Jaideep Singh

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Education

Lassonde School of Engineering, York University Toronto, ON
Bachelor of Engineering - Software Engineering (Specialized Honours) *Jan 2021 - May 2026*
- York University International Scholarship Recipient

Technical Skills

Languages: Java, Python, SQL, JavaScript, TypeScript, HTML/CSS, SystemVerilog, Verilog
Frameworks & Libraries: React, React Native, FastAPI, Django, Flask, Tailwind CSS, Java Swing
Databases: PostgreSQL, MySQL, Firestore, pgTAP, pg_prove
DevOps & Tools: Docker, Docker Compose, Kubernetes, Git, GitHub, Maven, Gradle, IntelliJ IDEA, VS Code
AI/ML: LLaMA (7B/13B), LoRA/QLoRA fine-tuning, GPT prompt engineering, LLM-assisted test generation
Testing: JUnit, JaCoCo, PIT Mutation Testing, EvoSuite, SpotBugs, pgTAP, YARA, Snort IDS
Security: OpenSSL (AES/RSA), YARA malware analysis, Snort IDS/IPS, XSS/CSRF exploitation, John the Ripper, Hydra
Hardware: Intel MAX10 FPGA, DE10-Lite, SPI protocol, VGA timing, PLL clock synthesis, FSM design
Other: REST APIs, gRPC, JWT, bcrypt, MVC, Agile, Docker Compose, requirements engineering, NLP (spaCy)

Professional Experience

Snz Infotech Private Limited - *Software Developer* Remote - India | Apr 2026 - Present
- Develop and maintain web applications using Java, JavaScript, HTML/CSS, and modern frontend frameworks, contributing to full-stack feature delivery across client projects.
- Write and execute unit tests, integration tests, and regression tests using JUnit and related testing frameworks to ensure code quality and reliability.
- Design and implement RESTful APIs and backend services, handling data processing, validation, and database interactions with SQL-based systems.
- Perform code reviews, debug production issues, and resolve defects across the application stack, improving system stability and reducing turnaround time.
- Collaborate with cross-functional teams in an Agile environment, participating in sprint planning, daily standups, and retrospectives.
- Build responsive, cross-browser web interfaces and optimize frontend performance for improved user experience.
- Write technical documentation for APIs, internal tools, and development workflows to support team onboarding and knowledge sharing.
- Participate in database schema design, query optimization, and data migration tasks to support application scalability.

Avis Budget Group Inc. - *Scheduler / Dispatcher / ERS Agent - Distribution* Etobicoke, ON | Oct 2022 - Present
- Coordinate fleet dispatch, vehicle positioning, and inventory management across a high-volume rental operation, maintaining service continuity and minimizing customer delays.
- Build and maintain employee work schedules and coordinate with Godspeed driver agency for driver scheduling, vehicle run assignments, and working-hour tracking.
- Rebuilt workforce scheduling system after operational data loss, restoring continuity and improving scheduling accuracy across the team.
- Developed the dispatch tracking template now used organization-wide, improving task visibility, follow-up, and cross-team coordination.
- Provide Emergency Roadside Services (ERS) for mechanical failures, accidents, towing, and vehicle recovery, handling escalated situations while prioritizing safety.
- Trained newly hired ERS agents and created Wizard system quick-reference guides adopted by the team for faster onboarding.
- Prepare operational reports on fleet movement, vehicle availability, and staffing to support daily planning and management decisions.

Projects

SalonAI - AI-Powered Salon Management System | *React, Django, LLaMA, PostgreSQL, Docker, K8s*

- Built an AI-powered salon management system with a 7-member team, delivering 15 REST API endpoints across 4 route modules for appointment booking, price estimation, and personalized hairstyle recommendations for 6 face-shape profiles.
- Designed 3-tier architecture: React/React Native frontend, Django REST API backend, and LLaMA 7B/13B AI module (fine-tuned with LoRA on 2x NVIDIA V100 GPUs) communicating via REST/gRPC.
- Implemented role-based access control across 3 user roles (client, stylist, admin) with JWT authentication, bcrypt hashing, and 12 Pydantic validation schemas enforcing data integrity.
- Containerized 3 microservices with Docker Compose (PostgreSQL 15, backend API, frontend) and orchestrated deployment using Kubernetes for horizontal scalability.

