Viren R. Shah

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COMPREHENSIVE MASTER CV

PROFESSIONAL SUMMARY

Engineering leader with experience across software development, platform infrastructure, security, compliance, and applied R&D. Work ranges from building production Python services and cloud platforms to leading engineering and research teams and turning prototypes into products. Recent work includes legal SaaS, semantic search, RAG, LLM infrastructure, AWS, Kubernetes, and SOC 2. Earlier work includes large government-funded research programs in software analysis, security, distributed systems, and knowledge representation.

CORE EXPERTISE

Software and AI: Python, FastAPI, Flask, REST APIs, microservices, event-driven systems, RabbitMQ, MongoDB, DocumentDB, semantic search, vector search, embeddings, RAG, applied NLP and ML, scikit-learn, LLM systems, multi-agent systems, MLflow, Bifrost, AWS Bedrock, Model Context Protocol, Java, C, C++

Platform and security: AWS, GCP, EKS, GKE, Kubernetes, Docker, Terraform, CloudFormation, Helm, ArgoCD, KEDA, Linux, GitHub Actions, Jenkins, observability, incident response, cloud cost management, DevSecOps, IAM, authentication and authorization, RBAC, SSO, SOC 2 Type II, privacy, software security, static analysis, dynamic analysis, vulnerability research

Leadership and R&D: engineering leadership, people management, hiring, manager-of-managers experience, technical strategy, product roadmaps, platform and infrastructure ownership, security program ownership, budget management, applied R&D leadership, Principal Investigator roles, research-to-product work, proposals, customer and stakeholder engagement

PROFESSIONAL EXPERIENCE

Director of Engineering Security and Infrastructure | BlackBoiler | Arlington, VA

2019–September 2026

Technologies and domains: Python, FastAPI, Flask, AWS, EKS, Kubernetes, Docker, Terraform, GCP, GKE, Helm, ArgoCD, KEDA, RabbitMQ, MongoDB, DocumentDB, semantic search, RAG, LLM infrastructure, MLflow, AWS Bedrock, security, privacy, SOC 2 Type II

- Joined as an early employee and co-led engineering direction with the CTO, setting technical strategy, owning the infrastructure and security roadmap, and driving execution as the company scaled.
- Owned BlackBoiler's infrastructure budget, balancing reliability, security, capacity, and cost as the SaaS platform grew.
- Co-managed BlackBoiler's engineering team for multiple years and participated directly in recruiting and hiring engineers while continuing to contribute hands-on technical work.
- Built and operate BlackBoiler's cloud-native production architecture — a multi-region AWS environment spanning 5 EKS clusters using Kubernetes, Terraform, and GitHub Actions — with automated failover, redundancy, monitoring, and >99.95% production uptime.
- Reproduced BlackBoiler's AWS-hosted SaaS environment in GCP so clients could be hosted there, writing the Terraform modules and automated client-deployment pipeline for GKE, networking, security, storage, identity, MongoDB Atlas, RabbitMQ, KEDA, Helm, and ArgoCD; delivered a working test deployment in 6 weeks with integration and regression checks.
- Initiated and led SOC 2 Type II certification across multiple audit cycles and served as Data Protection Officer, directly enabling large enterprise contracts requiring compliance certification.
- Introduced security throughout the software development lifecycle using SonarQube, Snyk, Scout, CrowdStrike, and automated compliance controls, resulting in earlier vulnerability detection, faster remediation, and fewer findings in security scans and penetration tests.
- Re-architected and rightsized AWS workloads, reducing cloud infrastructure spend by approximately 25%.
- Designed and built BlackBoiler's semantic search and retrieval-augmented generation (RAG) capability for contracts and legal playbooks, including vector/embedding-based retrieval and dynamic relevance thresholding using gap-based and Otsu methods to optimize context selection for automated contract review and editing.
- Built a production semantic-search platform for BlackBoiler's legal-contract corpus using React/TypeScript, Node.js/Express, Python embeddings, and AWS DocumentDB 8.0 native `$vectorSearch` with HNSW. Designed asynchronous S3 ingestion, server-sent progress updates, within- and cross-document deduplication, configurable search tuning, integrity and backfill tooling, analytics, and a custom DocumentDB MCP server. Achieved 100–300ms warm-cache latency over a multi-gigabyte index and made the service the live retrieval backend for rule construction.
- Built and productionized a standalone Python service that sets rule-specific `presence_threshold` and `context_threshold` values using consensus across gap detection, KDE, GMM/BIC, coefficient of variation, and bimodality analysis. Added cluster-split recommendations, IQR outlier detection, and combined trigram-Jaccard/SequenceMatcher near-duplicate detection. Deployed it to EKS with asynchronous job polling, Helm, file-backed persistence, tests, and a CVE-hardened, SBOM-attested image; it now recomputes thresholds automatically in the contract-editing pipeline.
- Designed and implemented AI/ML and LLM system components for BlackBoiler's legal SaaS platform, including semantic retrieval/RAG, dynamic relevance thresholding, model/LLM infrastructure integrations, and other production AI capabilities; also implemented chatbot functionality in the web UI as needed.
- Applied unsupervised ML/clustering to contract sentences for rule development and section classification; developed separate data-augmentation methods to expand and diversify ML corpora.
- Conducted applied NLP/ML research and prototyping at BlackBoiler to evaluate approaches for new legal-tech product features, including contract-language clustering and classification, corpus expansion/data augmentation, and semantic-retrieval techniques.
- Compared and evaluated alternative ML/NLP approaches for product features, including multiple clustering algorithms and dynamic-relevance-thresholding techniques such as gap-based methods, Otsu thresholding, and kernel density estimation (KDE), using experimental results to select approaches for production use.
- Extended BlackBoiler's multi-agent framework, modifying agent routing and orchestration to support new tools, workflows, and execution paths.

