

Professional Summary

Senior Computer Scientist with **44+ years (1981-Present)** of experience at the FDA's National Center for Toxicological Research (NCTR), specializing in **full-stack development**, **systems architecture**, and **scientific software engineering**. Expert in leading cross-functional teams, implementing modern web technologies, and ensuring regulatory compliance including GLP and FDA security standards. Proven track record of architecting scalable systems from real-time data collection to cloud-ready microservices. **AI-enhanced development practitioner** with deep expertise in JavaScript ecosystems, database optimization, and security hardening.

Core Competencies

Technical Leadership & Architecture

- **Full-Stack Development:** Node.js, React, Express, HTML5, CSS3, JavaScript/TypeScript
- **Backend Systems:** NGinx, JavaScript/NodeJS, Python, Java, C/C++, RESTful APIs, GraphQL, Microservices
- **Database Expertise:** Oracle, PostgreSQL, SQLite, Redis, MongoDB, SQL Injection Prevention
- **Cloud & DevOps:** Docker, GitLab CI/CD, Linux Administration (Arch/Ubuntu/Red Hat), 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

Lead software architect and technical expert for the Division of Bioinformatics and Biostatistics, overseeing critical scientific computing infrastructure and research applications. Managed cross-functional development team and led solution architecture for enterprise-scale scientific systems.

Key Achievements: - **Architected NCTR's authentication modernization**, developing PIV-enabled Node.js/NGINX solution replacing legacy systems, enhancing security while maintaining backward compatibility - **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) - **Pioneered AI-enhanced development workflows**, implementing automated testing with 97.8% code coverage using Claude Sonnet 4.5 and Vitest, reducing manual testing by 80% - **Established security-first development culture**, identifying and mitigating 134 security vulnerabilities in legacy systems, implementing SQL injection prevention and role-based access controls - **Spearheaded database migration strategy**, successfully moving 11TB of pathology data and Oracle schemas to PostgreSQL and SQLite architectures. - **Modernized development infrastructure**, upgrading GitLab to containerized deployment, implementing CI/CD pipelines, and training team on DevOps practices. Made significant business savings from GitHub Enterprise, to GitLab Enterprise, and finally to GitLab CE. All the while causing zero interruption to the NCTR community.

Technical Leadership: - Mentor development team of 5+ engineers on modern JavaScript frameworks, testing methodologies, and security best practices - Lead technology selection committees, ensuring alignment with FDA security requirements and scientific research needs - Design and implement microservices architecture supporting

real-time data collection for toxicology studies - Establish version control standards and automated testing frameworks ensuring GLP compliance

Robotics Software Engineer

Metal Fabricating Systems / 1985 - 1986 (14 months)

Developed control software for steel fabrication robotics systems in a manufacturing environment.

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, supporting nationwide toxicogenomics research across 20+ institutions with 10,000+ gene expression datasets - Developed web and database components of FDALabel, a nation-wide system to ensure consumer safety and informed decisions, structured data for drugs/food/devices allowing searchable access to these documents submitted by manufacturers. - 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

Technical Skills

- **Languages:** JavaScript/TypeScript, Python, Java, C/C++, C#, Bash, PowerShell, Perl, SQL
- **Frameworks:** Node.js, React, Express, Vue.js, Django, Flask, Spring, GraphQL, REST APIs
- **Databases:** Oracle (PL/SQL), PostgreSQL, SQLite, Redis, MongoDB, SQL Optimization
- **Cloud & DevOps:** Docker, GitLab CI/CD, AWS, Linux Administration, NGINX, Apache
- **Security:** PIV Authentication, TLS 1.2, Security Auditing, SQL Injection Prevention, Vulnerability Mitigation
- **Testing:** Vitest, Playwright, Jest, Unit Testing, Automated Code Review
- **AI & Modern:** Prompt Engineering, AI-Assisted Development, Claude API, Performance Profiling
- **Methodologies:** Agile, Scrum, Solution Architecture, Stakeholder Management, Technical Leadership

Education & Certifications

Bachelor of Science in Computer Science

University of Arkansas at Little Rock / 1989

- Minors in Electrical Engineering and Mathematics

- 129 semester hours: 48 CS, 18 Electrical Engineering, 18 Statistics/Math

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