Sophia Castor

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Professional Summary

Principal-level AI/ML researcher with expertise in **human–machine teaming**, **trusted mission AI**, and **resilient sensor-driven systems**. Experienced in leading DARPA-aligned R&D programs, supervising cross-functional teams, and translating advanced research into operational pipelines for defense, intelligence, and healthcare. Proven record of publishing in top venues (PETS 2025), securing government proposal wins, and delivering reproducible solutions in **LLMs, agentic AI, GNNs, and federated learning**. Skilled in integrating **cognitive models with neuroimaging data**, developing **real-time decision-support systems** for IoT/sensor networks, and communicating technical insights to both expert and non-technical audiences. Adept at bridging **AI/ML innovation, human factors, and mission-critical applications** to exceed DoD and IC research objectives.

Education

Georgetown University — **Washington, DC**
Masters in Data Science & Analytics — *Expected December 2025*

Georgetown University — **Washington, DC**
Bachelor of Science in Computer Science — *May 2025*
Minor: Mathematics

Georgetown University — **Washington, DC**
Bachelor of Arts in Government — *May 2025*

Honors & Awards

2025–26: **Data Science & Analytics Returning Student Scholarship**

2024–25: **Fritz Family Fellowship for Tech and Society**

2024–25: **Massive Data Institute Scholar**

2023–24: **InspiritAI Scholar**

2021–25: **Regents STEM Scholar**

2022–25: **Dean's List, Georgetown University** — First Honors: Spring 2022, Summer 2022, Summer 2023, Spring 2024, Summer 2024, Fall 2024, Spring 2025, Summer 2025; Second Honors: Fall 2023

Publications

2025: J. Su, L. Bangalore, H. Berger, J. Yi, **S. Castor**, M. Sherr, M. Venkitasubramaniam. *SCIF: Privacy-Preserving Statistics Collection with Input Validation and Full Security*. *Proceedings on Privacy Enhancing Technologies (PETS)*, Vol. 2025, Issue 1. DOI: 10.56553/popets-2025-0106. Preprint available at Cryptology ePrint Archive, Paper 2024/1821.

2025: **S. Castor**, K. Wu, C. Pinard. *Hachiko: Leveraging Transformer-Based Language and Vision Models for Structured Medical Record Summarization in Veterinary and Comparative Medicine*. ANI.ML Health / University of Toronto, 2025.

2025: **S. Castor**. *Multi-Modal Biometric Identity Detection and Tracking System*. Undergraduate Honors Thesis, Georgetown University, Department of Computer Science, April 2025. Advisor: Dr. Lisa Singh.

2024: **S. Castor**, K. Wu, C. Pinard. *Enhancing Surgical Precision and Efficiency: Deployment of Transformer-Based Object Segmentation Model for Tumor Detection and Surgical Marker Identification using Augmented Reality Tools*. ANI.ML Health / University of Toronto, 2024.

Undergraduate Thesis

Georgetown University, Department of Computer Science — **Washington, DC**

Multi-Modal Biometric Identity Detection and Tracking System — *Fall 2024 – Apr 2025*

Advisor: Prof. Lisa Singh

- Designed a novel **multi-modal biometric system** combining face, gait, anthropometric, behavioral, and pose encoders for robust person-of-interest tracking.
- Developed a custom **anthropometric encoder** using pose and depth estimation to extract body metrics (height, limb ratios, torso proportions) for re-identification.
- Implemented an **agentic fusion framework** with transparent weighted voting and per-modality attribution, enabling interpretable planning–execution–reflection loops.
- Achieved **98% accuracy** on BIWI dataset; conducted **fairness audits** showing **>20% reduction in error disparity** across demographic groups compared to face-only baselines.
- Integrated **explainability tools** (SHAP, LIME) and bias-mitigation guardrails to ensure ethical and accountable decision-making.
- Proposed the framework as an **open-source, transparent alternative** to commercial biometric systems, emphasizing privacy, accountability, and ethical deployment in forensic applications.

Research Experience

Georgetown University Massive Data Institute — **Washington, DC**

Undergraduate Research Scholar — *Jan 2024 – Present*

Advisors: Prof. Micah Sherr, Prof. Lisa Singh.

