Dalron J. Robertson, M.S.

AI/ML Research Engineer | Pharm.D. Candidate

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Experience Summary

Creator, engineer, and researcher working across the life sciences. With roots in the arts and training in biomedical science, clinical pharmacology, and software engineering, I build intelligent systems using high performance computing and machine learning to accelerate discovery, express ideas, and give structure to meaningful scientific work.

Technical Skills

Al & Large Language Models: ChatGPT | Deepseek | Gemini | Grok | LlaMa | OpenAl | TinyLlama Bioinformatics & Molecular Modeling: AlphaFold | ChimeraX | SwissTargetPrediction | Molinspiration | UniProt DataScience & Machine Learning: Tensorflow | Scikit-Learn | Pandas | NumPy Languages: Javascript | Python | Pinescript | Java | C | C++ | PostgreSQL | MySQL Tools & Technologies: Git | AWS | ISOLIDE | Schrödinger | jest | DocuTrack | Framework LTC | UiPath Web Development: Node.js | React.js | Express.js | Flask | HTML | CSS | AJAX | DOM | jQuery

Research & Publications

Domain-Specific Large Language Model for Life Sciences and Healthcare | Jan 2025 -

Designing an innovative AI architecture inspired by human cortical brain function, combining specialized LLMs and dynamic retrieval to accelerate scientific discovery across biology and medicine. The system scales autonomously as new research domains ("gyri") emerge.

- **Neuro-inspired Modular Architecture:** Leveraging principles from human cortical structure (Brodmann's areas) to define and organize specialized knowledge domains clearly and efficiently.
- **Specialized Expert Models ("Gyri"):** Creating highly specialized Mixture of Experts (MoE) models for distinct biomedical and life sciences disciplines, allowing deep expertise and rapid retrieval.
- **Central Knowledge Layer for Agentic Systems:** Establishing a foundational knowledge substrate enabling a central agentic system to dynamically query and synthesize knowledge across diverse, specialized gyri for complex scientific reasoning.
- Autonomous & Continuous Learning: Developing autonomous systems that continuously ingest new literature and datasets, retraining and expanding specialized gyri without requiring human intervention or full retraining cycles.
- **Dynamic Routing & Integration:** Implementing intelligent, brain-inspired routing that dynamically synthesizes outputs from multiple specialized gyri, effectively handling multidimensional scientific problems.
- Authored Foundational Architecture Paper: Wrote and published "The NaS Cortex: A Knowledge Architecture for the Life Sciences", formally detailing the system architecture, computational strategies, and future roadmap for autonomous, agent-driven discovery across life sciences.
- **Prototype Design and Evaluation:** Led initial system prototyping, benchmarking performance on Apple Silicon hardware, and identifying key constraints and next steps for scaling domain-specific MoE models and distributed training pipelines.

(White paper available upon request)

Bioinformatic Profiling and Pharmacological Evaluation of Phytochemical Constituents *.N. sativa* Mississippi College | Dr. Angela W. Reiken | Jan 2025 - May 2025 |

https://bit.ly/DJR-PhytochemicalResearch

Conducted comprehensive research investigating the pharmacological and therapeutic potential of ethanol-derived Nigella sativa extracts using bioinformatics, computational chemistry, molecular modeling, and experimental validation. Presented findings at an academic symposium. Recognized by the Provost for excellence in research pipeline and methodology.

