# Dr. Zeynab Bahrami Bidoni

Senior Data Scientist and Operations Research Expert
Ph.D. in Machine Learning & Supply Chain Optimization.

Over 17 years of industry collaborations, leading tangible real-world projects, mining extensive data for insights, and crafting solutions for complex analytical challenges and optimization problems.

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## WORK EXPERIENCE

Senior Data Scientist | A.T. Kearney Inc. (Hoptek)
(01/2023 - Present)

- Analyzing customer data to address quality and completeness issues, and employing data analysis and BI dashboards to streamline customer onboarding and change management processes.
- Design and develop cutting-edge **AI/ML** algorithms for **predictive forecasting and optimization**, aimed at enhancing the performance and efficiency of backend software products.
- Writing and implementing code for generated novel algorithms as part of the software and apply software engineering best practices to analytics code.
- Analyze extensive market and customer data to enhance various facets of customer experience, business operations, and product capabilities, ensuring continuous improvement and innovation across our services and product capabilities and features.

Research Assistant | Physical Internet Lab | ISYE, Georgia Institute of Technology | Atlanta, GA, USA (08/2015 - 12/2022)

- Be involved in big industrial projects (granted by BRP co., SF-Express, MiTek co.) as a researcher in the field of mathematical/statistical modeling, machine learning, data mining, data cleaning, pattern recognition, scenario-based demand forecasting, customer behavior modeling, and risk analysis.

Research Assistant | Clark Atlanta University | Atlanta, GA, USA
(08/2013 - 07/2015)

- Research in the field of network computing, data mining, and knowledge discovery granted by Army Research Laboratory had been done and novel approaches published in peer-reviewed journals and highly accredited conferences papers.

Project Controls Specialist and Management Advisor | KARA Project Management Co. | Tehran, Iran (2010 - 2012)

- Advising companies on leading their large-scale projects.
- Work with project managers and employees assigned to the projects and help them to properly plan their tasks through Oracle Primavera Software.
- Update schedules and planning for each projects, and communicate projects' progress updates through reports.

Adviser to CEO | Coasar Com R&D Group Co.| Tehran, Iran
(2006 - 2010)

- Revising human resource system and job allocations in the company and recommending required changes to CEO. Recognizing bottlenecks in the process of projects and providing solutions.
- Developing reasonable formulation for calculating employees' salary

## HONOR AWARDS

First ranked Award of POOIA Student Scholarship
***Professional Organization of Iranian Americans, January 2019.***

ACM/IEEE/ACM MobiHoc Travel Grant Awards
***Student Paper Competition, The 10th ACM/IEEE Symposium on Architectures for networking & communications systems (ANCS), and Poster competition in Airborne Networks & Communications conference, 2014.***

Secured 5th place in a national Mathematics Olympiad, competing against 175 finalists from 35 universities.
***behalf of Tarbiat Moallem University (TMU) 2004 and 2005.***

## EDUCATION

**PhD | Machine Learning - Supply Chain Optimization**
Industrial & Systems Engineering Department,
Georgia Institute of Technology
*08/2015 - 12/2022* *Atlanta, GA*

**MSc | Computer and Information Science**
Clark Atlanta University
*08/2013 - 07/2015* *Atlanta, GA*

**MSc | Industrial Engineering- System & Productivity Management**
Industrial Management Institute (IMI)
*2007 - 2010* *Tehran, IRAN*

**B.Sc.| Applied Mathematics**
Tarbiat Moallem University (Kharazmi University)
*2001 - 2005* *Tehran, IRAN*

## SKILLS

Python | TensorFlow | PyTorch | R studio | MATLAB | SQL/GSQL | C++ | Tableau | PowerBI | Azure Devops | AWS | DSS | HTML / CSS | D3 JavaScript | Creativity | Oracle Primavera | ProblemSolving | Integrity | Teamwork | Adaptability | Communication | Time Management

## INTERESTS

Machine Learning | Deep Learning | Demand Forecasting | Natural Language Processing | Probabilistic Graphical Models | Data Mining / Information Visualization | Network Computing | Mathematical Modeling | Customer Behavior Modeling | Multivariate Statistical Analysis | Business Decision Analysis | Integer/Combinatorial/Dynamic Optimization | Game Theory

