



BrandDataLab

AI/ML Driven Predictive & Dynamic Scheduling in Food & Beverage Industry to Address Labor Mismatch



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Executive Summary



In the post-pandemic economy, the logistics sector has been hit particularly hard, with the impact of worker-retention challenges and rising labor costs (1). While some of the impact is temporary, there are deeper structural shifts in the way the F&B industry needs to deal with the labor mismatch and increasing costs. As mentioned in the McKinsey report, “successfully navigating the current labor mismatch requires a comprehensive set of coordinated actions that address labor issues and their effects across the value chain” (1). This problem may be cost effectively solved using cutting-edge AI/ML applied to flexible work allocation to the workforce. The solutions need to be resilient to dynamically changing constraints and quickly re-adapt its optimal allocations allowing for situational awareness built into scheduling. This white paper gives the reader a snapshot of possibilities using the AI/ML assisted tools to address labor mismatch.

Key Opportunities



With over 4 million people having left the US workforce in civilian industries since 2020 till date, the cost of labor is increasing at double the traditional rates of increase. Transport and warehouses labor rates have increased by twofold more as compared to the average rate. Moreover, about 16 million people have relocated within the US and 1.7 million people have taken early retirement (2, 3, 4, 5).

Given the new constraints imposed by changing preferences of the workforce in terms of timezones, locations, task preferences, overtimes, and overall job satisfaction, a AI/ML-powered work-workforce allocator that boosts job satisfaction for the workers while minimising costs and time simultaneously will significantly reduce OpEx (4,5). This is because the AI/ML engine can simultaneously optimise up to large number of parameters including several human-centric accommodations to boost job-satisfaction for the workers.

Predictive and Resilient Scheduling in Food and Beverage (F&B) Distribution

A typical food and beverage operation consists of a multitude of discrete worker tasks. These tasks have inherent dependencies, dynamism, and productivity KPIs. Consider a sample set of operations (but not limited to these) a typical food and beverage industry worker carries out on a daily basis (6):

- Process, pack, and ship orders accurately
- Maintain inventory of products and supplies; restock as needed
- Inspect products for damages; report as needed
- Clean the warehouse environment
- Receive and appropriately sort and store incoming products
- Prepare products for shipping
- Follow all safety protocol and warehouse procedures
- Off-load inbound inventory from LTL or common carrier trucks
- Check and verify inbound inventory quantities against purchase orders documents
- Interact with Inventory Control to ensure accurate inventory data
- Maintain high productivity, quality and accuracy
- Identify errors to normal processing and escalate accordingly
- Operate shipping carrier manifesting machines
- Meet daily productivity goals
- Ability to work overtime as needed



Constraints

The above mentioned tasks need to be performed with the following constraints

- Accounting for different levels of urgency (for example, based on how perishable the foods are) and different levels of importance (for example, high dollar value shipments).
- Many of these tasks need multiple team members to work together simultaneously (e.g loading and unloading) by grouping people with right skill sets and training
- Many of these tasks may have multiple prerequisites and post-requisites
- Many of these tasks may need resources to be allocated from a specially trained pool of people (e.g using inventory management software, shipping and receiving machinery operations etc).
- Various members of the workforce may have different costs based on their payscale, contract or full time status, and appropriate quality and quantity of jobs needs to be assigned to each of them considering the cost model.
- Each workforce member may be assigned to separate shifts, or may have a preference for flexible work hours. All tasks need to be optimally scheduled, possibly considering flexible work hours and off-duty schedules.
- People's preferences for specific types of tasks to be allocated for specific groups of people need to be accounted for, along with the possibility of grouping people based on theirs or their manager's preferences for teammates.
- Overtimes need to be minimised for employee satisfaction and cost reduction.
- Optimal yet fast re-scheduling when team members are unable to keep their schedules.

BDL's AI engine efficiently navigates through all the constraints and finds a near-optimal allocation of work to the workforce, that accounts for human preferences as well as total cost and time. What differentiates the BDL solution is that it simultaneously optimises total time and opex across the entire team, across an arbitrary set of tasks. It is designed to be extremely efficient in terms of supporting analysis of various hypothetical "what-if" scenarios, in order to cover incumbency plans and their associated op-ex, given the post-Covid unpredictability in terms of workforce availability.

Basic Architecture / Plan and Pathways



BDL's AI based solution differentiates itself along many dimensions from other options in the marketplace, for example, by treating strategic aspects of schedule optimisation differently from tactical aspects. It differentiates between various levels of urgency and importance associated with any task, and the AI engine schedules important tasks before they become urgent. It accounts for human preferences for tasks, human preferences for locations and flexible hours/shifts, human preferences for teammates and tasks, prerequisites and post-requisites of tasks, fixed-ETA versus flexible-ETA tasks, avoiding priority inversion, all while maximising the efficiency and minimising the op-ex simultaneously. It can model perturbations caused by outside factors, and can assess cost and schedule impact in various "what-if" scenarios, thus enabling emergency preparedness and avoiding future drudgery.

In a typical work-to-workforce schedule optimisation, the BDL AI solution results in upto 20% cost and time saving across weekly and monthly schedules.

What can BDL do for you?

BDL is a boutique firm that helps clients with data extraction, integration and AI/ML analysis. BDL solution for AI/ML driven predictive scheduling and workload management, has generated upto 20% savings in OpEx for clients.

Team



Chet Rao

B.Tech. IIT Bombay
Ph.D. University of Wisconsin
Madison
M.B.A. University of Minnesota

20+ years experience in consumer products and healthcare. Experience at fortune 200 companies and large healthcare institutions. Strategic transaction experience, both buy and sell-side, for deal values ranging in \$5-\$500 MM. Seasoned executive with a proven track record in general management, innovation, and M&A.



Prachi Jogalekar

M.Sc. University of Ottawa in
Microbiology & Biochemistry

CEO of a stealth mode startup, who is delivering groundbreaking AI-driven technology that successfully optimizes OpEx and CapEx in complex organizational structures with dynamically changing constraints. Currently leading teams with extensive expertise in project management, modeling, and analysing "what-if" scenarios of workflows and logistics.



Mangesh Mahajan

M.Sc. IIT Bombay
London School of Economics
M.Sc. financial security and risk
analysis

Mangesh is known as one of the sought-after experts in AI, Exchanges, SAAS, and NLP. He is known for some of the early algorithms & models in Micro-reflexivity and the use of AI. Mangesh has successfully started software companies and exited out of them. He is considered an expert VC for SAAS growth companies in California.

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Thank you



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