Amin Keramati

Senior ML Engineer | Machine Learning & Statistical Modeling

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Senior ML Engineer with 10+ years of experience analyzing high-risk transportation events and developing data-driven crash and injury risk models for safety-critical systems. Led large-scale analyses of crash severity, injury outcomes, root-cause factors, and time-to-event behavior using real-world crash and operational data. Developed survival and competing-risk modeling frameworks to benchmark safety performance, improving prediction accuracy by up to 60% and risk prioritization by over 90%. Experienced in translating quantitative safety analyses into actionable inputs for safety cases through close collaboration with engineering,legal, and policy teams.

Experience

2021–Present **Widener University** Chester, PA

Assistant Professor of Supply Chain & Data Science

- Pioneered a survival neural network model on the Waymo Open Motion Dataset for AV time-to-conflict prediction, outperforming EVT-based TTC models by 20% and supporting AV-versus-human safety comparison.
- Built and benchmarked an LLM-powered RAG system across 8+ LLMs, converting deep survival model outputs into automated highway-rail crossing safety reports while improving numerical faithfulness by 10–40% and reducing hallucination by 10–30%.
- Designed an agentic decision layer on top of a neural survival–LLM framework to generate audience-specific safety reports, perform senior-level what-if analysis, and recommend safety interventions that achieved an average 30% predicted risk reduction across the dataset.
- Built time-to-event deep learning models using Monotonic Neural Networks to predict train–car crash injury severity, achieving 2× faster computation, 6–10% higher accuracy, and up to 42% improved risk prioritization.
- Developed and benchmarked deep learning time-to-event models for injury severity prediction and evaluation of traffic control device safety at grade crossings, improving accuracy by 18–60% and risk prioritization by 18–90%.
- Developed a hazard index for grade crossings by integrating time-to-event competing-risk models with multi-criteria decision analysis, identifying ~20% of public crossings as high-risk.
- Led large-scale benchmarking of 23 MLLMs on 500 real-world document images, analyzing OCR quality, inference latency, operational cost, and deployment feasibility across production AI serving environments.
- Led a team to develop an AI-driven LiDAR data pipeline for automated rail infrastructure extraction, providing precise infrastructure inputs for safety and risk analysis with 99.6% precision.

2015–2021 **Upper Great Plains Transportation Institute (UGPTI)** Fargo, ND

Graduate Research Assistant

- Led a $150K federally funded effort to develop a data-driven safety support system for large-scale crash risk assessment across 3,900 active grade crossings.
- Developed a Random Survival Forest model to quantify the impact of grade-crossing crash factors (e.g., train detection systems) on severity-specific crash risk, achieving 98% predictive accuracy across three outcome levels.
- Developed a Cox proportional hazards model to quantify traffic countermeasure impacts on grade crossing crash risk, generating Crash Modification Factors adopted by FHWA and DOT agencies.
- Computed geometric risk factors (e.g., intersection proximity and crossing angle) for 5,000 grade crossings using Python and ArcGIS, creating high-quality inputs to support crash risk modeling and safety assessment.
- Developed an R Shiny application leveraging time-to-event machine learning to estimate crash likelihood and severity changes under alternative infrastructure configurations, enabling safety risk evaluation and decision support.
- Engineered a linear optimization model for train routing and scheduling, integrating single/multi-track networks, overtaking dynamics, and constraint handling to minimize delays and adapt to diverse train systems.

Skills

- **Programming & Data**
  Python (NumPy, Pandas, scikit-learn, PyTorch), SQL, R, GAMS
- **Machine Learning & Statistical Modeling**
  Predictive Modeling, Survival & Time-to-Event Analysis, Random Forest, Gradient Boosting, Deep Learning, Imbalanced Data Modeling, Model Evaluation
- **Optimization & Operations Research**
  Linear Optimization, Constraint-Based Scheduling, Network Optimization, Resource Allocation
- **ML Systems & Decision Analytics**
  Predictive Decision Systems, Model Deployment, Model Validation & Monitoring
- **Data Platforms & Visualization**
  MySQL, SAP HANA, Tableau, R Shiny, ArcGIS

Professional Service & Leadership

2025–Present
- **Member**, TRB Standing Committee on Rail Safety Management Systems — active in the AI in Rail Safety Working Group, contributing to workshop design and developing Research Needs Statements for safety agencies and stakeholders.

2025–Present
- **Panelist**, TRB National Cooperative Highway Research Program (NCHRP 17-140) — Evaluated research proposals and guided projects on data-driven safety analytics and intelligent transportation systems.

2023–Present
- **Panelist**, TRB National Cooperative Highway Research Program (NCHRP 17-123) — Reviewed contractor deliverables and advised on analytics-driven evaluation of transportation safety performance.

2022–2024
- **Panelist**, TRB Transit Cooperative Research Program (TCRP) — Contributed to national research synthesis on surveillance technologies and collision prevention strategies.

Education

2015–2021 **North Dakota State University** Fargo, ND
PhD in Transportation & Logistics

2011–2014 **Islamic Azad University** Isfahan, Iran
Master of Industrial Management

2006–2011 **Islamic Azad University** Isfahan, Iran
Bachelor of Industrial Engineering

Selected Publications

- **Keramati, A., et al.** (2026). Time-to-event crash severity prediction at highway-rail grade crossings with monotonic neural networks. *Accident Analysis & Prevention.*
- **Keramati, A., et al.** (2025). Evaluating crash severity at highway-rail grade crossings using an analytic hierarchy process-based hazard index model. Accident Analysis & Prevention.
- **Keramati, A., et al.** (2021). Investigating the Effectiveness of Safety Countermeasures at Highway-Rail At-Grade Crossings Using a Competing Risk Model. *Journal of Safety Research*.
- **Keramati, A., et al.** (2020). A Crash Severity Analysis at Highway-Rail Grade Crossings: The Random Survival Forests Method. *Accident Analysis & Prevention.*
- **Keramati, A., et al.** (2020). Geometric effect analysis of highway-rail grade crossing safety performance. *Accident Analysis & Prevention*.