## PROFESSIONAL PROJECTS

### AI-Powered Optimization and Predictive Modeling for Supply-Demand Management in Truckload Dispatch Planning Software

Hoptek, a Kearney Company

*05/2023 - 12/2024* *Atlanta, USA*

*Achievements/Tasks*

- **Innovative Modeling for Predictive Analysis:** Leveraged the predictive modeling techniques developed in the AI-based 'Book or Wait' project to architect a sophisticated mathematical model. This new model is designed to compute and forecast supply-demand imbalances within any arbitrary future time window across the entire truckload network.
- **Real-Time Visualization Dashboard:** Developed a user-friendly visualization dashboard that geographically displays live imbalances. This interactive tool allows for immediate, informed decisions by presenting complex data in an accessible and actionable format.
- **AI-Driven Dispatch Optimization** : Developed a novel AI-powered optimization model using integer programming. This model identifies optimal truck repositioning strategies, reducing supply-demand imbalances while minimizing travel and waiting times for trucks. By integrating probabilistic freight availability forecasts, the model intelligently prioritizes freight search options, aligning repositioning decisions with long-term network efficiency goals.
- **Impactful Outcomes:** The implementation of these AI-driven tools has fundamentally transformed supply-demand imbalance management. The solutions have significantly improved decision-making processes, optimized resource utilization, reduced network inefficiencies, and enhanced overall reliability and operational performance across the truckload network.

### Fleet Sizing Optimization Project for a Complex Barge Line Network

A.T. Kearney Inc. & Hoptek

*09/2023 - 12/2023* *Atlanta, USA*

*Achievements/Tasks*

- **Strategic Framework Development:** Architecting a robust framework for input file formats, essential in crafting demand patterns and delineating supply constraints.
- **Algorithm Innovation and Digital Twin Construction:** Innovated and formulated sophisticated algorithms to construct a **digital twin**, reflecting real-world network dynamics encompassing Scenario Demand Generation, Barge Log Compilation, Towing Boat Allocation, and the reconciliation of Empty Barge Supply/Demand Discrepancies.
- **System Integration and Deployment:** Engineered and deployed an integrated suite of modules, synergizing as a cohesive system while navigating interdependencies.
- **Monte Carlo Simulation Mastery:** Masterfully Orchestrated complex Monte Carlo simulations on the digital twin, encompassing multiple scenarios and iterations, to validate the system's resilience and adaptability.
- **Calibration and Validation:** Diligently calibrated system parameters through an in-depth analysis of historical demand logs. This process ensured that the derived Key Performance Indicators (KPIs) accurately reflected and harmonized with empirical outcomes, thereby enhancing the model's validity and applicability.
- **Dynamic Dashboard Development:** Developed a dynamic dashboard to visualize the outcomes of Monte Carlo simulations. This tool provides critical insights and managerial overviews, facilitating informed strategic decision-making and continuous improvement initiatives.
- **Impactful Outcomes:** These outcomes collectively contributed to a more efficient, resilient, and data-driven approach to optimizing the fleet sizing for the barge line network, setting a new standard for operational excellence and strategic planning.

## PAPER PUBLICATIONS

*Journal paper*

**Predictive Demand Modeling for Modular Construction: A Focus on U.S. Metropolitan Statistical Areas**

*Author(s)*

Z. Bahrami-Bidoni, B. Montreuil

*Under review*

*Journal paper*

**A Comprehensive Risk Assessment Framework for Predicting On-Site Demand and Completion Timelines in Distributed Modular Construction Projects**

*Author(s)*

Z. Bahrami-Bidoni, B. Montreuil

*Under review*

*Journal paper*

**Predictive Scenario-Based Demand and Customer Behavior Modeling for New Services in Hyperconnected Urban Parcel Logistics**

*Author(s)*

Z. Bahrami-Bidoni, B. Montreuil

*Under review*

*Journal paper*

**A sustainable competitive supply chain design for a green product under uncertainty**

*Author(s)*

Sajjad Fakheri, Zeynab Bahrami-Bidoni, Ahmad Makui, Mir Saman Pishvaee, Ernesto DR Santibanez Gonzalez