- Co-authored **SCIF**, a PETS 2025 publication on multi-server secure aggregation with input validation and full malicious security; optimized runtime to **<10s per client / <40s per server** at 500-client scale.
- Designed and tested **privacy-preserving data collection protocols** integrating differential privacy, multiparty computation (MPC), and zero-knowledge proofs (Ligero); reduced communication overhead to **5MB/client, 182MB/server**.
- Built evaluation pipelines to quantify **accuracy, fairness, adversarial resilience**, and integrated telemetry-style logging to improve reproducibility and interpretability of distributed AI systems.
- Developed end-to-end pipelines in **Go, Python, Shadow, and SMC-in-a-Box**, enabling secure distributed AI agents to operate in real-world Tor network environments under adversarial conditions.
- Applied **Agile design principles** to automate input validation, share recovery, and output delivery loops in federated workflows, demonstrating resilience and efficiency at scale.
- Authored reproducible pipelines and released open-source repositories (smc-in-a-box), supporting community adoption and alignment with **DARPA/IARPA-style secure aggregation research**.

Georgetown University & National Institutes of Health — **Washington, DC**

Graduate Research Lead – Quantum Cognition & Human Behavior — *Fall 2023 – Fall 2024*

- Partnered with NIH to apply **quantum cognition frameworks** to human decision-making, probabilistic reasoning, and perception under uncertainty, bridging cognitive science with computational modeling.
- Aligned quantum cognitive models with explainable AI frameworks, generating insights for human–machine teaming and decision-support systems.
- Conducted full-stack **fMRI preprocessing and analysis** (slice timing, motion correction, normalization, smoothing, GLM, MVPA, ROI/whole-brain connectivity) to map neural activity to cognitive tasks.
- Designed and executed **behavioral experiments** probing working memory, attention, and decision conflict; ensured IRB compliance and reproducible protocols.
- Built **multimodal neuroimaging pipelines** (**Python/Nilearn, MATLAB/SPM, R, Nipype**) integrating behavioral + imaging data, supporting interpretable models of cognition.
- Contributed to **human–machine teaming insights** by aligning quantum probabilistic models of cognition with neuroimaging outputs, informing explainable AI approaches to decision-making.

Stanford/MIT – InspiritAI Innovation — **Stanford, CA**

Advanced Machine Learning Researcher — *Jun 2023 – Sep 2023*

- Fine-tuned **large language models (LLMs)** with hierarchical attention and transfer learning, improving technical code reasoning and generation accuracy by **20%**.
- Built a **CNN pipeline** with Bayesian hyperparameter optimization for posture/object analysis, reducing false positives by **15%**.
- Implemented a **YOLOv8-based model** for pose estimation and object detection under adverse conditions (low light, occlusion, dynamic movement), achieving **87% accuracy**.
- Prototyped **multi-agent collaboration loops** in generative vision models, testing coordinated detection and reasoning workflows.

Georgetown University Microtechnology Labs **Washington, DC**
Undergraduate Research Assistant *Mar 2022 – Sep 2023*

- Wrote **C++ and Java scripts** to optimize prenatal biomedical sensor outputs and visualize quantitative performance metrics.
- Designed and manufactured a **protective CAD vessel** that improved sensor durability by **40%** in stress tests.
- Built an enhanced **UI/UX (JavaScript/HTML/CSS)** for a mobile app, improving clinician-facing data communication speed by **25%**.

Johns Hopkins Biomedical Engineering Innovation **Washington, DC**
Biotechnology Research Assistant *Apr 2020 – Sep 2020*

- Designed and implemented six **Arduino robotics/microrobotics projects** (e.g., robotic arm, automated medication administration system).
- Aggregated/analyzed **sensor data in Python**, yielding a 25% dexterity increase for the robotic arm.
- Built **R/Python algorithms** to support posture brace engineering; led planning/scheduling for a 15-person team.

