

**Rutao Luo**  
**AI Expert in Finance @ Domain, ex-Vanguard | AWS, Machine Learning**  
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## SUMMARY OF QUALIFICATIONS

- **Strategic AI Leadership:** Over 5 years of experience leading transformative AI/ML projects and teams. Expert in driving innovation through data science, with a proven ability to deliver solutions that enhance operational efficiency, customer experience, and personalization across various sectors.
- **Technical and Product Management Expertise:** Deep technical expertise in AI/ML, including predictive modeling, NLP, LLM and cloud technologies. Skilled in translating complex business requirements into actionable data-driven strategies to solve critical healthcare challenges.
- **Agile Development and SDLC:** Extensive experience with SDLC and agile project management, leading cross-functional teams to deploy scalable data analytics solutions in fast-paced environments.
- **Stakeholder Engagement and Strategic Planning:** Exceptional ability to engage with senior business stakeholders, articulating complex ideas with clarity and persuasively influencing strategic direction based on data insights.
- **Distinguished Publishing Record:** Authored numerous impactful journal articles and papers in modeling of bio-systems(HIV disease), earning almost 300 citations, reflecting a significant contribution to the field.
- **Project/time management:** Proficient in efficiently managing and prioritizing multiple tasks concurrently to ensure the timely completion of projects while maintaining a high standard of quality.
- **Coaching & Mentoring:** Recognized for effectively guiding both data scientists and machine learning engineers, enhancing team skills and professional growth.

## TECHNICAL SKILLS

**Statistics and Mathematics:** Machine learning, Recommendation Systems, Experiment Design, GenAI, LLM, RAG, Reinforcement Learning from Human Feedback, Blockchain, Bayesian Estimation, Time Series Analysis.

**BIG DATA:** Spark, Hadoop, MapReduce.

**Programming Languages:** Python, SQL, R, MATLAB, C, C++, C#, Java, Scala, SAS.

## PROFESSIONAL EXPERIENCE

**Financial AI Specialist/Lead Domyon | August 2025 - Present**

Delivering end-to-end vertical AI solutions for highly regulated industries, including foundation models, agentic AI systems, and enterprise-grade AI governance..

- **Structured data agent:** Designed and implemented an LLM-driven agent that transforms natural-language questions into validated, governed structured-data operations (e.g., SQL), producing reliable, non-hallucinatory answers grounded in enterprise datasets.
- **Unstructured data agent:** Built a hybrid LLM + Knowledge Graph reasoning system that retrieves, interprets, and reasons over free-form documents and unstructured content using semantic search, embeddings, and contextual understanding.

**Principal Data Scientist (Equivalent to Senior Manager) Vanguard | May 2019 - August 2025**

In my current role, I steer the strategic roadmap for our team, devising innovative AI solutions to enhance Vanguard's business operations. I excel in translating intricate business challenges into robust statistical and mathematical models, thereby spearheading transformative ML/AI initiatives. Through my dedicated efforts, I have notably propelled marketing strategies, operational efficiency, client engagement, and fraud detection to new heights. Notable achievements include:

- **Team Leadership and Talent Cultivation:** Championed an environment of continuous learning and innovation, leading comprehensive training sessions on Large Language Models that markedly elevated the team's technical prowess. Actively mentored a diverse group of data scientists and machine learning engineers, guiding them through complex project lifecycles and fostering a culture of professional growth.
- **Revenue Generation:** Successfully implemented AI-driven strategies, generating millions in revenue and achieving a major financial milestone for the company every year.
- **Enhanced Personalization:** Led the design of hyper personalization systems to serve millions of personal investors by using MAB and reinforcement learning. Developed sophisticated recommender systems for clients and advisors, significantly improving conversion rates and reducing attrition.
- **GenAI Application Leadership:** Spearheaded the pilot of GenAI applications, employing Large Language Models (LLM), Retrieval-Augmented Generation (RAG), and Reinforcement Learning from Human Feedback (RLHF), showcasing innovative applications in AI (Crew Assistance, Voice Bot and Call Summarization).
- **Growth in Personal Advice Service (PAS):** Drove a 130% increase in PAS leads through a strategic real-time ML solution.
- **Risk Mitigation:** Employed cutting-edge LLM technologies and audio signal processing for proactive fraud detection and cognitive decline assessment, substantially strengthening risk management.
- **Standardized and secured CRSP market index data using blockchain technology:** Implemented a blockchain-based solution to standardize, secure, and verify CRSP market index data, ensuring data integrity, transparency, and immutability while optimizing data distribution and auditability for financial stakeholders.
- **Marketing and Sales Enhancement:** Built multiple propensity models to amplify conversion rates in advice, ETFs, and other Vanguard products.

