

Jose Tupayachi

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Experienced professional in data analytics with a proven ability to design and implement data-driven solutions that drive business impact. Skilled in developing advanced machine learning systems, signal processing and integrating tools like retrieval-augmented generation and vector databases to enhance applications. Proficient in programming languages, data engineering, and data visualization, with a strong focus on collaboration and delivering scalable solutions by working effectively with interdisciplinary teams. These skill sets have been applied in developing health-support apps and decision support systems for transportation and logistics applications.

Education

University of Tennessee, Knoxville USA PhD Candidate in Industrial Engineering	May 2024 - Present
Advisor: Dr. Xueping Li	
University of Tennessee, Knoxville USA MS in Industrial Engineering	Aug 2022 - May 2024
GPA: 3.9	
Pontifical Catholic University of Peru, Lima Peru BS in Industrial Engineering	March 2014 - May 2020
Time off from school - Searching for Internships	June 2020 - July 2020

Publications

- Design and Usability Testing of SmartSHOTS: A Mobile App to Reduce Vaccine Barriers for Children 0-24 Months** Wyatt Tami, Taylor Penny, Li Xueping, Lowe Sarah, Sharmin Aliza, Tupayachi Silva Jose, Wang Xudong, Mcneely Clea, Niederhauser Victoria *Proceedings of the 58th Hawaii International Conference on System Sciences* (2025)
- A Simulation-Based Real-Time Deep Reinforcement Learning Approach for Fighting Wildfires** J Tupayachi, MM Ferguson, X Li *2024 Annual Modeling and Simulation Conference (ANNSIM), 1-12* (2024)
- Drone-aided delivery methods, challenges, and the future: A methodological review** X Li, J Tupayachi, A Sharmin, M Martinez Ferguson *Drones* 7 (3), 191 (2023)
- Towards next-generation urban decision support systems through AI-powered construction of scientific ontology using large language models—A case in optimizing intermodal freight** J Tupayachi, H Xu, OA Omitaomu, MC Camur, A Sharmin, X Li *Smart Cities* 7 (5), 2392-2421 (2024)
- Automating Bibliometric Analysis with Sentence Transformers and Retrieval-Augmented Generation (RAG): A Pilot Study in Semantic and Contextual Search for Customized Literature** H Xu, X Li, J Tupayachi, JJ Lian, OA Omitaomu *Proceedings of the 2nd ACM SIGSPATIAL International Workshop on Advances in Urban-AI* (2024)
- Better Efficiency on Non-performing Loans Debt Recovery and Portfolio Valuation Using Machine Learning Techniques** J Tupayachi, L Silva *Production and Operations Management: POMS Lima, Peru, December 2-4, 2021* (2022)

Pre-Prints:

- Empowering Cognitive Digital Twins with Generative Foundation Models: Developing a Low-Carbon Integrated Freight Transportation System** X Li, H Xu, J Tupayachi, O Omitaomu, X Wang *arXiv preprint arXiv:2410.18089* (2024)
- Towards Next-Generation Urban Decision Support Systems through AI-Powered Generation of Scientific Ontology using Large Language Models: A Case in Optimizing Intermodal Freight Transportation** J Tupayachi, H Xu, O A Omitaomu, M C Camur, A Sharmin, X Li *arXiv preprint arXiv:2405.19255* (2024)

Graduate Research Assistant - Funded Projects Developer

RECOIL Cognitive Freight Transportation Digital Twin for Resiliency and Emission Control Through Optimizing Intermodal Logistics	Jul 2024 – Present
<ul style="list-style-type: none">Designed ontology-guided optimization models for large-scale freight transportation networks, integrating data from diverse GIS-based transport modes, including road, rail, and waterways, to minimize costs and emissions while enhancing operational efficiency.Leveraged Convolutional Neural Networks and Graph Neural Networks to analyze the impacts of weather, traffic, and demand on EV charging behavior, enabling data-driven, real-time optimization of EV charging station operations.Applied large language models to power a chatbot that provides domain-specific responses for non-technical users, enabling accurate trade-off analysis between cost, time, and CO₂ emissions.Designed a real-time feedback loop for digital twins, utilizing “Simulated” sensor data and scrapping techniques to continuously optimize intermodal system performance based on real-world conditions.Investigating the use of BERT and sentence transformers to further refine provide a domain literature for QA providing accurate and reproducible responses supported by LLM and similarity based search.	