*Socio-Economic Planning Sciences, 2022, p.101414.*

*Full-text paper*

**Predictive Demand Modeling for New Services in Hyperconnected Urban Parcel Logistics**

*Author(s)*

Z. Bahrami-Bidoni, B. Montreuil

*Proceeding of IPIC 2021, 8th International Physical Internet Conference, June 2021*

*Full-text paper*

**Enabling Scientific Assessment of Large Scale Hyperconnected Urban Parcel Logistics: Scenario-based Demand and Customer Behavior Modeling**

*Author(s)*

Z. Bahrami-Bidoni, B. Montreuil

*Proceedings of IISE 2021 Conference*

*Full-text paper*

**Enabling Scientific Assessment of Large Scale Hyperconnected Urban Parcel Logistics: System Configuration and Assessment**

*Author(s)*

Campos M., B. Montreuil, L. McGinnis, S. Kaboudvand, S. Kwon, Z. Bahrami-Bidoni, L. Faugere, S. Buckley

*Proceedings of IISE 2021 Conference*

*Full-text paper*

**Discovering Overlapping Community Structure in Social Networks**

*Author(s)*

Z. Bahrami-Bidoni, R. George and K. Shujaee

*Proceedings of SOTICS 2016 : The Sixth International Conference on Social Media Technologies, Communication, and Informatics.*

*Full-text paper*

**Reliability-based Optimization aimed for Task Allocation in Heterogeneous Distributed Computing Systems**

*Author(s)*

Z. Bahrami-Bidoni, K. Shujaee

*World Automation Congress (WAC), 31 July- 4 Aug 2016.*

## PROFESSIONAL PROJECTS

### Developed AI-based 'Book or Wait' Recommender in Truck Load Dispatch Planning Software

Hoptek, a Kearney Company

*01/2023 - 04/2023* *Atlanta,USA*

*Spearheaded the creation of an advanced decision-support tool utilizing a sophisticated mathematical model to assist logistics planners. This tool calculates the probability of encountering additional loads within specific timeframes and locations, significantly aiding in the decision to book current loads or wait for potentially better options.*

*Achievements/Tasks*

- **Data-Driven Decision Making Model:** Integrated historical order data to predict future order likelihoods, tailored for both external freight and contracted orders. My efforts enhanced the strategic planning process, reducing reliance on intuition and significantly improving operational efficiency.
- **Continuous Improvement and Innovation on application Software:** Over four iterative versions, I led the design, development, and refinement of the application software, focusing on improving feature sets, accuracy, and user experience.
- **Extensive Testing and Validation:** Conducted rigorous testing across various geolocations and timeframes to assess risk and reliability. This process was critical in establishing a robust tool that guides planners in real-time, offering a 'light signal' indicator in dispatch plan enterprise software to optimize booking decisions.
- **Impactful Outcomes:** My contribution to the Book or Wait capability has been instrumental in transforming how planners approach load management, leading to an appreciable increase in operational efficiency and decision-making accuracy within the organization.

### Integrated Scenario-based Demand Forecasting and Risk-Informed Completion Scheduling in Modular Construction

Researcher in GeorgiaTech funded by MiTek Co.

*01/2021 - 12/2022* *Atlanta, USA*

*Achievements/Tasks*

- Pioneered the **Predictive Demand Modeling software**, a cutting-edge application for forecasting modular construction demand across U.S. Metropolitan Statistical Areas (MSAs). Developed a robust, scenario-based algorithm to **generate detailed demand logs**, effectively predicting geographically-distributed demand volumes over a 10-year horizon.
- Concentrated on key sectors including multi-family housing, hotels, dormitories, clinics, and convalescent centers. The software's predictive insights are crucial for strategic capital allocation in module production, enhancing the supply chain's capacity to meet anticipated demand in urban high-density areas.
- Advanced a comprehensive **risk assessment framework utilizing Statistical Modeling and Machine Learning** to quantify on-site risks and disruptive events. This framework systematically addresses uncertainties like weather conditions, equipment failures, and resource constraints, providing a mathematical foundation for risk management.
- Created an **interactive Python application facilitating user engagement with scenario simulation**. Users can set different assumptions, generating a range of probable scenarios from daily risk distributions. The app provides visual analytics and strategic insights, empowering managers to understand variables' impacts on project timelines and building completion windows.
- Demonstrated the application's effectiveness through deployment on multiple large-scale, real-world modular construction projects with MiTek Co. The tools have proven essential for enhancing planning and execution in the modular construction industry, leading to more efficient, informed, and risk-adjusted project management.