- **Client Experience Index (CXI):** Innovated the CXI to comprehensively measure client experiences across all retail divisions, leveraging a wealth of operational data and call transcripts.
- **Research and Technological Advancement:** Engaged deeply in research on emerging technologies and AI algorithms, ensuring that Vanguard remains at the forefront of technological evolution in the financial industry.
- **Governance Leadership:** Led the development of a comprehensive model governance guide to ensure the responsible and scalable deployment of AI/ML models. Also spearheaded the creation of a governance framework specifically for GenAI applications, establishing best practices and regulatory compliance for safe and ethical AI usage.
- **Balance trade-offs between using vendor solutions versus in-house development:** Evaluating vendor solutions for fit, scalability, and cost-effectiveness, ensuring alignment with long-term strategic objectives.

#### **Senior Data Scientist** Vanguard | October 2016 - May 2019

Spearheaded the development of machine learning (ML) and AI models to enable data-driven decision-making.

- Designed ML models specifically tailored for RIG (Retail Investor Group) marketing initiatives, contributing to targeted and effective marketing campaigns.
- Pioneered research efforts in optimization, deep learning (DL), and reinforcement learning, exploring innovative avenues for enhancing business processes.
- Enhanced customer experience by providing precise forecasts of queue-level phone call demand and recommending optimal staffing strategies, resulting in improved service quality.
- Played a pivotal role in transitioning Vanguard's analytics teams from traditional analytics platforms to a cutting-edge big data and unified analytics platform on the Cloud, fostering a more agile and data-driven environment.
- Demonstrated the predictive power of machine learning algorithms and big data platforms to both peers and internal clients, showcasing the potential for data-driven insights.

#### **Engineer III-Data Analytics** Comcast | September 2014 - July 2016

Led Advanced Modeling and Data Analysis for Comcast's Next-Generation Network Optimization Budget.

- Spearheaded advanced modeling and data analysis efforts crucial to network forecast and Comcast's budget plan for optimizing the next-generation network.
- Designed and seamlessly implemented budget models tailored for the Next-Generation Network Architecture, establishing a robust foundation for future network enhancements and scalability.
- Leveraged cutting-edge machine learning and Big Data technologies to elevate the customer experience, directly leading to heightened service quality and increased customer satisfaction.
- Demonstrated a strong commitment to knowledge sharing by mentoring and training junior engineers in algorithm design and coding, actively contributing to the professional development and collaborative growth of the team.

#### **Research Control System Engineer (New Product Introduction)** GE | July 2013 - August 2014

Led the design and development of GE's Trip Optimizer, a product within the Ecomagination portfolio, which autonomously managed locomotive throttle and brake systems to optimize train schedules and minimize fuel consumption and costs.

- Applied mathematical modeling and optimization techniques to generate optimal trip plans for train journeys, contributing to significant improvements in operational efficiency.
- Designed and implemented real-time control algorithms tailored for embedded systems, ensuring the seamless integration of the Trip Optimizer into locomotives.

#### **Research Assistant** Department of Electrical and Computer Engineering, University of Delaware | January 2007 - January 2013

Conducted research in the field of nonlinear control theory and its applications, with a specific focus on mathematical biology and medicine.

- Developed mathematical models to describe disease systems and employed nonlinear control techniques to analyze system dynamics, resulting in the identification of innovative therapeutic strategies.
- Investigated approaches to extend the efficacy of HAART (Highly Active Antiretroviral Therapy) for HIV treatment by preventing the emergence of drug-resistant viral strains.
- Proficiently utilized software and programming languages such as MATLAB, C++, R, SAS, and SPSS to support research endeavors.
- Achieved notable academic success by publishing as the first author in five world-class journals and presenting research findings in five refereed conference papers. These contributions garnered significant attention from prominent media outlets, including Science Daily and NPR (National Public Radio).

### **CERTIFICATES/EXAMS**

- AWS Machine Learning Specialty Certification
- SAS Certified Base Programmer for SAS 9.
- SAS Certified Advanced Programmer for SAS 9
- Actuarial Science: Pass of Exams P, FM.