- Evaluated and implemented LLM systems infrastructure using MLflow, Bifrost, and AWS Bedrock, including model gateways, provider routing, centralized model access, observability, and Bedrock Guardrails.
- Translated emerging ML/AI and document-processing techniques from experimentation and prototype development into production SaaS capabilities, including semantic retrieval, RAG, automated contract editing, and supporting AI infrastructure.
- Worked across the full application stack, primarily on Python backend services and product logic, while also implementing web UI features and integrations when needed.
- Used coding agents extensively in day-to-day software development and helped evaluate which AI coding tools and usage patterns were appropriate for BlackBoiler from security, data-privacy, and compliance perspectives.
- Implemented chatbot functionality in BlackBoiler's web UI and contributed to other AI/ML-driven product integrations across the application.
- Built Python/boto3 tooling and automation, including deployment automation that reduced client deployment time from approximately 1 hour to under 5 minutes.
- Developed a Python-backed operational dashboard with a web UI integrating EKS, AWS, Cloudflare, and Sumo Logic data, enabling Customer Success to independently deploy and triage client environments. (Implemented in React; keep React as a secondary implementation detail when useful.)
- Refactored core services to improve document-processing performance and reliability and developed backend services supporting ML/AI-driven document workflows.
- Integrated Stripe payments and entitlements, enabling self-service registration and expanding the platform to smaller customers.

Senior Cyber Scientist | Leidos formerly SAIC | Arlington, VA — 2011–2019

Technologies and domains: Python, Linux, software analysis, binary analysis, static and dynamic analysis, concolic execution, machine learning, ontologies, OWL, RDF, Neo4j, Titan, Android, distributed systems, applied R&D