## PAPER PUBLICATIONS

*Full-text paper*

**A Recommendation Model for Reciprocal Negotiation Systems**

*Author(s)*

Z. Bahrami-Bidoni, R. George

*The IEEE Southeast Conference 2015*

*Full-text paper*

**A sorting method for group decision making with considering multi-criteria reciprocal judgments**

*Author(s)*

Z. Bahrami-Bidoni, R. George, A. Makui

*The IEEE Southeast Conference 2015.*

*Full-text paper*

**A smart assignment with consideration of multicriteria reciprocal judgments**

*Author(s)*

Z. Bahrami-Bidoni, R. George, A. Makui

*The Third ASE International Conference on Social Informatics – Harvard University, Dec 2014.*

*Full-text paper*

**Network Performance Rank: An Approach for Comparison of Complex Networks**

*Author(s)*

Z. Bahrami-Bidoni, R. George

*The Sixth ASE International Conference on Privacy, Security, Risk and Trust, Harvard University, Dec 2014.*

*Full-text paper*

**Network Service Quality Rank: A Network Selection Algorithm for Heterogeneous Wireless Networks**

*Author(s)*

Z. Bahrami-Bidoni, R. George

*Proceedings of the tenth ACM/IEEE symposium on Architectures for networking and communications systems, pp.239-240. ACM, 2014.*

*Full-text paper*

**Discovering Community Structure in Dynamic Social Networks using the Correlation Density Rank**

*Author(s)*

Z. Bahrami-Bidoni, R. George

*Proceedings of the SocialCom - Stanford, CA, USA. The Sixth ASE International Conference on Social Computing, 2014.*

*Full-text paper*

**A Generalization of the PageRank Algorithm**

*Author(s)*

Z. Bahrami-Bidoni, R. George and K. Shujaee

*Proceedings of the ICDS 2014, The Eighth International Conference on Digital Society, pp. 108-113. 2014.*

*Thesis*

**Modeling Multi-Criteria Reciprocal Decision Making**

*Author(s)*

Z. Bahrami-Bidoni

*2007-2010*

Industrial Management Institute | M.Sc. Thesis

## CONFERENCE PRESENTATIONS

Risk-Sensitive Scenario-based Prediction of On-Site Demand and Completion Times in Modular Construction Projects

*Talk presented at IISE 2022 Conference, May 21st – May 24th, 2022, Seattle.*

Parcel-logistic Customer Behavior Modeling and Scenario-based Demand Generation

*Talk presented at INFORMs 2020 Annual Meeting Conference, Nov 8th -11th, 2020.*

## PROFESSIONAL PROJECTS

### Predictive Scenario-based Demand Forecast and Customer Behavior Modeling for New Services in Hyperconnected Urban Parcel Logistics

Researcher in GeorgiaTech funded by SF-Express co.

*2017 - 2020* *Atlanta, USA*

*Achievements/Tasks*

- Demand and customer behavior modeling for a service provider who wants to extend its offering system to much faster delivery service than ever done before.
- Studied a **big real-world Chinese megacity database** on **SQL server** including one-year waybills and Barcode Scanning streaming (in terabytes volume) - Cleaning, detecting anomalies, and estimating Null/missed data was challenging.
- Conducted **ML** methods for **customer profiling and clustering** in terms of their preferences over services by capturing customers' sensitivities to the delivery-time observed in historical sales data and geo-categorization of orders in different time factors.
- Developed a **scenario-based demand generation App** with an interactive user-interface in **MATLAB** for generating a wide range of **demand scenarios** with **probabilistic patterns for customers' behavior** over all service offers with **dynamic pricing** and providing scenario-based **forecasted demand logs** for any arbitrary time horizon.
- The App's outputs are used to **feed a simulator** which models the last-mile delivery network of urban agglomerations in **Anylogic**, and it enables **testing service capability improvements** achievable by leveraging Physical Internet aligned transformation in a megacity.

