MARTIN A. JACKSON Senior Computer Scientist | Software Architect | Full-Stack Developer

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Professional Summary

Software architect and full-stack technical lead who owns production systems end-to-end — from database schema through deployment pipeline to live monitoring. At the FDA's National Center for Toxicological Research (NCTR), I led the architecture and modernization of enterprise-scale scientific computing infrastructure serving hundreds of researchers, including a 97% performance improvement on a critical research platform and a successful 11TB database migration with zero downtime. I drive technical direction, mentor engineers, and translate complex requirements into reliable, maintainable systems. My stack spans **TypeScript, React, Node.js, PostgreSQL, Go, Rust, Docker, and Linux/NGINX** — and I operate all of it in production, not just write it.

Career Highlights

- **97% faster**: Migrated Multi-species Behavioral System from Python to Node.js, cutting query time from 186.7s to 6.28s
- **11TB zero-downtime migration**: Moved Oracle schemas and pathology data to PostgreSQL/SQLite without interrupting research
- **134 vulnerabilities mitigated**: Identified and resolved security flaws across legacy systems, establishing SQL injection prevention and role-based access
- **Production operator**: Run multiple live services on nginx/systemd with TLS, CI/CD, and automated WAL-consistent backups
- **Cross-runtime performance engineering**: Built load-testing harness comparing Node.js, Go, and Rust at 1–1000 concurrent users with p50/p95/p99 latency profiling

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Core Competencies

Technical Leadership & Architecture

- **Full-Stack Development**: Node.js, React, Express, TypeScript, HTMX, HTML5, CSS3, JavaScript
- **Backend Systems**: Go, Rust (Axum/Tokio), NGinx, Python, Java, C/C++, RESTful APIs, GraphQL, WebSocket, Microservices
- **Database Expertise**: Oracle, PostgreSQL, SQLite, MongoDB, SQL Injection Prevention
- **Cloud & DevOps**: Docker (multi-stage builds), Linux Administration (Arch/Ubuntu/Red Hat), NGINX Reverse Proxy & TLS, systemd Services, Automated Backups, GitLab CI/CD, Security Hardening
- **AI & Modern Tools**: Prompt Engineering, AI-Assisted Development, Automated Testing (Vitest, Playwright, Jest)

Domain Expertise

- **Scientific Software**: Toxicology Research Systems, Real-time Data Collection, Bioinformatics
- **Regulatory Compliance**: GLP (21 CFR Part 58), FDA Security Standards, PIV Authentication
- **System Security**: Security Audits, Vulnerability Mitigation, TLS 1.2 Implementation
- **Performance Optimization**: Database Tuning, Asynchronous Programming, Load Testing

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Professional Experience

Senior Computer Scientist (GS-1550-13)

FDA, National Center for Toxicological Research (NCTR) | 1981 - Present

Technical lead and architect responsible for the full lifecycle of production scientific computing systems — from requirements and design through deployment and operations. Owned technical outcomes for a team of 5+ engineers, drove architectural decisions, modernized legacy systems incrementally, and maintained reliable service for hundreds of active researchers throughout every transition.

Key Achievements: - **Led cloud-readiness transformation** of Multi-species Behavioral System (MBS), migrating from Python to Node.js achieving **97% performance improvement** (186.7s → 6.28s query time) while maintaining backward compatibility for existing researchers - **Spearheaded enterprise database migration**, successfully moving 11TB of pathology data and Oracle schemas to PostgreSQL and SQLite architectures with zero downtime and zero data loss across the research community - **Identified and mitigated 134 security vulnerabilities** across legacy systems, establishing SQL injection prevention, role-based access controls, and a security-first development culture - **Own production web infrastructure end-to-end**: deploy and run multiple Node.js and Go services behind nginx with TLS (Let's Encrypt), systemd service management, GitLab CI/CD pipelines, and automated WAL-consistent SQLite backups — achieving zero-downtime redeploys across live services - **Built cross-runtime load-testing and observability harness** driving Node.js (Express), Go, and Rust services at 1–1000 concurrent users against live PostgreSQL data, capturing p50/p95/p99 latency, throughput, CPU/RSS, and file-descriptor-leak metrics to guide architecture and runtime decisions - **Pioneered AI-enhanced development workflows**, implementing automated testing with 97.8% code coverage using Claude and Vitest, reducing manual testing by 80% - **Architected authentication modernization**, developing PIV-enabled Node.js/NGINX solution replacing legacy systems while maintaining backward compatibility - **Modernized development infrastructure** with zero interruption: migrated from GitHub Enterprise to GitLab Enterprise to GitLab CE, containerized deployments, and trained team on DevOps practices — delivering significant cost savings - **Developed polyglot backend portfolio** with production-ready applications in Go (WebSocket kanban board, reading tracker), Rust (Axum/Tokio async portfolio site), and TypeScript (strict-mode SQLite ER-diagram viewer with 22 Vitest tests) — all with Docker, SQLite, and real-time capabilities - **Implemented local AI/ML inference and LLM-integrated tooling**: Go/CGo bindings to llama.cpp with CUDA GPU offload and GGUF models for a video-to-text summarization pipeline, plus a Python proofreading workflow that preserves Word Track Changes — shipping AI features with full control over cost, privacy, and latency

