Tanzid Hasnain, PhD
Senior Data Scientist
Supply Chain Analytics
Walmart Inc.

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RESEARCH INTEREST

My research interests focus on developing optimization-based methods to elicit stakeholders' preference/utility and include such preferences in identifying the optimal and preferred decision for the stakeholders. I have employed the following methodologies in my research: multi-criteria optimization models, linear programming, non-linear programming, mixed-integer programming, machine learning models including regressions, static and longitudinal clustering.

TEACHING INTEREST

I am interested to teach graduate and undergraduate level courses related to production system, supply chain management, mathematical modeling, operations management, data and business analytics, data visualization, and statistics.

EDUCATION

North Carolina State University, *Raleigh, NC*

Ph.D. in Industrial Engineering   *CGPA: 3.80 (4.00), August 2022*

Dissertation: Agents' Preferences in a Food Bank Network and Their Interaction.

Advisor: Dr. Julie Ivy, Professor, and Dr. Irem Sengul Orgut, Assistant Professor

Master of Industrial Engineering   *CGPA: 3.87 (4.00), May 2019*

Bangladesh University of Engineering & Technology (BUET), *Dhaka, Bangladesh*

Bachelor of Science in Industrial and Production Engineering   *CGPA: 3.60 (4.00), September 2015*

PROFESSIONAL EXPERIENCE

Walmart Inc.   ***Bentonville, AR***

Senior Data Scientist, *Supply Chain Analytics*   *July 2022 - Present*

- Developed a single-period, mixed-integer weighted multi-criteria optimization model that optimally consolidates the earmarked bundles to be delivered from Walmart vendors to Distribution Centers (DC) in Walmart Consolidation Centers.
- Considered three criteria in the model: (i) minimize total trucking cost; (ii) maintain truck utilization within capacity bounds (bounds are fluid, i.e., allowed to be violated with a penalty); and (iii) maintain equitable truckload among the dispatched trucks.
- Developed a unimodularity-based heuristic to warm start the MIP model that reduced the runtime by as much as 80% without worsening the solution quality.
- The solutions from the model resulted in 10% reduction in trucking cost, 60% reduction in truck capacity breach, and 5% increase in unfairness in truckload on average on a biweekly basis.
- Implemented the model in Cloud environment for pilot using Jupyter Notebook, PuLP library and SQL queries.

Walmart Inc.   ***Bentonville, AR***

Supply Chain Corporate Graduate Intern   *June 2021 – August 2021*

- Developed a Mixed-Integer Linear Programming model as a sourcing solution (identifying the facility, carrier method, and route) for Walmart online customer orders.
- Developed a Linear Regression Model to predict the transportation cost of a package based on package weight and dimensions.

- Performed extensive data wrangling to identify the scale of Walmart online retail in terms of number of orders, items per order, quantity per item, number of facilities, carrier methods, and lanes.
- Performed extensive run-time analysis of the model on nation-wide and regional scales of Walmart's online retail with the largest model containing approximately 200,000 variables and 10,000 constraints; showed that the runtime of the model is feasible on US regional scale during off-peak, average and rush-hours.

Performigence Corporation,   *Los Angeles, CA*
Graduate Student Research Intern   *May 2020 - August 2020*
- Created executable filles (software applications) for predictive and optimization models developed in Python, CPLEX, and R for the demand and distribution policies of food banks. The executable files assisted two food banks in their monthly planning and decision-making process in donation and distribution of donated food.
- Developed interactive network graphs (geomaps) in Python to visualize the optimal distribution policy to assist food banks visually in their distribution decision-making process.
- Developed optimization models to produce the optimal distribution policy in Python and CPLEX for the food banks. The models consider equity, waste and trucking cost minimization, three criteria commonly used the food banks.
- Developed interactive charts using the Plotly library in Python for volunteer data, comparing the results in COVID-19 with previous years to help food bank managers to track volunteer availability and take necessary actions to mitigate the impact of a shortage of volunteers.