Auction Bidding E-Commerce Platform | *React, TypeScript, FastAPI, PostgreSQL, Docker*

- Developed a full-stack auction platform with 15 API endpoints across 5 routers (auth, items, auctions, bids, users), supporting real-time bid tracking, time-bound auction management, and Luhn-validated payment processing.
- Built the backend with Python FastAPI and PostgreSQL (4 models, 30 columns, 3 foreign key relationships); implemented bcrypt hashing, JWT (HS256) authentication, and 12 Pydantic validation schemas.
- Created 11 React + TypeScript + Tailwind CSS components with 12 API wrapper functions and containerized the 3-service stack with Docker Compose for one-command deployment.
- Applied test-driven development with 12 pytest test functions using FastAPI TestClient, covering user registration, bid placement, auction lifecycle, and edge-case validation.

Farmer's Hub - Agricultural Marketplace App | *Java, Swing, PostgreSQL, Gradle, JUnit*

- Built a 2,888-line Java marketplace with 51 source files, featuring 9 domain models, 10 JavaFX views, 5 controllers, and 4 PostgreSQL tables supporting dual user roles, shopping cart, order management, and review/rating system.
- Implemented MVC architecture with Repository + Strategy patterns using 12 repository files (4 interfaces, 4 mock, 4 Postgres implementations) enabling zero-code database backend swapping via config flag.
- Wrote 30 JUnit 5 tests (25 unit + 5 integration) with 40+ assertions and Gradle build automation; designed class hierarchy using inheritance (User to Farmer/Customer, Item to Produce/Machine).

Real-Time Accelerometer-Based VGA Graphics Controller | *SystemVerilog, FPGA, SPI, VGA*

- Designed an 11-module real-time sensor visualization system on Intel MAX10 FPGA (DE10-Lite), bridging an ADXL345 accelerometer to a 640x480 @ 60 Hz VGA display across 4 subsystems - entirely in hardware with no soft-core processor.
- Implemented a custom SPI Master controller and FSM in SystemVerilog to configure the accelerometer and continuously read X-axis tilt data with 58 top-level port signals.
- Managed 3 clock domains (50 MHz system, 2 MHz SPI, 25 MHz VGA) using 2 PLL IP cores with proper clock domain crossing to prevent metastability and data corruption.
- Created a novel feedback loop where extreme tilt (shown on 10-bit LED array) triggers dynamic RGB color changes on the VGA output, with parallel 7-segment display readout.

Morse Code Display System | *Verilog, DE10-Lite FPGA, FSM*

- Designed a 4-module FPGA-based Morse code translator supporting all 26 characters (A-Z) with 3 simultaneous output modalities: 7-segment display, LED blink patterns, and mechanical relay clicks.
- Implemented a 5-state Moore FSM with 7 state transitions for dot/dash timing (0.5s/1.5s) and a 25-bit clock divider reducing 50 MHz to 2 Hz enable pulses, using shift-register-based MSB-first transmission.
- Built an external transistor-based amplifier circuit driving LED and relay simultaneously; verified timing with ModelSim testbench across 3 test characters.

Database Testing Suite - Pagila PostgreSQL | *PostgreSQL, pgTAP, pg_prove, SQL*

- Evaluated 10 database testing frameworks and selected pgTAP + pg_prove; wrote 6,864 lines of test SQL across 90 files with 767 pgTAP assertions (474 is(), 244 ok(), 35 throws_ok()) - 100% pass rate.
- Built a manual test suite of 259 tests (15 files) validating 46+ database objects: 15 tables, 7 views, 10 functions, 2 triggers, 36 foreign keys, and 22 primary keys across 13 test categories.
- Extended to 508 AI-assisted test cases (75 files) with 42 reusable pg_temp helper functions, adding business rule validation, regression checks, partition testing, and edge cases.

Test Suite Analysis & LLM-Assisted Improvement | *Java, JUnit, JaCoCo, Maven, LLM*

- Analyzed test coverage across 50 algorithm implementations using JaCoCo + PIT, improving line coverage from 72.4% to 89.2% (+16.8pp), branch coverage from 58.1% to 78.5% (+20.4pp), and mutation score from 61% to 79% (+18pp).
- Applied a 5-step methodology: baseline analysis, gap categorization by type (boundary, edge case, error path), targeted LLM test generation, validation, and before/after comparison with 4 coverage tools.
- Identified and documented cases where branch coverage diverges from condition-decision coverage due to short-circuit evaluation in algorithms like AhoCorasick, SuffixArray, and MinCostMaxFlow.