- Collaborated with Oak Ridge National Laboratory researchers to create industry-ready solution that reduce emissions and enhance the resilience of intermodal freight and supply chain operations.
- Development of the unified UI using Flutter at <https://portal.recoil.ise.utk.edu>.

Funding Agency: U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E)
Project Number: #DE-AR0001780

SmartShots | Cross-Platform Application to Improve Childhood Vaccination Rates in Tennessee Dec 2023 – Dec 2024

- Enhanced vaccination tracking with real-time data updates, guardian and dependent updates, notifications, and integrated alerts for users.
- Developed a scalable backend system using Laravel. Used Dart and Flutter based on flutter to ensure smooth functionality across platforms.
- Integrated community health information to offer users real-time access to nearby vaccination providers.
- Collaborated with the Tennessee Department of Health and local health agencies to align the app with state public health objectives and needs.
- <https://play.google.com/store/apps/details?id=com.ilab.smartshots> <https://apps.apple.com/us/app/smartshots-tn/id6526502640>

Funding Agency: Tennessee Department of Health

Active Caregiver's Toolkit (ACTAPP) | Mobile Application to Promote Physical Activity Among Rural Appalachian Caregivers at Risk for Cardiovascular Disease (CVD) Jul 2024 - Present

- Development of the ACT APP as a digital solution for rural Appalachian caregivers, aiming to reduce cardiovascular disease risks through targeted physical activity interventions.
- Implemented latest mobile development standars based on Dart 3.0 and material design including custom components and state manangement using GetX.
- Initial alpha testing at <https://testflight.apple.com/join/PehxA8aW>

Funding Agency: Hillman Emergent Innovation (HEI)

Pathology Cancer Staging - UT Medical Center Jan 2025 - Present

- Development of Flutter UI and web map services for interactive demographic cancer visualization.

Graduate Teaching Assistant

IE406/408: Simulation – Teaching Assistant, Spring 2022

- Assisted students with their final project and Anylogic simulation use and preparation.
- Graded homework assignments and addressed questions during class sessions.

IE483: Introduction to Reliability Engineering – Teaching Assistant, Fall 2022

- Provided in-class support by answering student questions.
- Proposed new homework problems, evaluated and graded homework assignments.

Awards & Scholarships

51st Conference on Computers and Industrial Engineering (CIE51) *Best Paper Award: "Emerging AI and Cognitive Digital Twin Technologies Towards Low-Carbon Multimodal Freight Transport Systems – Sustainable Transport Systems"*
Sydney, Australia December 9–11, 2024

IISE Data Analytics & Information Systems (DAIS) Student Mobile App Competition
2024 Winners - SmartShots Project, Montreal | <https://www.iise.org/Details.aspx?id=33697>

Graduate Fellowships and Awards
Holiday Fellowship: 2022, 2023, 2024

HIDA Helmholtz Visiting Researcher
Year: 2024 - Awarded but not taken.

Industry Work Experience

Data Engineer | INDRA SISTEMAS S.A. – Full-time March 2022 – Aug 2022

- Developed and maintained data pipelines using Python and Shell scripting to streamline big data workflows.
- Worked with Apache Spark, Hadoop, and HQL for distributed data processing, querying, and large-scale data migration, including data migration from Oracle and SaaS to PySpark.
- Implemented Jenkins-based deployment strategies for automating ETL pipeline updates.
- Ensured data quality and performance through data governance practices and code optimization techniques.
- Managed memory allocation for distributed data processing tasks in High-performance computing.

Business Intelligence Analyst | GLOBOKAS PERU S.A. – Full-time Jan 2022 – March 2022

- Developed and optimized Extract, Transform, and Load (ETL) pipelines using Transact-SQL to streamline data processing and improve efficiency.

- Designed and implemented a live platform for real-time revenue and administrative KPI monitoring, enabling data-driven decision-making.
- Leveraged Google BigQuery and custom macros to automate daily data parsing and dashboard updates, ensuring up-to-date insights.
- Enhanced data quality and integrity by applying statistical metrics to detect and mitigate inconsistencies.