### Data-driven Product Substitution Availability Optimization in the Dealer network of a Vehicle Manufacturing System

Research in GeorgiaTech granted by BRP Co. (2016)

### Large Scale Data Analysis and Knowledge Extraction in Communication Data

Research funded by Army Research Laboratory

*08/2013 - 07/2015* *Atlanta, USA*

*Achievements/Tasks*

- Developing a **Generalizing PageRank** algorithm such that recognizing spider traps and **avoids the negative impact of spam pages.** This generalization enables the elimination of network anomalies- and increases the applicability of the algorithm to an array of new applications in networked data. Through experimental results, it **minimizes the effect of network anomalies,** and results in a more realistic representation of the network. (PageRank is used for ranking web pages by Google Co.)
- Define a novel and efficient **distance-based ranking** algorithm, called the "**Correlation Density Rank**" (CDR), which is utilized to derive the hidden **communities and leadership structures** and also to present an evolution graph of the organizational structure in dynamic networks.
- Proposed a novel approach with **low complexity** to **rank alternative complex networks** based on their performances considering occurring positive/negative frequent events as criteria which is capable of discriminating events occurring between important nodes over those between less significant nodes.
- Proposed a **utility-based** novel approach for **Ranking Quality of Service** and identifying the best service provider in Heterogeneous Wireless Networks by differentiating the quality of service (**QoS**) and providing a framework for analytical performance evaluation.
- Modeled an effective novel method to find the best solution with low computation time using the **CDR** algorithm on the **Virtual Allocation Network** (VAN) in order to obtain a **Reliability-based Optimization** aimed for **Task Allocation** in Distributed Computing Systems.

## CONFERENCE PRESENTATIONS

Predictive Demand Modeling for New Services in Parcel-delivery Logistic Systems
*Talk presenting in IISE 2020 Conference, Oct 31st – Nov 3rd, 2020, New Orleans.*

An integrated parcel logistics demand and customer behavior modeling
*Talk presenting in IISE 2019 Conference, May 21st, 2019, Florida.*

Virtual Allocation Network Analysis: a fast way to Reliability-oriented Optimal Task Assignment in Heterogeneous Distributed Computing Systems
*Poster presenting in CRIDC 2016 Conference, Georgia Tech, March 10, 2016.*

Service Quality Ranking in Airborne Communication Networks
*Poster presenting in ACM MobiHoc workshop on "Airborne Networks and Communications" 2014.*

A Two-Dimensional Screening Method for Multi-Criteria reciprocal Selection Systems
*Poster presenting in the third ASE International Conference on Social Informatics– Harvard University, Dec 2014.*

## TEACHING ASSISTANTSHIPS

ISYE - 6230 • Economic Decision Analysis | GaTech, Spring 2022

CS - 4400 • Intro. to Database Systems | GaTech, Summer 2021

ISYE- 6740 • Computational Data Analysis | GaTech, Spring 2021

ISYE-6202 • Warehousing Systems | GaTech, Fall 2017

ISYE-3104 • Supply Chain Modeling: Manufacturing & Warehousing | GaTech Summer 2017

ISYE-3025 • Engineering Economy | GaTech, Spring 2017

ISYE-4803 • Health Supply Engineering | GaTech, Summer 2016

## ORGANIZATIONS

Coordinator of ROSHD (Resource Organization for sexuality, Health and Development) (08/2019 - 12/2022)
***As part of the Serve, Learn, Sustain aspect of my second minor in the field of Iranian Studies with an emphasis on Technology, Media, and Society, Georgia Institute of Technology***

## LANGUAGES

English
*Full Professional Proficiency*

Persian
*Native or Bilingual Proficiency*