern* *2020*

- Contributed to Microsoft Azure Machine Learning's first Kubeflow integration, building Python tooling to connect Kubernetes-native open-source ML pipelines with enterprise-scale Azure MLOps infrastructure.

Jobcase Inc. - *Machine Learning Intern* *2019*

- Built NLP-based moderation models for a 100M+ user career platform, using MLflow workflows to improve reproducibility, evaluation, and deployment-readiness for large-scale conversation moderation.