- Detailed Research Pipeline and Responsibilities:
 - Phase 1: Data Collection & Literature Mining
 - Applied Deep Research methodologies (OpenAI LLMs) to rapidly extract and synthesize bioactivity data, chemical constituents, and pharmacological profiles from PubMed, PubChem, and UniProt.
 - Phase 2: Compound Library Creation & Chemical Profiling
 - Created a chemical library of bioactive constituents, performed molecular descriptor calculations, drug-likeness assessments (Molinspiration, SwissADME), and prioritized compounds via PCA and hierarchical clustering.
 - Phase 3: Target Identification, Protein Structure Modeling & Advanced Visualization
 - Executed computational target prediction using SwissTargetPrediction to identify high-confidence protein targets (probability thresholds ≥ 0.50–0.70+), followed by comprehensive validation through literature reviews and database cross-referencing.
 - Generated accurate 3D structural predictions of protein targets with AlphaFold, establishing robust structural frameworks to facilitate subsequent docking studies.
 - Created high-resolution 3D visualizations and instructional videos using ChimeraX and Blender to effectively communicate molecular structures, binding sites, and protein-ligand interactions.
 - Phase 4: Virtual Screening, Molecular Docking & Interaction Analysis (Current Phase)
 - Conducting rigorous molecular docking simulations to characterize ligand-target interactions and predict binding affinities. Tools currently employed include CB-Dock2 and Schrödinger Suite (Glide, LigPrep) for precise docking accuracy.
 - Analyzing docking results, generating detailed interaction maps, binding affinity plots, and comparative scoring analyses.
 - Producing comprehensive visual documentation to present docking outcomes, enabling enhanced interpretation of ligand-target dynamics using ChimeraX and Blender.
 - Wet Lab Techniques:
 - Anti-inflammatory assays: Protein denaturation inhibition, proteinase inhibitory assay.
 - **Phytochemical analyses**: Total flavonoid and flavonol content determination using aluminum colorimetric method.
 - Antioxidant activity assays: DPPH radical scavenging, H₂O₂ radical scavenging.
 - **Spectrophotometry & Quantitative Analyses**: Calibration curves, standard preparation, absorbance measurements, calculation of bioactivity equivalents.
 - Teaching & Mentorship:
 - Provided comprehensive training and mentorship to a team of 20 undergraduate and graduate researchers throughout the entire computational research pipeline.
 - Instructed team members in bioinformatics and computational chemistry techniques, molecular modeling, and data visualization using specialized software, including OpenAI LLMs, SwissTargetPrediction, AlphaFold, ChimeraX, Blender, Schrödinger Suite (Glide, LigPrep), and CB-Dock2.

Comparative Enzymatic Hydrolysis of Lactose Across Milk Types Using Exogenous Lactase | Graduate Research Project | Mississippi College | Dr. Angela W. Reiken | Sep 2024 -Dec 2024 |

Designed and conducted an original research experiment to evaluate the effectiveness of lactase enzyme supplements across different milk types with varying fat content. The study employed glucose-based colorimetric assays to quantify lactose hydrolysis, assess enzyme efficiency, and examine potential interference from milk composition.

- Designed an experimental protocol simulating lactose digestion across five milk conditions, including whole, 2%, 1%, fat-free, and almond (NC), to assess enzyme functionality across variable fat content.
- Measured pre- and post-treatment glucose levels using semi-quantitative glucose test strips at multiple time points to evaluate enzymatic breakdown of lactose and rate of hydrolysis
- Analyzed data using enzyme kinetics principles to evaluate lactase activity across varying milk types, observing consistent enzymatic performance and minimal impact of fat content on catalytic efficiency.
- Presented findings to faculty and peers, including discussion of methodological limitations, real-world implications for dietary management, and recommendations for future research.

Experience

Mississippi College, Clinton MS

Lead Graduate Researcher | Dec 2024 - Jul 2025

- Employed OpenAI LLMs to systematically extract and synthesize bioactivity data, phytochemical profiles, and pharmacological properties from extensive databases including PubMed, PubChem, and UniProt.
- Established a curated chemical library of Nigella sativa constituents, performed molecular descriptor analysis, drug-likeness screening (via SwissADME and Molinspiration), and prioritized lead candidates using statistical methods (PCA, hierarchical clustering).
- Applied SwissTargetPrediction for precise molecular target identification and generated highly accurate 3D structural models of identified protein targets using AlphaFold. Created advanced visualizations for protein-ligand interactions using ChimeraX and Blender software.
- Conducted rigorous molecular docking studies utilizing CB-Dock2 and Schrödinger Suite (Glide, LigPrep) to analyze ligand binding affinities, predict pharmacodynamic behavior, and interpret interaction dynamics through detailed visual mapping.
- Performed supporting wet-lab validations: anti-inflammatory, antioxidant assays, phytochemical quantifications, and spectrophotometric analyses.
- Trained and mentored a team of 16 undergraduate and graduate researchers, facilitating instruction in bioinformatics methodologies, computational chemistry techniques, and molecular modeling software.