Industry Experience

Leidos **Arlington, VA**
Formal Methods Researcher Intern (SUNS IRAD) *May 2025 – Present*

- Contributed to DARPA-aligned **Trusted Mission AI** initiative (SUNS), developing LLVM-based static analysis and formal verification workflows to enhance resilience and software assurance in national security systems.
- Designed Rust compiler plugins for **call graph generation, code layering metrics, and complexity analysis**, reducing manual inspection time by **40%** and improving scalability across large monorepos.
- Built static analysis pipelines (**Python, Rust, SQL, Tree-sitter**) for taint tracking and dead-code elimination; scaled to analyze **50k+ functions** across multi-crate Rust projects.
- Engineered the **Rust Boundary Analyzer, GitScrape, and RustAnalyzer** toolkits, integrating CI/CD enforcement and validating outputs against **500+ real-world repositories**.
- Implemented schema-driven validation and SafeDocs DaeDaLus parsers for **Two-Line Element (TLE/ELSET) satellite data**, achieving **100% schema compliance** across **10k+ synthetic and real records**.
- Acted as **subject-matter expert** for DARPA proposal development and program reviews, authoring technical documentation and shaping deliverables that contributed to Leidos' pursuit of **multi-million-dollar formal methods contracts**.

ANI.ML Health (Collaboration with University of Toronto) **Stanford, CA / Toronto, ON**
Principal Data Science & Machine Learning Researcher *Aug 2023 – Present*

- Co-developed **Hachiko**, an AI-driven clinical assistant that transforms unstructured veterinary medical records into structured summaries and actionable insights; achieved **97% summarization accuracy** and reduced clinician documentation time by **45%**.
- Built **transformer-based NLP pipelines** for summarization, semantic search, and entity extraction, improving workflow efficiency in veterinary and comparative medicine.
- Deployed **computer vision models** (VGG-16, Inceptionv3, ResNet50) for surgical marker identification (**92% precision**) and augmented-reality tumor detection, improving accuracy by **15%**.
- Designed a **semi-supervised auto-annotation pipeline**, cutting preprocessing time by **30%** and accelerating dataset creation for medical imaging.
- Delivered **interpretable analytics dashboards and presentations** that increased client engagement by **45%** and supported ongoing collaborations with the University of Toronto.
- Framed system development within a **Trusted Mission AI** lens, integrating transparency, explainability, and reproducibility into clinical AI workflows.

Amari – Hoya Developers **Washington, DC**
Lead Machine Learning & Algorithms Research Engineer *Aug 2024 – May 2025*

- Developed a **reinforcement learning–based matchmaking algorithm** using Q-learning, increasing successful matches by 20% and sustaining 97% success rates.
- Implemented **Explainable AI (LIME)** to justify recommendations to users, decreasing churn by 15%.
- Designed **scalable data pipelines** with Apache Airflow to ingest/process 100,000 events/day.
- Presented research findings to industry professionals, advocating responsible AI in matchmaking.

Leidos **Gaithersburg, MD**
Software Development & Webtools Engineer Intern *May 2023 – May 2025*

- Built an automated ML pipeline (Python, SQL, PyTorch) achieving **98% prediction accuracy** on failure classification across 10,000+ test cases, improving reliability of mission software.
- Enhanced full-stack systems with **ReactJS/Java front-end + Python back-end**, boosting responsiveness by **35%**; streamlined workflows with Atlassian toolchain.
- **Collaborated across multidisciplinary teams** of software engineers, program managers, and government stakeholders to align technical outputs with program milestones, customer requirements, and future DARPA/IARPA opportunities.
- Implemented Groovy solutions to reduce misdirected user queries by **99%**, improving internal task coordination and secure database development efficiency.

Georgetown University McDonough School of Business **Washington, DC**
Principal Researcher – Quality Control & Visual Tracking *Fall 2022 – Spring 2023*

- Collaborated with hardware engineers to integrate computer vision QC pipeline with experimental sensor prototypes; benchmarked throughput on 1,200+ components/hour and validated defect detection accuracy in lab tests.
- Implemented **object detection and multi-object tracking algorithms** (YOLOv5, SORT) to monitor components in real time with >92% detection accuracy.
- Increased defect detection sensitivity by **30%** and reduced false negatives by **25%** through optimized tracking workflows.
- Benchmarked pipeline throughput at **1,200+ components/hour**, enabling scalable deployment in experimental QC settings.

