

Integrating Forecasting and Inventory Decisions Using AI/ML

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In this talk, I will discuss a novel decision-making approach that integrates demand forecasting and inventory management for IKEA's multi-store food service operations. The focus is on determining thawing quantities for frozen ingredients by transferring them from freezer storage to cold rooms for use in prepared dishes. This replenishment decision is particularly challenging due to ingredient commonality across multiple dishes, which amplifies complexity when combined with the uncertain and non-stationary demand for dishes. To address this, we propose a bound-and-shave approach that first estimates lower and upper bounds for each ingredient's optimal thawing quantity using cost-sensitive regression. A greedy cost-sensitive classification algorithm then iteratively reduces the initial upper bound in increments of thawing batch sizes until further reductions are predicted to yield no additional cost savings or the lower bound is reached. Applied to eight Belgian IKEA Food restaurants, the bound-and-shave model reduces food waste up to 74.7% and total operational costs by 50% under high service-level requirements. Independent ingredient-level forecasts proved inadequate when component commonality is high, underscoring the relevance of this methodology for assemble-to-order systems in food service, retail, and manufacturing.