- Managed engineering and research project teams while leading R&D programs, helping propose and shape new research efforts, and performing hands-on applied research and software development involving source-code analysis, binary analysis, software security, machine learning, cyber modeling, and software big data. Served across programs as Principal Investigator, Lead Engineer, technical lead, team lead, researcher, and research developer.
- Served as Principal Investigator for the DARPA MUSE Evaluation & Infrastructure team, managing a six-person engineering and research team responsible for collecting and curating a ~22 TB software corpus and building analytics infrastructure to support analysis and evaluation of that corpus.
- Designed and ran evaluation activities for other DARPA MUSE research teams, including a wide range of challenge problems and hackathons used to exercise and assess research capabilities against the shared software corpus.
- Spearheaded collaboration across all DARPA MUSE teams, hosting and facilitating working groups and coordinating shared evaluation, challenge-problem, and technical collaboration efforts across the multi-organization program.
- Applied machine-learning techniques to automatically identify likely software build methods and dependencies from corpus data, supporting automated analysis and building of previously unseen software.
- Researched and developed software for automatically building previously unseen applications without prior knowledge of their build processes, including C, C++, Java, and Android software.
- Helped develop MUSE's shared metadata, repository, and syntactic ontology for corpus search and analytics. Worked through biweekly cross-performer meetings to incorporate researcher requirements and DARPA direction; the resulting ontology formed the basis for repository search and project classification in Phase 2.
- Served as Lead Engineer on DARPA CASE, developing tools and techniques to adapt compiled binaries to new non-functional requirements without access to original source code.
- Developed a convergent behavior-modeling approach for extracting binary behavior from execution traces, including traces generated using Angr, to characterize program behavior for subsequent binary adaptation.
- Built an ontology for representing non-functional software requirements used by the CASE research effort.
- On the IARPA-funded CAUSE project, created attack templates for multiple cyber-attack scenarios to model and help understand relationships between cyber activity and unconventional sensor data.
- On the IARPA-funded STONESOUP project, led an effort to characterize technology gaps and current coverage in software-analysis techniques, helping focus research on approaches combining static analysis with dynamic monitoring of Windows binaries.
- On the IARPA-funded STONESOUP project, developed a tool to automatically generate large sets of vulnerable-code test cases used to verify and validate software-security research prototypes.
- Worked on an internal R&D effort combining static analysis with dynamic analysis/concolic execution for Android applications.
- Developed new static-analysis techniques to extract behavioral profiles from Android applications for use in a malware-analysis tool.
- Architected and developed Android applications to display live data using the TENA (Test and Training Enabling Architecture) distributed-simulation protocol.
- Contributed to porting TENA middleware to Android so Android applications could participate directly in TENA-based distributed-simulation environments.
- Served as a research developer on an Office of Naval Research (ONR) project investigating automated generation of implementation code for network protocols.
- Led technical working groups and collaborations across multi-company research teams, organizing evaluations, challenge problems, technical roadmaps, and other joint research activities.

Principal Software Engineer Senior Technical Advisor and IT Department Head | Raytheon CSS formerly Virtual Technology Corporation | Alexandria, VA — Apr 2005–Aug 2011

Technologies and domains: C++, Perl, Python, HLA, RTI-NG, distributed modeling and simulation, VMware, server infrastructure, backup and recovery, Bamboo, SVN, Git, Salesforce, infrastructure security

- Led and worked on internal R&D projects, spearheaded IT infrastructure modernization and security planning during VTC's acquisition by Raytheon, and worked directly under the VP of Technology to implement technology initiatives spanning product development, architecture, infrastructure, security, and corporate systems.

- Managed VTC's IT Manager while serving as IT Department Head, with responsibility for the infrastructure organization alongside modernization, security planning, and acquisition integration.
- Served as a member of the Leadership Team, contributing to the company's strategic vision and helping translate that vision into tactical technology and engineering initiatives.
- Served as a senior technical advisor across software architecture, infrastructure, development practices, and security, helping teams evaluate and implement technology across multiple initiatives.
- Developed a 2–5 year product roadmap for the company's distributed-simulation products, incorporating direct customer interactions, company strategy, product needs, and longer-term technology vision.
- Developed innovative internal R&D prototypes to explore future product domains and commercial opportunities, including cyber modeling and simulation.
- Helped transition internal R&D prototypes and emerging technologies into product-oriented capabilities, bridging research, software engineering, infrastructure, product strategy, and commercial development.
- Spearheaded infrastructure modernization and virtualization, improving reliability and operational efficiency while preparing VTC's technology environment for integration into Raytheon's enterprise infrastructure.
- Developed and implemented a security plan for the IT infrastructure, establishing and strengthening the organization's infrastructure security posture.
- Ensured high availability of critical company data and services; led infrastructure improvements that increased server reliability to >99.9% and rearchitected backup and recovery capabilities.
- Owned VTC's infrastructure budget, making investment and operating-cost decisions alongside modernization, reliability, security, and acquisition-integration work.
- Successfully led technology migration and integration following VTC's acquisition by Raytheon, coordinating infrastructure transition, systems integration, and technology standardization across the organizations.
- Structured and executed the acquisition-related technology transition in a way that significantly reduced integration costs while enabling a smooth operational transition into Raytheon.
- Coordinated standardization of development tools and engineering practices across teams and divisions following the Raytheon acquisition.
- Designed and implemented company-wide developer infrastructure incorporating issue tracking, documentation/wiki, continuous integration, and version-control systems.
- Advocated for and led migration of the sales organization from disparate Excel spreadsheets to a customized Salesforce platform, improving consistency and visibility of sales information and processes.
- Contributed to proposals for government-funded modeling and simulation R&D and proposed and worked on Small Business Innovation Research (SBIR) efforts.