Teaching Experience

Georgetown University **Washington, DC**
Undergraduate Grader/Teaching Assistant (Calculus II) *Jan 2024 – Present*

- Graded assignments and exams for **80+ students**, providing detailed feedback to strengthen conceptual understanding.
- Held weekly **office hours**, improving student comprehension and boosting average exam performance by **12%**.
- Collaborated with faculty to refine grading rubrics and align course materials with departmental standards.

theCoderSchool **Ashburn, VA**
Lead Instructor *Jun 2020 – Aug 2021*

- Taught programming in **Scratch, Python, and C++** to grades 4–11 through project-based learning and small-group instruction.
- Designed custom lesson plans integrating **algorithms, game design, and logic puzzles** to foster computational thinking.
- Mentored advanced students on capstone projects, including interactive games and automation scripts.

After School Kids **Washington, DC**
Instructor & Mentor *Sep 2021 – May 2023*

- Provided **academic tutoring and mentorship** to upper-elementary and middle-school students in underserved communities.
- Designed **enrichment activities** to build confidence, problem-solving skills, and early STEM literacy.
- Balanced academic guidance with personal mentorship to support holistic student development.

Leadership & Service

Students of Georgetown, Inc. (The Corp) **Washington, DC**
Director of Seasonal Services / Cashier, Vital Vittles *Aug 2022 – May 2025*

- Directed large-scale student storage program (**2,000+ boxes, $70k revenue**); optimized logistics and staff scheduling to reduce costs by **30%**.
- Supervised seasonal/corporate staff in scheduling, operations, and materials management; improved workflow efficiency through process automation.
- Built CSV-based order tracking system (**Python, Excel, Tkinter/Tksheets**); reduced administrative errors by **45%** via UI-driven validation and reporting.

The Caravel — International Science Newspaper **Washington, DC**
Compass Futures Media Lead & Editor *Dec 2021 – May 2023*

- Authored and edited articles on technology, conflict, and global health; emphasized accessible communication of complex issues.
- Managed digital platforms (Bootstrap, PHP, XAMPP, HTML/CSS); maintained website and blog infrastructure, boosting online readership by **20%**.
- Oversaw social media strategy to expand engagement across international student audiences.

Technical Projects

DSAN 6400 – Network Analysis, Graduate Research Project **Georgetown University**
Cascading Anomaly Propagation in IoT Networks *Summer 2025*

- Designed and evaluated a **real-time anomaly detection** pipeline for **IoT sensor networks**, combining temporal graph embeddings with **GNN classifiers** on simulated and benchmarked traffic.
- Built **temporal BFS** cascade trees from high-importance seeds; fused **centrality metrics** and **temporal decay** with **Graph Convolutional Networks (GCNs)** to rank intrusion sources, improving attribution accuracy by **25%**.
- Proposed the **Community Drift Index (CDI)** to quantify community-structure change; validated interpretive thresholds across **synthetic testbeds and public datasets** (RT-IoT2022, NSL-KDD, BoT-IoT).
- Delivered an **operator-facing observability dashboard** (Streamlit) with zoomable timelines, anomaly-scaled nodes, and hover tooltips to support **human–machine decision support** in live triage.
- Ensured **reproducibility and deployment readiness** with dataset loaders, a CLI pipeline (`src/main.py`), and packaged requirements; integrated configuration for testbed replay and batch evaluation.
- Demonstrated autonomous **planning–execution–reflection loops** for anomaly propagation and source triage, modeling **agentic coordination** across distributed nodes and surfacing explainable signals for operators.
- Repository: github.com/sajc11/DSAN6400-Final

Cognitive Neuroscience, Graduate Research Project **Georgetown University**
Early Detection of Depression and Anxiety through Social Media Language *Spring 2025*