Scale AI, San Francisco, CA

AI Software Engineer | Sept 2023 - Jan 2025

- Collaborated with Google to enhance Gemini, developing training sets improving performance.
- Improved the YouTube search engine within Gemini, enabling models to scan videos, extract relevant content, and present it effectively to users.
- Enhanced the Google search engine by training models to deliver more accurate and relevant search results.
- Developed expertise in Side-by-Side (SxS) evaluation techniques focused on enhancing model responses, enabling real-time improvements to model training, and adjustment of training parameters.
- Built synthesis algorithms to create data to facilitate AI understanding of temporal and relational data.
- Conducted red teaming exercises to identify and mitigate vulnerabilities.
- Conducted in-depth analysis of AI model outputs, assessing model performance and identifying areas for model improvement, leading to measurable increases in model precision and client satisfaction.

Author & Self-Publisher

Independent | Aug 2023 - Present

- Published three full-length titles: Circuit Breakers: Echoes of Innovation, Circuit Breakers: Imperfections, and To Love Ignorantly: Love's Memoir.
- Managed the end-to-end publishing process, including manuscript development, cover design, formatting, and distribution via Amazon KDP, Google Books, and Barnes & Noble.
- Designed digital and print-ready marketing assets; developed metadata strategies to enhance discoverability across platforms.
- Oversaw proofreading, typesetting, and quality control to meet industry publishing standards across formats.

Equities & Derivatives Strategist

Self Employed | Aug 2021 - Present

- Leveraged AI models, including LSTM and GPT-4o-mini, to optimize trading strategies, improve decision-making, and manage risk.
- Built robust processing pipelines integrating historical and live data for real-time data analysis.
- Created custom indicators and analytical tools using PineScipt on the TradingView platform.
- Implemented multi-layered security frameworks to protect trading data and ensure compliance with regulations.

Medication Management Partners, Crestwood, IL

Pharmacy Informatics & Automation, Staff Pharmacist-in-Training Aug 2020 - Apr 2022

- Managed end-to-end prescription workflows for over 150 long-term care (LTC) facilities, including first and second quality verification (QV1/QV2), medication history review, therapy comparisons, and DURs.
- Led daily standup meetings and participated in weekly department head sessions, offering system-level insights and operational feedback to support organizational performance.
- Served as the primary informatics lead across Framework LTC, DocuTrack, and eMAR systems, ensuring system integrity, script accuracy, and seamless provider communication
- Operated, maintained, and troubleshot robotics platforms including TCGRx ATP, Parata Max, and IntelliVault, supporting accurate dispensing, cycle fill automation, and controlled substance compliance.
- Maintained and stocked pharmacy shelves, cabinets, and robotic canisters, overseeing inventory levels, ordering processes, change of strength (COS) updates, and waste reduction strategies.
- Handled real-time communication with LTC providers, physicians, and insurance payors, resolving prior authorizations, script clarifications, adjudication errors, and patient-specific concerns.
- Trained and mentored new team members across automation, verification, informatics, and clinical workflows, establishing SOPs and maintaining high team performance standards.
- Coordinated medication packing, shipping, and mailing operations, ensuring accurate fulfillment and timely delivery for all facilities served.
- Played a central role in a startup environment of ~80 employees across five departments, consistently recognized for adaptability, technical leadership, and full-spectrum operational command.

CVS Health, Chicago, IL

Staff Pharmacy Manager-in-Training | Jul 2015 - Aug 2020

- Effectively followed workflow procedures with an in-depth understanding of each workstation for day-to-day coordination and processing.
- Coordinated/implemented the training and development of support staff with field training team
- Assisted Pharmacist with managing day-to-day activities and administration.
- Understood and followed applicable Federal and State laws (e.g., HIPAA), regulations (e.g., OSHA), professional standards, and ethical principles.

