

# Jose Tupayachi

Knoxville, TN | jtupayac@vols.utk.edu | 661 365 5289 | jtupayachi.github.io

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

<b>University of Tennessee, Knoxville</b>   PhD Candidate in Industrial and Systems Engineering Advisor: Dr. Xueping Li	Aug 2024 - Present
<b>University of Tennessee, Knoxville</b>   MS in Industrial and Systems Engineering GPA: 3.9	Aug 2022 - Jul 2024

## Work Experience

<b>Data Engineer</b>   Indra – Full-time	Jan 2022 – Aug 2022
<ul style="list-style-type: none"><li>Developed and maintained data pipelines using Python and Shell scripting to streamline big data workflows.</li><li>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.</li><li>Implemented Jenkins-based deployment strategies for automating ETL pipeline updates.</li><li>Ensured data quality and performance through data governance practices and code optimization techniques.</li><li>Managed memory allocation for distributed data processing tasks in High-performance computing.</li></ul>	
<b>Data Analyst Intern</b>   Enel Group – Full-time	Nov 2020 – Dec 2021
<ul style="list-style-type: none"><li>Optimized payment collection processes and client segmentation by employing advanced unsupervised clustering techniques, improving efficiency and effectiveness.</li><li>Designed and implemented dashboards using Power BI and Tableau, providing strategic insights and actionable intelligence.</li><li>Administered SQL and T-SQL databases alongside Salesforce, ensuring data integrity and delivering accurate, reliable reporting for Enel’s Business Partners.</li><li>Developed a robust desktop application using PyQt to streamline invoice collection verification and automate digital invoice processing, enhancing operational efficiency.</li></ul>	

## Funded Projects Developer

<b>RECOIL</b>   Cognitive Freight Transportation Digital Twin for Resiliency and Emission Control Through Optimizing Intermodal Logistics	Jul 2024 – Present
<ul style="list-style-type: none"><li>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.</li><li>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.</li><li>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 <math>CO_2</math> emissions.</li><li>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.</li><li>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.</li><li>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.</li><li>Development of the unified UI using Flutter at <a href="https://portal.recoil.ise.utk.edu">https://portal.recoil.ise.utk.edu</a>.</li></ul>	

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

<b>SmartShots</b>   Cross-Platform Application to Improve Childhood Vaccination Rates in Tennessee	December 2023 – December 2024
<ul style="list-style-type: none"><li>Enhanced vaccination tracking with real-time data updates, guardian and dependent updates, notifications, and integrated alerts for users.</li><li>Developed a scalable backend system using Laravel. Used Dart and Flutter based on flutter to ensure smooth functionality across platforms.</li><li>Integrated community health information to offer users real-time access to nearby vaccination providers.</li><li>Collaborated with the Tennessee Department of Health and local health agencies to align the app with state public health objectives and needs.</li><li><a href="https://play.google.com/store/apps/details?id=com.ilab.smartshots">https://play.google.com/store/apps/details?id=com.ilab.smartshots</a> <a href="https://apps.apple.com/us/app/smartshots-tn/id6526502640">https://apps.apple.com/us/app/smartshots-tn/id6526502640</a></li></ul>	

**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)

**Awards & Scholarships**

**51<sup>st</sup> 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>

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

**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)

**Technologies**

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