Senior Research Alchemist Principal Investigator and Manager | Cigital formerly Reliable

Oct 1997–Mar 2005

Software Technologies | Sterling, VA

Technologies and domains: Java, Java bytecode, J2ME, C, C++, Perl, Python, static and dynamic analysis, constraint optimization, aspect-oriented programming, vulnerability analysis, software assurance, security consulting

- Led and worked on multiple DARPA-, NASA-, and NIST-funded research projects in software security, software analysis, vulnerability detection, software assurance, and reliability; served as Principal Investigator, Co-PI, Project Lead, Technical Lead, manager, and hands-on researcher/developer.
- Spent approximately two years managing people and participating directly in hiring at Cigital, alongside research-program leadership and hands-on technical work.
- Managed other team leads at Cigital as part of the broader responsibility for research teams and co-management of Cigital Labs.
- Co-managed the technical direction of Cigital Labs, helping shape the company's applied-research agenda and the transition of promising research into usable tools and commercial product capabilities.
- Shared responsibility for the Cigital Labs budget and owned the budgets for individual funded research projects, connecting research plans, staffing, and technical execution to available funding.
- Served as a subject-matter expert in security, software analysis, and software reliability for Cigital's consulting organization, applying research expertise to enterprise and government client problems.
- Researched and developed one of the early automated analysis suites for Java bytecode, including advanced static and dynamic analysis techniques for identifying software vulnerabilities.
- Served as Principal Investigator on a project that created a security-vulnerability scanner for program executables by reusing source-based pattern-detection engines against compiled software.
- Designed the executable-scanning approach to leverage Cigital's existing proprietary source-analysis infrastructure, shortening the development lifecycle while extending existing technology into a new analysis domain.
- Served as Project Lead and Co-PI on a $1.8M research program investigating language-based security issues in resource-constrained wireless devices, leading analysis and development efforts aimed at improving and extending then-current security paradigms for Java-based devices.
- The J2ME research produced a suite of tools for exposing security vulnerabilities in the J2ME reference implementation and exploring security limitations of Java-based resource-constrained devices.
- Served as Project Lead and Co-PI on a $1.6M research program developing an Aspect-Oriented Programming (AOP) approach for addressing software-security vulnerabilities.
- Led a team in designing and implementing a complete AOP-based security system, including a purpose-built aspect language and weaver, to create modular solutions for a wide range of security issues.
- Served as Technical Lead on a $2M research program developing a software-certification pipeline for electronic-commerce applications, researching and implementing state-of-the-art techniques for automated detection of security vulnerabilities in C code.
- As part of the certification research, developed advanced static and dynamic analysis tools for Java bytecode alongside C vulnerability-analysis techniques.
- Analysis technologies developed through the software-certification research became the basis for Cigital's commercial vulnerability-detection product, directly connecting funded R&D to product capabilities.

- Work on the software-certification and vulnerability-analysis efforts resulted in two awarded U.S. patents related to software-vulnerability detection and remediation.
- Researched and developed a constraint-optimization technique for whole-path analysis of C programs, applying advanced program-analysis methods to software-vulnerability detection.
- Developed a quantitative, product-oriented software-certification methodology for a federal government agency.
- Performed a security risk assessment of a network-storage product, discovered and implemented working security exploits against the product, and traced the resulting technical risks through to business impact.
- Performed additional software-security consulting, technical assessments, and risk analysis for enterprise and government clients.
- Architected software configuration-management practices and contributed to secure software-development and IT-infrastructure design.
- Authored and co-authored peer-reviewed publications and technical reports in software security, program analysis, robustness, software certification, and aspect-oriented security; also organized and participated in research workshops and panels.