Technical Leadership: - Own technical direction and system design; influence architecture decisions across cross-functional teams of engineers, QA, and product stakeholders - Mentor 5+ engineers on modern JavaScript frameworks, automated testing, and security best practices - Translate research requirements into practical technical solutions; drive those solutions through implementation and into production - Lead technology selection committees, ensuring alignment with security requirements and scientific research needs

Robotics Software Engineer

Metal Fabricating Systems | 1985 - 1986 (14 months)

Developed control software for steel fabrication robotics systems in a manufacturing environment as well as GM windshield placement.

Key Achievements: - Reduced existing code base by over 80% while adding dual measurement support (inches and metric), enabling Canadian and European market expansion - Programmed real-time robotic control systems for steel forming and fabrication processes - Developed hardware interface drivers for industrial automation equipment - Implemented safety-critical control logic for heavy machinery operations

Software Engineer V

ICF/Z-Tech Corporation (FDA Contract) | 2004 - 2012

Principal software developer for NCTR research systems, focusing on web-based scientific applications and database architecture.

Key Achievements: - Developed ArrayTrack™ bioinformatics platform, building data integration pipelines that ingested and synchronized gene expression datasets from 20+ institutions into a unified searchable research platform serving 10,000+ datasets - Developed web and database components of FDALabel, a nationwide data synchronization system aggregating structured submissions from drug, food, and device manufacturers into searchable consumer safety documents — ensuring correctness and idempotency across distributed submissions - Co-inventor on FreshTag™ patent, designing software architecture for real-time food freshness monitoring system - Implemented Oracle database optimization strategies, improving query performance by 40% - Led Agile/Scrum adoption, reducing project delivery cycles by 30% - Co-authored FDA Ubuntu Linux Hardening Guide, establishing agency-wide security standards

Software Architect

Northrop Grumman IT (FDA Contract) | 1994 - 2004

Technology evangelist introducing modern development practices to NCTR's scientific computing environment.

Key Achievements: - Architected patent-pending SIAS colorimetric analysis system, reducing phototoxicology analysis time by 60% - Developed Linux kernel drivers for real-time behavioral testing hardware - Led NCTR's first web-based scientific application deployment, serving 100+ researchers - Established Java development standards and object-oriented design practices

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Technical Skills

- **Languages**: TypeScript, JavaScript, Go, Rust, Python, Java, C/C++, C#, Bash, PowerShell, Perl, SQL
- **Frameworks**: Node.js, React, Express, Axum, GraphQL, REST APIs, WebSocket
- **Databases**: Oracle (PL/SQL), PostgreSQL, SQLite, Redis, MongoDB, SQL Optimization
- **Cloud & DevOps**: Docker (multi-stage builds), Linux Administration, NGINX Reverse Proxy & TLS, systemd Services, Automated Backups, GitLab CI/CD, Apache
- **Security**: PIV Authentication, TLS 1.2, Security Auditing, SQL Injection Prevention, Vulnerability Mitigation
- **Testing**: Vitest, Playwright, Jest, Unit Testing, Automated Code Review
- **Observability & Performance**: Load & Stress Testing (1–1000 concurrent users), Percentile Latency (p50/p95/p99), CPU/Memory/FD-Leak Profiling, Metrics Collection
- **AI & Modern**: Prompt Engineering, AI-Assisted Development, Claude API, Local LLM Inference (llama.cpp, CUDA), Performance Profiling
- **Methodologies**: Agile, Scrum, Solution Architecture, Stakeholder Management, Technical Leadership

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Education & Certifications

Bachelor of Science in Computer Science
University of Arkansas at Little Rock | 1989
- Minors in Electrical Engineering and Mathematics

Professional Development: - GLP Training Certificate (21 CFR Part 58 Compliance) - FDA Annual Ethics Training 2025 - Mastering JavaScript Unit Testing (Vitest) - O'Reilly Fluent Conference Speaker 2013

Selected Publications & Presentations

1. **Chen, M., Jackson, M., et al.** "ebTrack: an environmental bioinformatics system built upon ArrayTrack™" - *Proceedings of the First International Conference on Toxicogenomics Integrate with Environmental Sciences (TIES-2007)*
2. **Jackson, M.** "A Self-Maintained Space Management System with Dynamic Manipulation Capability for Pictorial Data" - *Arkansas Computer Conference, 1993*
3. **O'Reilly Fluent Conference 2013** - Ignite Speaker: "Change is going to happen, how is your project prepared for it?"

Awards & Recognition

- **O'Reilly Fluent Conference 2013** - One of seven Ignite Speakers selected from hundreds of applicants
- **Sun Microsystems JavaOne Symposium** - One of eight technologists invited to present nationally