Apache Commons CLI Testing Enhancement | *Java, JUnit, Maven, PIT, JaCoCo, EvoSuite*

- Engineered 1,938 test methods producing 3,965+ assertions across 36 production classes, achieving 98% line/instruction coverage and 95% branch coverage with build-enforced JaCoCo thresholds.
- Designed 36 parameterized tests and 11 bug regression test classes (targeting known CVE-adjacent bugs); integrated 31 EvoSuite-generated suites and validated across 6 JDK versions (8, 11, 17, 21, 25, 26-ea).
- Configured a 6-tool quality pipeline (JaCoCo, PIT mutation testing, SpotBugs, Checkstyle, PMD, Apache RAT) with 4 GitHub Actions workflows including CodeQL security scanning and OpenSSF Scorecard audits.

Smart Health & Wellness Center - Requirements Verification | *NLP, spaCy, GPT, Model Checking*

- Extracted 15 functional and 9 non-functional requirements using NLP tools (spaCy, GPT), then formally verified 25 LTL properties across 3 concurrent process models (user, booking, payment) using SPIN model checker - 21 passed, 4 revealed genuine concurrency bugs.
- Classified requirements across 5 subsystems (User Management, Scheduling, Payment/Billing, IoT Monitoring, Analytics) with HIPAA/GDPR compliance; wrote 4 Promela models and 3 property specification files covering safety, liveness, and fairness.

Web Architecture Scalability Research | *MVC, Event Sourcing, Microservices*

- Authored a 5-page research paper with 9 academic references, evaluating MVC, Event Sourcing (Kafka, CQRS), and Microservices across 4 criteria (scalability, testability, data consistency, parallel development) with case studies from Netflix, Amazon, and The Guardian.
- Proposed a novel combined architecture integrating all three patterns - MVC processes inputs, Event Sourcing logs immutably, Microservices consume events - resolving monolithic limitations for modular, auditable systems.

Computer Security Lab Portfolio | *OpenSSL, YARA, Snort, Kali Linux, Python*

- Completed 6 hands-on security labs using 18+ tools: performed static analysis on AgentTesla malware (PE32/.NET), identifying 2 anti-analysis techniques and writing custom YARA detection rules with 3 signature patterns.
- Exploited 3 CVEs (ProFTPD mod_copy, UnrealIRCd backdoor, Slowloris DoS), fingerprinted 7 services via 5 Nmap scan types, and obtained 2 reverse shells on Metasploitable3; deployed Snort 3.x IDS with custom detection rules.
- Implemented AES-256-CBC/RSA-2048 encryption with OpenSSL, cracked passwords using John the Ripper + Hydra (rockyou.txt/14M+ entries), and demonstrated 4 web attack types (File Upload XSS, Reflected XSS, Stored XSS, CSRF) on Google Gruyere.

Leadership & Community

City of Markham | Markham Environmental Advisory Committee - *Committee Member* May 2026 - Present

- Contribute to sustainability and environmental awareness initiatives, bringing a software engineering perspective to data-driven environmental decisions.

Youth Challenge International - *Mentor - Human x Tech Program* May 2026 - Present

- Co-designed a community challenge question on AI-powered multilingual food waste classification for Markham's diverse population (82% visible minority, 58% immigrants), representing the Markham Environmental Advisory Committee.
- Mentor youth teams building solutions using computer vision image recognition and Learning from Demonstration (LfD) to train AI models on culturally specific food items not covered by existing waste sorting tools.
- Developed a data collection and employment pipeline framework with 5 role categories (Data Collection Specialists, Data Labellers, Quality Reviewers, Outreach Coordinators, Language Specialists) designed for scalability across Canadian cities.

Waste Less, Feed More - *Team Lead* Sep 2024 - Apr 2025

- Led an 8-member cross-functional team to deliver a community-driven food waste awareness campaign for the Markham

Environmental Advisory Committee, coordinating content creation, web development, and outreach across multiple deliverables which was featured by City's social media handles (Campaign Video).

- Directed end-to-end project execution - from stakeholder alignment and task delegation to final delivery - producing an educational website, an interactive eBook, social media content, and a video presentation featured by the City of Markham.
- Aligned all deliverables with UN Sustainable Development Goals: Zero Hunger (SDG 2), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13).

Certifications & Additional

Certification: Project Management Foundations - LinkedIn Learning (2025)