## EDUCATION

**Master of Science in Electrical Engineering** *University of Delaware | January 2013*

**Master of Science in Applied Mathematics** *University of Delaware | May 2012*

**Bachelor of Science in Control Engineering** *Beijing University of Chemical Technology | July 2000*

## Publications

E. Fabian Cardozo, Rutao Luo, Michael J. Piovoso and Ryan Zurakowski, Spatial modeling of HIV cryptic viremia and 2-LTR formation during raltegravir intensification. 2014, *Journal of Theoretical Biology*, Vol. 345, pp. 61-69

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Rutao Luo, E. Fabian Cardozo, Michael J. Piovoso, Hulin Wu, Maria J. Buzon, Javier Martinez-Picado and Ryan Zurakowski, Modelling HIV-1 2-LTR dynamics following raltegravir intensification. *Journal of the Royal Society - Interface*, 2013 Vol. 10, No. 84, pp. 20131086. doi:10.1098/rsif.2013.0186 <http://rsif.royalsocietypublishing.org/content/10/84/20130186.full.pdf+html>

Rutao Luo, Michael J. Piovoso and Ryan Zurakowski, Modeling Uncertainty in Single-Copy Assays for HIV. *Journal of Clinical Microbiology*, 2012 50(10):3382-3383. doi:10.1128/JCM.01254-12 <http://jcm.asm.org/content/50/10/3381.full>

Rutao Luo, Michael J. Piovoso, Javier Martinez-Picado and Ryan Zurakowski, HIV Model Parameter Estimates from Interruption Trial Data Including Drug Efficacy and Reservoir Dynamics, *PLoS ONE* 7(7): 2012 e40198. doi:10.1371/journal.pone.0040198

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0040198>

Rutao Luo, Michael J. Piovoso, Javier Martinez-Picado and Ryan Zurakowski, Optimal antiviral switching to minimize resistance risk in HIV therapy. *PLoS ONE* 6(11):2011 e27047. doi:10.1371/journal.pone.0027047

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0027047>

Rutao Luo, LaMont Cannon, Jason Hernandez, Michael J. Piovoso and Ryan Zurakowski, Controlling the Evolution of Resistance. *Journal of Process Control*. 2011 Vol. 21, No. 3. pp. 367-378. doi:10.1016/j.jprocont.2010.11.010.

<http://www.sciencedirect.com/science/article/pii/S0959152410002283>

Rutao Luo, Michael J. Piovoso and Ryan Zurakowski, Quantitative analysis of viral persistence and transient viral load rebound from HIV clinical data. 33rd International Conference of the IEEE EMBS, 2011, pp. 3585-3588.

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Rutao Luo, Michael J. Piovoso and Ryan Zurakowski, Modeling-error robustness of a viral-load preconditioning strategy for HIV treatment switching. *Proc. American Control Conference* 2010, Baltimore, MD. pp. 5155-5160.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5530483&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D5530483](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5530483&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D5530483)

Rutao Luo, Michael Piovoso and Ryan Zurakowski, A Generalized Multi-strain Model of HIV Evolution with Implications for Drug-resistance Management. *Proc. American Control Conference*, 2009 St. Louis MO, pp. 2295-2300.

<http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5160358&url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F5089257%2F5159764%2F05160358.pdf%3Farnumber%3D5160358>

Ryan Zurakowski and Rutao Luo, Resistance risk management in HIV therapy switching with explicit quiescent T-cell modeling. *Proc. 17th IFAC World Congress*, 2008 Seoul, Korea, pp. 10325-10330. <http://www.ifac-papersonline.net/Detailed/37440.html>

Rutao Luo and Ryan Zurakowski, A new strategy to decrease risk of resistance emerging during therapy switching in HIV treatment. *Proc. American Control Conference*, 2008 Seattle, WA pp. 2112-2117.

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W. Zhang and R. Luo, An adaptive feedback neural network approach to job-shop scheduling problem. *Proc. IEEE IJCNN* (2008). pp. 3949-3954 DOI: 10.1109

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=4634365&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D4634365](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=4634365&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D4634365)

Marc Macenko, Rutao Luo, Mehmet Celenk, Limin Ma and Qiang Zhou, Lesion detection using Gabor-based saliency field mapping. *Proc.SPIE*, Vol.6512, 65123E (2007). <http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1299644>