Jose Tupayachi

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Experienced professional in business analytics with a proven ability to design and implement data-driven solutions that drive business impact. Skilled in developing advanced machine learning systems and integrating tools like retrieval-augmented generation and vector databases to enhance chatbot applications. Proficient in Python programming, data engineering, and data vizualization with a strong focus on collaboration and delivering scalable solutions by working effectively with interdisciplinary teams.

Education

University of Tennessee, Knoxville | PhD Candidate in Industrial and Systems Engineering   Aug 2024 - Present
Advisor: Dr. Xueping Li, Co-advised: Dr. Haowen Xu
University of Tennessee, Knoxville | MS in Industrial and Systems Engineering   Aug 2022 - Jul 2024
GPA: 3.9

Publications

- **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)

- **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

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)

Funded Projects Developer

RECOIL | Cognitive Freight Transportation Digital Twin for Resiliency and Emission Control   Jul 2024 – Present
Through Optimizing Intermodal Logistics

- Developed and integrated digital twin models for large-scale freight transportation networks, leveraging data from diverse transport modes (road, rail, waterway) to enhance system performance, minimize emissions, and increase resilience.
- Utilized advanced forecasting models to analyze transportation systems' responses to climate change and extreme weather events, enabling data-driven, real-time decision-making such those applicable to EV charging stations.
- Applied Large Language models to improve transportation planning decision making, enabling more accurate tradeoff analysis among cost, time, and emissions.
- Designed a dynamic real-time feedback loop for digital twins, utilizing sensor data and scrapping technology to continuously

optimize system performance based on real-world conditions.
- Collaborated with academic researchers, the Oak Ridge National Laboratory, and industry partners to develop scalable solutions for technology transfer, focusing on reducing emissions and enhancing resilience in freight and supply chains.

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   December 2023 – Present
- Enhanced vaccination tracking with real-time data updates, notifications, and integrated alerts for users and healthcare providers.
- Developed a scalable backend system using Dart and Flutter, ensuring smooth functionality across platforms and enhancing the user experience.
- Integrated community health data to offer users real-time access to nearby vaccination providers and appointment availability.
- Collaborated with the Tennessee Department of Health and local health agencies to align the app with state public health objectives and needs.
- Led user testing and incorporated feedback to improve the app's inclusivity, addressing issues such as misinformation and disparities in healthcare access.
- `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   Jul 2024 - Present
Rural Appalachian Caregivers at Risk for Cardiovascular Disease (CVD)
- Development of the ACTAPP as a digital solution for rural Appalachian caregivers, aiming to reduce cardiovascular disease risks through targeted physical activity interventions.

Funding Agency: Hillman Emergent Innovation (HEI)

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

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

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

Work Experience

Data Engineer |Indra – Full-time   Jan 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 processes and job scheduling.
- Ensured data quality and performance through rigorous data governance practices and optimization techniques.
- Managed memory allocation for distributed processing tasks to optimize resource utilization and improve processing efficiency.

Data Analyst |Enel Group – Full-time   Nov 2020 – Dec 2021
- Improved collection systems using a "Payments to Customer" strategy, leveraging unsupervised clustering techniques to enhance efficiency.
- Implemented dashboards PowerBi enabling strategic insights at Enel.
- Managed SQL and T-SQL databases, ensuring data quality and accurate reporting for Enel's Business Partners in Salesforce.
- Developed a desktop application PyQT to streamline invoice collection verification, and automated digital invoice processing.

Community Service

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

Conferences & Paper Review

Paper Reviewer:
Scenario Decomposition Approach for Mobile Multi-Agent Monitoring under Failure Submitted to *Transportation Research Part C: Emerging Technologies - November 2024*

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
Frameworks: Django, Flask, TensorFlow, PyTorch, Flutter, Laravel
Databases: PostgreSQL, MongoDB, MySQL, SQL Server

DevOps: Docker, Git, Jenkins
Optimization: Networkx, Gurobi, cplex, AnyLogic Simulation, NetworkX
Office Tools: Excel, Microsoft Office, Linux