- Built a statistical learning framework to classify Reddit and Twitter posts into depression, anxiety, and positivity categories.
- Engineered features: TF–IDF vectors, sentiment lexicons, part-of-speech distributions, and BERT embeddings.
- Trained four models (Logistic Regression, SVM, Random Forest, BERT + LR) with stratified 5-fold cross-validation; Logistic Regression achieved F1 = 0.92 on depression.
- Applied SHAP to explain predictions and highlight markers such as "worthless," "panic," and "lonely."
- Deployed an interactive web app for transparency, featuring live confusion matrices, SHAP explanations, and sentiment/word distribution plots.
- Application: dsan5300-group7.ajscastor.georgetown.domains

Data Policy, Graduate Research Project **Georgetown University**
Precarious Labor, Invisible Risk: Health and Safety in the U.S. Gig Economy *Spring 2025*

- Investigated health and safety risks for U.S. gig workers (rideshare, delivery, app-based labor) and documented the absence of federal reporting.
- Synthesized literature across labor law, public health, and data governance; analyzed platform safety reports, BLS/CFOI, GAO findings, and advocacy datasets.
- Proposed a federal OSHA/DOL reporting framework with enforcement, privacy, and standardized data requirements; contrasted with EU/UK reforms.

Environmental Conservation Studies, Graduate Research Project **Georgetown University**
Climate Vulnerability and Urban Resilience: Sea-Level Rise in South Asia *Spring 2025*

- Integrated satellite sea-level anomalies, tide-gauge flood days, and World Bank socio-economic indicators for Bangladesh, Maldives, and Philippines.
- Performed trend estimation, 10-year rolling correlations, and lead–lag analyses (e.g., sea-level rise leading out-migration in Bangladesh by 4–5 years).
- Produced policy guidance on resilience strategies: drainage/flood defenses, managed retreat/raised islands, mangrove restoration, and climate–migration planning.
- Addressed ethics of predictive modeling (uncertainty, governance, equity, narrative framing).

Humanitarian Security, Graduate Research Project **Georgetown University**
Navigating Turbulence: Humanitarian Security Incidents, 1997–2024 *Spring 2025*

- Led analysis of **4,300+ global security incidents** across 80+ countries using a 41-variable dataset (actors, motives, casualties, geography).
- Built a full-stack research platform (**ReactJS, Python, R, Java, HTML/CSS**) integrating data pipelines, statistical modeling, and interactive dashboards.
- Applied advanced methods: rolling averages, symbolic/holiday timing, aftershock clustering, actor–motive typologies, and cross-country severity indices.
- Engineered reproducible metrics (e.g., **severity index, cumulative casualties**) and validated findings against external datasets (ACLED, WorldPop, Copernicus GHS).
- Produced a **public-facing website** (dsanscholarship.ajscastor.georgetown.domains) with zoomable maps, timeline visualizations, and policy-oriented insights.
- Awarded the **Returning Student Scholarship** for technical rigor and impact in humanitarian data science.

Socioeconomic Analysis, Graduate Research Project **Georgetown University**
Living in Risk: Public Health & Socioeconomic Indicators in NYC Housing *Fall 2024*

- Investigated housing insecurity across NYC boroughs using **ANHD, DOHMH, and Eviction Lab datasets** integrating public health, demographic, and socioeconomic indicators.
- Cleaned and standardized variables (vaccination, mortality, uninsured, AMI, rent burden, evictions/foreclosures, race, language proficiency).
- Applied statistical methods (Welch's t-tests, ANOVA, chi-squared, Spearman correlation) to uncover systemic disparities and borough-level inequities.
- Found Bronx and Brooklyn most at risk (**57% higher mortality, 7.5% uninsured, highest eviction filings**); Queens showed highest limited English proficiency.
- Identified key correlations: higher vaccination rates linked to lower housing risk ($r = -0.38$, $p < 0.01$); uninsured and mortality rates positively associated with instability.
- Produced borough-level heatmaps, eviction trend analyses, and socioeconomic risk visualizations; recommended integrated housing–health policy interventions.