Technical Development Projects

NaS Knowledge Model | Feb 2025 | https://github.com/NaS-Research/knowledge-model

Built a full-stack biomedical LLM pipeline that ingests 10 000+ new PubMed papers per cycle, cleans and embeds millions of passages, fine-tunes TinyLlama adapters with LoRA on Apple Silicon, and serves citation-backed answers through a FastAPI endpoint, refreshing itself from PDF download to vector indexing and adapter training without human intervention.

Key Achievements & Technical Highlights:

- Autonomous Monthly Ingestion:
 - Designed a monthly pipeline that queries PubMed via NCBI E-Utilities, retrieves open-access PDFs (or abstracts when necessary), de-duplicates records, versions each batch by year / month, and archives > 9 000 new articles per run to AWS S3.
- Data Cleaning & Embedding:
 - Wrote a Unicode-safe cleaner that normalises ASCII, strips citations / figures, and chunks articles into ≤ 1 200-token blocks.
 - Embeds 2 M+ chunks with SentenceTransformers and stores them in FAISS for sub-second semantic search.
- LoRA Fine-Tuning Framework:
 - Built a CLI that applies PEFT LoRA adapters to TinyLlama-1.1 B and refreshes the model every run (2 epochs on an 80 % raw / 20 % instruction mix).
 - Apple-silicon optimisations (fp16 / bf16, gradient checkpointing) cut epoch time by 4×.
- Retrieval-augmented service (RAG):
 - Deployed a FastAPI endpoint that performs top-k retrieval, context packing, and source-cited answer generation in < 250 ms P-99 latency on a single Mac Studio M1.
- Autonomous refresh cycle:
 - One-step scheduler ingest new literature, rebuilds the corpus, retrains a LoRA adapter, and deploys it unattended; keeping models evergreen without human intervention.

Lumen | April 2024 - | https://github.com/AGuyNamedDJ/Lumen

Al-driven trading platform engineered for autonomous execution and management of complex options strategies, leveraging cutting-edge language and deep learning models for predictive accuracy, user interaction, and real-time market adaptability. **Key Achievements & Technical Highlights:**.

- Advanced AI Model Integration:
 - Integrated and fine-tuned state-of-the-art language models including OpenAI's GPT-3.5-turbo (o3-mini, o1-mini) and DeepSeek's open-sourced models (DeepSeek V3, E1) via Hugging Face for sophisticated natural language processing, trading signal generation, and real-time analytics.
 - Successfully downloaded and locally deployed DeepSeek's open-source models, allowing customization, fine-tuning, and dnow irect application tailored to platform-specific needs.
- Deep Learning & Predictive Analytics:
 - Developed and trained specialized Long Short-Term Memory (LSTM) neural networks for high-precision forecasting of financial time-series data, significantly improving predictive reliability and trading performance.
- Conversational AI Implementation:
 - Built an advanced conversational AI agent powered by GPT-o3-mini and DeepSeek, enabling seamless and interactive user engagement for actionable trading insights and real-time analytics.
- Scalable Infrastructure & API Design:
 - Designed and deployed a hybrid API framework utilizing Node.js for general RESTful endpoints and Python (Flask) specifically optimized for AI-driven computations and predictions.
 - Established robust data ingestion and preprocessing pipelines, handling structured and unstructured financial data seamlessly from diverse sources (AWS S3, Finnhub API), ensuring efficient, real-time decision-making capability.
- Continuous Market Monitoring & Autonomous Decision-Making:
 - Engineered a fully automated system capable of 24/7 market monitoring, immediate data analysis, and autonomous strategic decision-making to rapidly adapt to evolving market conditions, ensuring sustained optimal performance.
- Open-Source Model Exploration & Customization:
 - Conducted extensive experimentation with open-source models (DeepSeek, Hugging Face-hosted models), customizing and retraining models on proprietary data to enhance predictive performance, explainability, and autonomy.