Decathlon   *Chittagong, Bangladesh*
Supply Chain Analyst   *September 2015 - July 2017*
- Managed the product orders received in prod.com and/or SAP from the warehouses around the world.
- Maintained the production planning of the received orders to ensure on-time production and delivery.
- Performed component procurement considering the component lead times and order delivery dates.

RESEARCH EXPERIENCE

North Carolina State University   *Raleigh, NC*
Graduate Research Assistant, Department of Industrial and Systems Engineering   *Fall 2018 - Spring 2021*
Research Project: PFI: BIC - Flexible, equitable, efficient, and effective distribution (FEEED)
Funded by: National Science Foundation, Mentor: Dr. Julie Ivy
The goal of the FEEED project is to develop a smart service system to assist hunger relief organizations, like food banks, in the Flexible, Equitable, Efficient (minimize trucking cost), and Effective (minimize food waste) Distribution (FEEED) of food to those in need. FEEED synthesizes data from various sources to automatically predict, visualize, learn from decision maker's actions, and identify strategies to advance operational effectiveness of food collection, distribution, and resource management and fundamentally transform the way food banks operate.
- Analyzed the historical distribution data of a local food bank in NC, to understand and characterize different input parameters to the models developed.
- Designed food banks' food safety and operational Standard Operating Procedure in ProcessGenius as a part of the smart service system developments.
- Developed a single period weighted multi-criteria optimization model for the efficient, equitable and effective distribution and implemented using Python and Gurobi to study the optimal distribution policy to distribute the donated food received by a food bank.
- Developed an algorithm that can elicit a food bank manager's preference/weights on the three criteria by observing the manager's historical actions in the past.
- Developed visualizations in Python to present the model outputs to showcase the model performance.

- Developed executable files to implement the model as part of a prototype to be used by partner food bank managers.
- Coordinated and lead project meetings; prepared and reviewed project reports; mentored teammates.

Research Project: PFI: 2125600 - Satisfying Households in Areas with food Insecurity with a Network for Good (SHARING)

Funded by: National Science Foundation, Mentor: Dr. Julie Ivy

The goal of the SHARING project is to develop a smart and connected community among different stakeholders in a food bank network. The primary goals of the project are to identify the preferences of different stakeholders, develop models to identity the optimal distribution policy considering the preferences, develop resilient network structures, and reduce food waste by connecting the volunteers with local food sources real-time.

- Developed a non-linear programming model that can elicit the utility structure of the charitable agencies who receive food from the food bank and distribute the food to the people in need.
- Developed an algorithm that can elicit the length of horizon a given agency's activities are performed in a stable manner.
- Developed a linear regression model to study the association of the agencies' utilities over the food they receive from a food bank with relevant socio-economic and ability related factors.
- Developed Python based visualizations to capture the variance among the agencies' utility structure and their stabilities geographically.
- Presented our findings on the utility and stability of our partner food bank's partner agencies, which was deemed as "highly useful" to separate the agencies with high ability to receive food from the food bank from the ones with low ability.

Research Project: RAPID/Collaborative Research - Capacity Adjustment, Resilience and Information Sharing in a Network for Good (CARING)

Funded by: National Science Foundation, Mentor: Dr. Julie Ivy

The goal of the RAPID: CARING project is to support data collection efforts to capture the after-effects of Hurricane Florence on the Food Bank of Central and Eastern North Carolina (FBCENC). The project team collects data on the challenges encountered by FBCENC after Hurricane Florence to provide insight for how nonprofit food distribution organizations can prepare, respond, and recover from disruptions to their network.