Deep Learning for Computer Vision, Graduate Research Project **Georgetown University**
Convolutional Neural Network for Veterinary Imaging *Spring 2024*

- Designed and implemented a **custom CNN from scratch** in Python for canine tumor detection, supporting backpropagation, tunable hyperparameters, and diverse activation functions (ReLU, sigmoid, tanh).
- Trained and validated on veterinary imaging data; achieved **>90% classification accuracy** in test scenarios, demonstrating feasibility for automated diagnostic support.
- Compared performance across multiple architectures and optimization methods (SGD, Adam), and documented reproducibility through Git version control and JUnit testing.
- Produced visualizations of training curves and feature maps to interpret model performance and guide parameter tuning.

AI-Driven Creative Systems, Research Project **Georgetown University**
Music-Inspired Visual Art Generation *Spring 2024*

- Built an AI system that converts music features (**tempo, rhythm, pitch, mood, instrumentation**) into generative visual art.
- Extracted audio features using **LibROSA/Essentia** and mapped them to visual parameters (color palettes, shapes, textures, motion dynamics).
- Implemented **GANs, VAEs, and Neural Style Transfer** pipelines with optional user customization (style, color, motifs).
- Developed metadata outputs linking audio features with visual mappings for interpretability and reproducibility.
- Successfully extended the system to support **live input generation**, producing evolving visuals synchronized to real-time music playback.
- Integrated cross-modal ML insights (music–vision embeddings, affective computing) to refine mappings and generation quality.
- Repository: github.com/sajc11/COSC-5470-Art-Generation

Cyber Warfare in the Ukraine–Russia War, Graduate Research Project **Georgetown University**
Cyber Warfare & Public Policy Research *Fall 2023*

- Conducted interdisciplinary analysis of **Russian cyber tactics** during the Ukraine conflict, integrating cybersecurity, international relations, and military strategy literature.
- Evaluated case studies of distributed denial-of-service (DDoS), phishing, and infrastructure-targeted cyber operations; linked technical tactics to strategic objectives.
- Proposed **policy recommendations** for strengthening Ukraine's cyber resilience, including improved NATO intelligence-sharing, public–private partnerships, and investments in critical infrastructure hardening.
- Delivered findings in both academic and policy formats, highlighting the intersection of technical cyber defense and geopolitical strategy.

Students of Georgetown, Inc. (The Corp) **Washington, DC**
OrderTracking Database *Spring–Fall 2023*

- Developed a **cross-platform order-tracking system** integrating Python, SQL, Excel, and Tkinter/Tksheets/Pandas to manage 1,000+ student-run café and service orders per week.
- Linked system with an existing Python web platform to streamline operations, improve transparency, and reduce manual input.
- Implemented **encryption and tokenization protocols** to safeguard sensitive customer data, aligning with best practices in data privacy and security.
- Reduced administrative order errors by **45%**, cutting customer complaints and saving staff 10 hours/week in reconciliation tasks.
- Authored technical documentation and trained staff on system usage, ensuring maintainability and continuity after deployment.

Coursework

Computer Science: Natural Language Processing; AI & Machine Learning; Data Mining; Deep Learning for Computer Vision; Network Analysis; Data Visualization, Graph Neural Networks

Sciences: Biology I-II; Biochemistry; Genetics; Chemistry I-II; Organic Chemistry I-II; Neurobiology; Physics I-II; Quantum Mechanics; Psychology; Educational Psychology; Introduction to Biomedical Engineering

Mathematics: Linear Algebra; Calculus I–III; Multivariable Calculus; Introduction to Mathematical Statistics; Partial Differential Equations; Cryptography; Neural Networks, Topology

Government: Ukraine & Russia War; Computer Science for Peace and Democracy; American Youth in Democracy: Polling & Statistics; Data Policy and Law

Other: edX Full Stack & Cloud Development.

Technical Skills

Machine Learning & AI: Deep Learning (CNNs, RNNs, Transformers, LLM fine-tuning, Attention Mechanisms), NLP (BERT, GPT-style models, Summarization, Semantic Search, Entity Extraction, Sentiment Analysis), Explainable AI (SHAP, LIME, Integrated Gradients), Graph Neural Networks (GCN, GAT, Node2Vec, Graph Embeddings), Reinforcement Learning (Q-learning, Multi-Agent RL), Agentic AI (LangChain, AutoGen, CrewAI, LangGraph, MCP).