Health Hive | Back-End Developer | Feb 2022 - Feb 2022 |

https://github.com/AGuyNamedDJ/Health-Hive-Back-End

A Full-Stack Web App using Node.js, Express.js, and PostgreSQL to store and manage patient health records.

- Implemented RESTful API endpoints for CRUD operations on patient, staff, and treatment plan data
- Designed and developed a robust PostgreSQL database to store and maintain patient data
- Implemented secure user authentication and authorization using bcrypt and JWT
- Developed middleware for input validation and error handling to ensure the reliability and safety of input

Oral Presentations

"Computational Drug Discovery from Nigella sativa: A Multimodal Pipeline Integrating Bioinformatics, Structural Modeling, and AI Architecture"

Mississippi College Research Week | Mississippi College, Apr 2025

Presented a comprehensive research pipeline focused on evaluating bioactive compounds from *Nigella sativa* using bioinformatics, molecular docking, and structural modeling. Shared methodology involving PubChem, SwissTargetPrediction, ChimeraX, and ISOLDE to explore compound-target interactions and ADMET properties.

"Code of Ethics for AI-Driven Biotechnology Leadership"

Ethics of Healthcare Administration | Mississippi College, Mar 2025

Developed and presented a personal code of ethics addressing the governance of emerging biotechnologies. Applied the ERC/PLUS framework to issues in data privacy, patient safety, and equitable innovation, emphasizing the role of ethical leadership in AI- and quantum-based healthcare systems.

"Breast Cancer Risk, BRCA Mutations, and Targeted Therapies: A Ted Talk on Genomics and Hope" Biology of Cancer | Mississippi College, Dec 2024

Delivered a TED Talk-style presentation to faculty, peers, and the Assistant Provost on the genetics, clinical significance, and treatment of BRCA-related breast cancer. The talk emphasized early detection, genomic risk, and targeted therapies, drawing on research and patient-centered narratives to promote awareness and action.

"A Geospatial Analysis for Headquarters Placement"

Quantum Geographical Information Systems | Mississippi College, Dec 2024

Presented a graduate research project using QGIS to identify optimal U.S. regions for establishing a biotechnology headquarters. Applied multi-criteria spatial analysis to assess factors including workforce availability, infrastructure, academic partnerships, tax climate, and long-term growth potential.

"Artificial Intelligence and Quantum Computing in Drug Discovery and Genomics: Paving the Way for Personalized Medicine"

Graduate Seminar | Mississippi College, Nov 2024

Presented to graduate students and faculty on leveraging AI-enhanced quantum simulations and large language models in precision medicine, exploring breakthroughs in molecular dynamics for accelerated drug discovery and AI in encoding clinical knowledge for personalized treatments. Emphasized advancements in predictive diagnostics, clinical decision support, and biomarker discovery to tackle complex healthcare challenges.

"Category-Based Toxicokinetic Evaluations of Data-Poor Per- and Polyfluoroalkyl Substances (PFAS) using Gas Chromatography Coupled with Mass Spectrometry"

Introduction to Graduate Studies | Mississippi College, Nov 2024

Presented an analysis of PFAS toxicokinetics, focusing on categorization, metabolic stability, and protein binding using advanced GC-MS techniques. Provided insights into PFAS bioaccumulation and clearance, enhancing understanding of in vitro and in vivo extrapolation for risk assessment among graduate students and faculty.

Poster Presentations

"Bioinformatic Profiling and Pharmacological Evaluation of Phytochemical Constituents from N. sativa"

Mississippi College Research Week | Mississippi College, Apr 2025

Presented research on the pharmacological potential of *Nigella sativa* extracts using bioinformatics, molecular modeling, and experimental validation.

"Comparative Enzymatic Hydrolysis of Lactose Across Milk Types Using Exogenous Lactase" Mississippi College, Dec 2024

Presented research on the pharmacological potential of *Nigella sativa* extracts using bioinformatics, molecular modeling, and experimental validation.

Books & Creative Publications

Circuit Breakers: Imperfections (2025)

The second installment in the *Circuit Breakers* series. Set within the biotech industry, the novel follows Dr. Jade King as she navigates corporate pressure, ethical dilemmas, and personal conflict. The book explores the human cost of ambition and the tension between innovation and integrity.