- Performed a collaborative mixed-method approach combining qualitative and quantitative methodologies to study and capture the impact of Hurricane Florence on the activities of the entities that constitute the FBCENC network.
- Led and performed the quantitative analysis including comparison and control chart development, statistical analysis, and geo-plotting. Then matched the findings from the quantitative analyses with the findings from the qualitative analyses to bolster our findings on Hurricane Florence's impact on FBCENC.
- Participated in the discussion of identifying potential agencies to study, design the interview questions and focus group discussion.
- Developed visualization of agency mapping in the hurricane Florence affected counties and identified candidate agencies for process observation.
- Visited all three Florence affected branches of FBCENC, observed and recorded their operational process to identify the impact of hurricane Florence.
- Coordinated and lead project meetings; prepared and reviewed project reports; mentored teammates.

TEACHING EXPERIENCE
North Carolina State University   *Raleigh, NC*

Instructor, Department of Industrial and Systems Engineering   *Spring 2021*
- Independent instructor for an undergraduate level class Design and Control of Production and Service Systems. (24 enrolled)

Graduate Teaching Assistant, Department of Industrial and Systems Engineering
- Teaching Assistant for Undergraduate Engineering Economy Course   *Fall 2017*
- Teaching Assistant for Graduate Engineering Economy Course   *Spring 2018*
- Teaching Assistant for Graduate Production Planning, Scheduling and Inventory Control
  Fall 2018, Spring 2019
- Teaching Assistant for Undergraduate Design and Control of Production and Service Systems
  Fall 2018, Spring 2019

PUBLICATIONS
Peer Reviewed Journal Publications
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. (2021). Elicitation of preference among multiple criteria in food distribution by food banks. Production and Operations Management, 30(12), 4475-4500.
- Zeytoon-Nejad, A., & **Hasnain, T.*** (2021). The coronavirus trade-off–Life vs. economy: Handling the trade-off rationally and optimally. Social Sciences & Humanities Open, 4(1), 100215.

Peer Reviewed Conference Papers
- Zoha, N., **Hasnain, T.**, & Ivy, J. (2022, September). Tradeoff between Geographic and Demographic Equity in Food Bank Operations. In IIE Annual Conference Proceedings.

Manuscripts under review
- **Hasnain, T.**; Walton, T; Odubela, K.; McConnell, S.; Davis, L.; Ivy, J.; Jiang, S.; Coan, D.; Islam, M. & Mpere, E. Resiliency within the Socio-Ecological System of a Large Food Bank Network: Preparing, Mitigating, Responding, and Recovering from Hurricane Florence. Submitted to International Journal of Disaster Risk Reduction. (Submission no: IJDRR-S-22-01348)

Manuscripts in Preparation
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of Utility and Stability of the Partner Agencies of a Food Bank and the Association of the Utilities with Socio-economic Factors. To be submitted to International Journal of Production Economics.
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. When a Food Bank Considers the Utility of its Partner Agencies in the Distribution of Donated Food: A Nonlinear Multi-criteria Optimization Approach.

PRESENTATIONS/INVITED TALKS
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of Utility and Stability of the Partner Agencies of a Food Bank and the Association of the Utilities with Socio-economic Factors. To be submitted International Journal of Production Economics. NCSU SHARING Research Group (Invited Speaker)
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. INFORMS 2021, Virtual (Invited Speaker)
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. INFORMS Minority Issues Forum Best Paper Competition 2021 (Invited Speaker)
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. INFORMS 2020, Virtual (Invited Speaker)

POSTER PRESENTATIONS
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. INFORMS Minority Issues Forum 2021 Poster Competition

*Equal Contribution

- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. 4th Annual NRT Conference
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. INFORMS 2020 Poster Competition
- **Hasnain, T.,** Sengul Orgut, I., & Ivy, J. S. Elicitation of preference among multiple criteria in food distribution by food banks. 1st Annual NRT Conference

SERVICE
- Reviewer, Operations Research in Healthcare, 2022
- Reviewer, European Journal of Operations Research, 2021
- Reviewer, Socio-Economic Planning Sciences, 2021
- Session Chair, Policy Design according to User Preferences, INFORMS Annual Meeting, 2020