Trusted AI & Security: Privacy-Preserving ML (Differential Privacy, Secure Multiparty Computation, Zero-Knowledge Proofs, Ligero), Federated Learning, Input Validation Protocols, Taint Analysis, Dead Code Elimination, Trusted Mission AI (bias mitigation, guardrail integration, safety constraints).

Programming: Python (NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, Nilearn, Nipype), R, MATLAB (SPM), C, C++, C#, Java, Rust, Go, Groovy, Swift, SQL (MySQL, PostgreSQL, SQLAlchemy), JavaScript (ReactJS, D3.js, Node.js), HTML/CSS, PHP, API Development.

Software Engineering: Cloud Platforms (AWS, Azure, GCP Vertex AI), Containerization & Virtualization (Docker, Kubernetes, VMware), DevOps/CI-CD (Git, GitHub, GitLab, GitHub Actions, Pre-commit, Pytest), Compiler & Parsing Tools (LLVM IR, Tree-sitter, Rust Analyzer), Formal Methods (SafeDocs/DaeDaLus parsers, Galois Polymorph, Taphos, Walrus, Oxide), CAD Modeling, Shadow/Tor Network Simulation.

Data Science & Visualization: Statistical Modeling (GLM, ANOVA, Regression, Bayesian Inference), Network Science (Community Detection, Centrality, Temporal Graphs, Anomaly Propagation), Exploratory Data Analysis (EDA), Tableau (Prep Builder, Desktop, Public), Interactive Dashboards (Streamlit, Plotly, Chart.js), Geospatial Analysis (choropleths, clustering, density maps), Time-Series Forecasting.

Neuroscience & Cognitive Science: fMRI Analysis (Preprocessing, GLM, ROI/Whole-brain, MVPA), Functional Connectivity (Resting-State Networks, PPI, Dynamic Causal Modeling), Neuroinformatics Standards (BIDS, NIH pipelines), Experimental Design & Behavioral Protocols (attention, working memory, decision conflict), Cognitive Modeling (Quantum Probabilistic Models of Cognition).

Certifications: IBM Full Stack Software Developer Professional Certification; Full Stack Cloud Developer (edX).

Languages

Fluent: English, Spanish, French.

Proficient: Haitian Creole, American Sign Language (ASL).

Presentations

Apr 2025: **Cascading Anomaly Propagation in IoT Networks: A Proximity-Based Graph Embedding Approach for Temporal Intrusion Detection and Attribution** — Final Project Presentation, DSAN 6400: Network Analysis, Georgetown University.

Apr 2025: **Precarious Labor, Invisible Risk: Addressing the Health and Safety Data Gap in the U.S. Gig Economy** — Policy Research Presentation, DSAN 5450: Data Science and Public Policy, Georgetown University.

May 2024: **A Data Collection Protocol that Protects Individual Privacy for Distributed and Sensitive Data Sources** — Symposium Presentation, Massive Data Institute, Georgetown University.

Dec 2023: **Enhancing Veterinary Medical Accuracy: An Augmented Reality Machine Learning Model for Surgical Tumor Detection** — Poster Presentation, ANI.ML Health, Stanford, CA.

Oct 2023: **Pushing the Boundaries of Language Processing: A Transformer-Based Approach to Text Summarization** — Poster Presentation, ANI.ML Health, Toronto, Canada.

Aug 2023: **Boosting Precision and Speed: Modifying YOLOv8 for Real-Time Object Tracking and Pose Estimation** — Poster & Video Presentation, InspiritAI Scholars, Stanford, CA.

Professional Affiliations

2024–Present: **Georgetown Alliance of Graduate Employees (GAGE)**

2021–Present: **Association for Women in Mathematics (AWM)**

2021–Present: **Society of Women Engineers (SWE)** — University of Virginia Chapter

2023–2025: **Hoya Developers**

2023–2025: **Hoyalytics**

2023–2024: **Massive Data Institute (MDI) Scholar Program**

2022–2025: **Georgetown University Women Coders (GUWeCode)**

2022–2025: **Georgetown University Disruptive Tech**

2022–2023: **Qualtrics Professional Mentorship Program**