To Love Ignorantly: Love's Memoir (2025)

A reflective memoir structured in eight acts, exploring the emotional and spiritual dimensions of love. Through moments of connection, loss, and clarity, the book traces how love shapes identity, deepens faith, and invites growth. More than a personal story, it offers a meditation on vulnerability and the quiet work of transformation over time.

Circuit Breakers: Echoes of Innovation (2024)

The first novel in the *Circuit Breakers* series. Set in Chicago's medical and technology sectors, the story follows Dr. Jade King as she navigates the ethical and emotional challenges posed by emerging artificial intelligence in healthcare. The book explores the tension between innovation and humanity, and what it means to care in a system shaped by machines.

Awards & Honors

2nd Place - Graduate Research Forum, Foman & Nita Musselwhite Prizes | *Mississippi College, 2025* Awarded 2nd place at the 24th Annual Graduate Research Forum for "Bioinformatics Profiling and Pharmacological Evaluation of Phytochemical Constituents from *Nigella sativa*." Recognized for developing an interdisciplinary computational framework combining bioinformatics, 3D protein structure modeling, and machine learning.

Graduate Academic Excellence - 4.0 GPA (Winter & Spring) | *Mississippi College, 2025* Maintained a perfect 4.0 GPA across consecutive semesters in the M.S. in Biological Sciences program,

demonstrating academic excellence in coursework, research, and seminar presentations.

Clerkship/Rotations

Stroger Hospital | Jan 2022 - Apr 2022 Chicago, IL Pharmacy Practice II Experience (IIPE'S) P2 Preceptor: Dr. Brandle Blakely, PharmD, BCPS

Drexler Pharmacy | Aug 2021 - Dec 2021 Chicago, IL Pharmacy Practice II Experience (IIPE'S) P2 Preceptor: Dr. Tijuana Dixon, PharmD

Harbour Light Hospice | Jan 2020 - Mar 2020 Winfield, IL Pharmacy Practice I Experience (IIPE'S) P1 Preceptor: Larisa Calvanese

Walgreens Pharmacy | Sep 2019 - Dec 2019 Orland Park, IL Pharmacy Practice I Experience (IIPE'S) P1 Preceptor: Dr. Tujan Almasri, PharmD

Interprofessional Clinical Training

Clinical Scholar

UChicago Medicine | Sep 2020 - May 2021

Completed a seminar-based program focused on cross-disciplinary collaboration and healthcare delivery. Worked in rotating groups to analyze specialty-driven patient cases and contribute to team-based care solutions across the clinical domain.

Clinical Scholar

Rush University Medical Center | Sep 2019 - May 2020

Participated in weekly interdisciplinary training alongside students in medicine, pharmacy, nursing, physician assistant studies, physical therapy, radiology, and healthcare administration. Engaged in hospital-based seminars, collaborative treatment planning, and supervised patient rounds. Contributed to case-based discussions that emphasized communication, ethics, and coordinated care across discipline.

Certifications

Genesis Plus Trading Academy American Heart Association – *CPR/AED/First Aid Certification* **National Healthcareer Association (NHA)** – *Certified Pharmacy Technician (CPhT)* **Pharmacy Technician Certification Board (PTCB)** – *Certified Pharmacy Technician (CPhT)*

Education

Chicago State University - 55 Credits towards Doctor of Pharmacy, Graduating May '28 Mississippi College - M.S. in Biological Sciences University of Illinois, Chicago- Software Development Certificate Jackson State University - B.S. in Biology

Professional Organizations

Sep 2019 - Present American Pharmacist Association Academy of Student Pharmacists - (APhA - ASA)

Sep 2019 - Aug 2022 Student National Pharmaceutical Association – (SnPHA)

Community Service

Volunteer Hot Chocolate 15K/5K Run Chicago, IL

Volunteer

Chicago Heart Walk Chicago, IL

Volunteer University of Mississippi Medical Center - Supervisor: Marsha Burton Jackson, MS