MENTORING
North Carolina State University   *Raleigh, NC*

Graduate Students
- Naurin Zoha, Industrial and Systems Engineering   *Spring 2021 – Spring 2022*
  Research: Tradeoff between demographic and geographic equity in food bank operations.
- Ajinkya Pandurang Salve, Industrial and Systems Engineering   *Fall 2019 – Spring 2020*
  Research: Static and longitudinal clustering of the partner agencies of Los Angeles regional Food Bank in terms of the pounds of food received by the agencies.
- Ajith Yadav Selvaraj, Industrial and Systems Engineering   *Fall 2019 – Spring 2020*
  Research: Visualization of donation and distribution activities by Los Angeles regional Food Bank.

Undergraduate Students
- Dani Coan, Sociology   *Fall 2018 – Spring 2020*
  Research: Process observation of FBCENC branches affected by Hurricane Florence.
- Trea Johnson, Industrial and Systems Engineering   *Fall 2018 – Spring 2019*
  Research: Analysis of agency locations by service types in Hurricane Florence affected counties.
- Sarah McConnell, Industrial and Systems Engineering   *Fall 2018 – Fall 2019*
  Research: Development of comparison and control charts to capture the impact of Hurricane Florence on the network of Food Bank of Central and Eastern North Carolina
- Bill Lamm, Industrial and Systems Engineering   *Spring 2021*
  Research: Visualization of the partner agencies of the Los Angeles Regional Food Bank (LARFB)

LEADERSHIP EXPERIENCE
North Carolina State University   *Raleigh, NC*

Vice President, Bangladesh Students' Association   *July 2018 – June 2019*
- Represent the student body of the Bangladeshi International graduate students at NCSU to the University Graduate Students Association.
- Planning and executing events to promote the Bangladeshi culture to the NCSU community.

Sports Secretary, Bangladesh Students' Association   *July 2019 – June 2020*
- Organized different sports e.g., Soccer, Cricket events for Bangladeshi students studying at NCSU.

GROUPS AND AFFILIATIONS
- *Institute for Operations Research and Management Sciences (INFORMS)*   *August 2018 - Present*
- *Institute of Industrial and Systems Engineers (IISE)*   *September 2021 – Present*

HONOR & AWARDS

- *Graduate Students Association Travel Assistance Award, NCSU*   *Spring 2022*
- *Featured by POMS - College of Humanitarian Operations and Crisis Management*   *April 2022*
    Paper: Elicitation of Preference among Multiple Criteria in Food Distribution by Food Banks
- *1st Place Winner, 3MT Thesis, NRT Conference, NCAT*   *Fall 2021*
- *Fitts's Fellowship, Industrial and Systems Engineering, NCSU*   *Fall 2021 – Spring 2022*
- *Finalist, Best Paper Competition, INFOMRS Minority Issues Forum*   *October 2021*
    Paper: Elicitation of Preference among Multiple Criteria in Food Distribution by Food Banks
- *Runners-up, Feeding America Supply Chain Data Analytics Competition*   *January 2021*
- *Winner, Call for Code Spot Challenge: Mental health in a time of crisis*   *October 2020*
    Featured in [FORBES](), [Research Triangle](), [WUNC]()
- *Prepare the Professoriate fellowship*, Graduate School, NCSU   *Fall 2020 - Spring 2021*
- *Graduate Fellowship*, Graduate School, NCSU   *Fall 2017-Spring 2018*
- *Merit List Scholarship, BUET*   *June 2005, December 2014*

CERTIFICATIONS

- *IBM Data Science Specialization, Coursera*   *December 2019*
- *Neural Networks and Deep Learning, Coursera*   *February 2021*

COMPUTER SKILLS

Statistical Software   : SAS, SAS Enterprise Miner, R, Tableau, SPSS, Stata
OR Software   : CPLEX, GUROBI, LINGO
Programming Languages   : Python, JAVA, MATLAB,
Database Management Tools   : My SQL, My SQL Server, BigQuery