Data Analyst Trainee | ENEL DISTRIBUCION PERU S.A.A. – Full-time Nov 2020 – Dec 2021

- Optimized payment collection processes and client segmentation by employing advanced unsupervised clustering techniques, improving efficiency and effectiveness.
- Designed and implemented dashboards using Power BI and Tableau, providing strategic insights and actionable intelligence.
- Administered SQL and T-SQL databases alongside Salesforce, ensuring data integrity and delivering accurate, reliable reporting for Enel’s Business Partners.
- Developed a robust desktop application using PyQt to streamline invoice collection verification and automate digital invoice processing, enhancing operational efficiency.

Developer – Portfolio Valuation Project | GPS MANAGEMENT DEL PERU S.A.C. – Machine Learning Consulting Aug 2020 – Nov 2020

- Developed a predictive model for valuing non-secure and secured portfolios of non-performing loans using Machine Learning.
- Conducted data compilation, feature engineering, modeling, and validation.
- Deployed the model on a web platform using Flask.

Professional IT Intern | SUPERINTENDENCIA DE BANCA, SEGUROS Y ADMINISTRADORAS PRIVADAS DE FONDOS DE PENSIONES Sep 2020 – Oct 2020

- Automated PDF reports using Jinja-Python for user service indicators.
- Managed Help Desk tasks and Active Directory access control, complying with ITIL standards.

Plant Intern | MATMACK S.A. – Bottling Company (Brands Bells and Cencosud) Dec 2019 – Mar 2020

- Improved inventory control, supplier coordination, and established reorder points.
- Developed demand forecasting models for products per client.
- Conducted cost analysis of raw materials and determined the Economic Order Quantity.
- Built a planning application based on a Master Production Schedule.

Information Technology Intern | ADMINISTRADORA CLINICA RICARDO PALMA S.A. – Medical and Hospital Services Feb 2019 – Aug 2019

- Structured databases for the “Health and Insurance Plan” and implemented ETL workflows.
- Supported and monitored project development, scheduling, and cost evaluation.
- Developed Power BI dashboards for financial reporting and KPIs.
- Designed and structured the medical staff privilege database.

Community Service

University of Tennessee Graduate Student Senate - Senator, Industrial and Systems Engineering, 2024–2025
Represented students, advocated for academic and professional development opportunities, and fostered graduate student engagement.

Conferences & Paper Review

Paper Reviewer:
IISE 2025 Annual Conference - Logistics and Supply Chain (LSC) - 2 Papers reviewed

Conference Presenter:
Federated Learning Fault Detection: Towards a Decentralized Machine Learning Framework - IISE 2023

Rule-based Automated Cancer Staging from Scanned Pathology Reports - IISE 2024

Empowering Simulation Modeling: An Automated Ontology Framework Enhanced by Large Language Models - INFORMS 2024

Conversational Geographic Question Answering: LLMs & Continuous Retrieval-Augmented Generation - SIGSPATIAL 2024

Technologies

Languages: Python, SQL, Bash, Dart, PHP, Java, C++ , CUDA	DevOps: Docker, Git, Jenkins, AWS, Virtualization KVM
Frameworks: Django, Flask, TensorFlow, PyTorch, Flutter, Laravel, Wordpress	Optimization: Networkx, Gurobi, cplex, AnyLogic Simulation, NetworkX
IoT: Arduino, ESP32	Office Tools: Excel, Microsoft Office, Linux
Databases: PostgreSQL, MongoDB, MySQL, SQL Server	GIS: WMS, GeoSever, OverPass API

Upcoming Publications

- **Reviewing 1,000 Papers in Minutes:** A Low-Cost Explainable LLM Framework for Rapid Domain Knowledge Synthesis and Enrichment to Advance Human-AI Partnership in Research and Education.
- **Federated Learning and Remaining Useful Life Predictor:** An LSTM and MLP-Based Experimental Study.
- **Predicting Electric Vehicle Charging Station Demand:** Using Spatial-Temporal Graph Neural Networks with Integrated Weather and Traffic Data.