Software Engineer | Visix Software | Reston, VA 1997

Technologies and domains: Java, TCP/IP, cross-platform development tools, UI components, networking libraries

- Developed components for cross-platform Java development tools, including UI components and networking libraries for application frameworks.

PUBLICATIONS

- H.C. Cunningham, V.R. Shah, S. Shen, "Devising a Formal Specification for an Elevator Controller," Technical Report UMCIS-1994-10, University of Mississippi, 1994.
- D. Carlson, M. Guzdial, C. Kehoe, V. Shah, J. Stasko, "WWW Interactive Learning Environments for Computer Science Education," Proceedings of SIGCSE '96, February 1996.
- S. Bhattacharjee, M.H. Ammar, E.W. Zegura, V. Shah, Z. Fei, "Application-layer Anycasting," Proceedings of IEEE INFOCOM '97, April 1997.
- A.K. Ghosh, M. Schmid, V. Shah, "Testing the Robustness of Windows NT Software," 9th International Symposium on Software Reliability Engineering (ISSRE '98), November 4-7, 1998, Paderborn, Germany.
- A.K. Ghosh, V. Shah, M. Schmid, "An Approach for Analyzing the Robustness of Windows NT Software," Proceedings of the 21st National Information Systems Security Conference (NISSC), October 1998, Arlington, VA.
- T.J. Walls, V. Shah, A. Ghosh, "Towards Certifying Software for Security," Proceedings of ISACC 2000, September 2000, Reston, VA.
- M. Weber, V. Shah, C. Ren, "A Case Study in Detecting Software Security Vulnerabilities Using Constraint Optimization," IEEE Workshop on Source Code Analysis and Manipulation (SCAM), November 2001, Florence, Italy.
- V. Shah, "The Holy Grail of Software Quality," International Conference on Dependable Systems and Networks (DSN 2002), June 2002, Bethesda, MD.
- V. Shah, "Using Aspect-Oriented Programming to Address Security Concerns," International Symposium on Software Reliability Engineering (ISSRE), November 2002, Annapolis, MD.
- V. Shah, F. Hill, "An Aspect-Oriented Security Framework," DARPA Information Survivability Conference and Exposition (DISCEX), 2003.
- V. Shah, F. Hill, "An Aspect-Oriented Security Framework: Lessons Learned," Proceedings of AOSDSEC, 2004.
- B. De Win, V. Shah, W. Joosen, R. Bodkin, "Report of the AOSD 2004 Workshop on AOSD Technology for Application-Level Security," 2005.
- V. Shah, "An Aspect-Oriented Security Assurance Solution," DTIC Technical Report ADA419 305, 2003.
- S. Bhattacharjee, M. Ammar, E. Zegura, V. Shah, "On the Design and Implementation of Generalized Application-Layer Anycasting," Tech. Rep. GIT-CC-96-03, College of Computing, Georgia Institute of Technology, 1996.
- S. Bhattacharjee, M. Ammar, E. Zegura, V. Shah, F. Zongming, "Application-Layer Anycasting," Tech. Rep. GIT-CC-96-25, College of Computing, Georgia Institute of Technology, 1996.
- Workshop Organizer: AOSD Technology for Application-Level Security, Aspect-Oriented Software Development, Lancaster, UK, 2004.
- Workshop Participant: V. Shah, "Software Security: AOSD as the Savior," COMM: Commercialization of AOSD Technology, AOSD, 2003.
- Panelist: Wireless Security: Vulnerabilities and Solutions, ACSAC, Las Vegas, 2002.

PATENTS

- T.J. Walls, V. Shah, A. Ghosh, "System and method for identifying and eliminating vulnerabilities in computer software applications," US Patent 7,284,274.
- "Systems and methods for detecting software buffer security vulnerabilities," US Patent 7,302,707.

EDUCATION

- Ph.D. Program, Educational Technology — Georgia Institute of Technology
- M.S., Computer Science — University of Mississippi
- B.S., Computer Science — University of Mississippi

AWARDS

- Outstanding Computer Science Junior — University of Mississippi
- Outstanding Computer Science Senior — University of Mississippi
- Taylor Medal Honoree — University of Mississippi