

# Optimizing Delivery Time Estimation with Machine Learning



# Introduction

Accurate scheduling is critical in last-mile logistics, where delivery timing significantly impacts customer trust, driver availability, and revenue.

Bungii is a national final-mile provider specializing in the on-demand delivery of big and bulky goods across retail, logistics, and distribution. Previously, Bungii relied on a static formula to calculate delivery durations. This approach worked initially, but as Bungii

expanded to high-volume, scheduled deliveries, the legacy method produced inconsistent delivery windows and reduced operational efficiency.

Creative Capsule partnered with Bungii to develop a machine learning-based solution that predicts delivery times more accurately, using historical delivery data, contextual variables, and scalable cloud deployment.

creativecapsule™ +  BUNGII

Partnered to develop a machine learning-based solution that predicts delivery times more accurately using:



Historical  
delivery data



Contextual  
variables



Scalable  
cloud deployment

# Challenges

## Inaccurate Delivery Time Estimates

Delivery estimates frequently deviated from actual completion times, leading to early or delayed arrivals. To compensate, Bungii widened delivery windows, which reduced precision and slowed operations. Support tickets and operational analytics highlighted these discrepancies.

## Limitations of the Existing Model

The original model used Google Maps for travel time, customer-entered loading/unloading duration, and a fixed multiplier and buffer, applied uniformly across all cities and delivery types. The Bungii application works on scheduled deliveries, and Google Maps accounted for traffic behavior in real-time rather than the scheduled time. This resulted in high error margins. Our solution takes this into consideration, as well as other factors that Google Maps does not capture like item types, service time at pickup/drop-off, partner workflows, and geographic variations.

## Operational and Customer Impact

Drivers experienced idle time between jobs, reducing deliveries completed per shift, and limiting earning potential. Dispatch teams made frequent manual adjustments. Customers and retail partners experienced less predictable delivery windows, leading to scheduling conflicts and reduced satisfaction.

## Scaling and Complexity

As Bungii expanded into enterprise logistics, the volume and complexity of scheduled deliveries increased. Historical delivery data existed but was not utilized for predictive analytics. A scalable, data-driven system was needed to adapt to operational variability.

These challenges collectively reduced delivery throughput, limited revenue growth, affected driver earnings, and impacted customer satisfaction—highlighting the need for a more accurate, and data-driven delivery time prediction approach.



# Solution

## 1 Strategic Shift to Data-Driven Estimation

Creative Capsule identified the issue by analyzing recurring delivery discrepancies and historical delivery data. Instead of refining the static formula, a machine learning framework was proposed to generate real-time, context-aware delivery duration predictions tailored to the route, driver behavior, partner, and delivery characteristics.

## 2 Machine Learning Model Development and Architecture

- **Data Preparation and Feature Engineering**  
Creative Capsule cleaned historical delivery data, removed anomalies, and structured it for training. The data included pickup and drop-off timestamps, Google Maps travel estimates, loading and unloading times, partner SLAs, delivery zones, and route metadata.
- **Model Selection and Training**  
We evaluated several algorithms, including Linear Regression, SVR, Decision Trees, Random Forest, and XGBoost. XGBoost delivered the most accurate results. We improved prediction accuracy through hyperparameter tuning and cross-validation.
- **Technology Stack and Tools**

Model development	Python, scikit-learn, XGBoost, Pandas, NumPy
Model tracking	MLflow
Data versioning	DVC
REST API deployment	FastAPI
Scalable cloud deployment	AWS services including EKS, EC2, RDS (MySQL), S3, API Gateway, Lambda, and Secrets Manager

## 3 Deployment and Rollout

We deployed the models as microservices using REST APIs. We conducted a controlled rollout within geofenced areas and enabled real-time monitoring through Power BI. After the models outperformed the static system, we scaled the solution across all active markets.

# Results and Impact



## 94%

reduction in major delivery-time errors, resulting in more reliable ETAs.



## 54%

improvement in overall prediction accuracy for top partners.



Up to  

## 73%

accuracy improvement across service regions.

## Future Outlook

The ML framework supports ongoing retraining with new data and expanding features such as weather, seasonal demand, vehicle types, and item dimensions.

Future enhancements may include route optimization, dynamic pricing, capacity forecasting, and real-time driver incentive models. This foundation enables Bungii to scale using predictive automation rather than static scheduling.

## About Us

Creative Capsule LLC was founded in Kansas City, USA, in 2003. It has subsidiaries in Switzerland and India. With over 300 full-time, local, and offshore employees, the company provides cost-effective software consulting and development, DevOps, and cybersecurity services to SaaS companies.

For companies looking to scale up and secure their software operations, we offer a range of advanced services such as AWS Elastic Kubernetes Service, Azure DevOps, Serverless computing, cyber threat prevention, and vulnerability assessment. Our expertise spans diverse industries, including tech startups, financial services, healthcare, and pharma.

## Startup Ecosystem Partners



## Expertise Areas

- MLOps Integration
- Cloud Computing
- Amazon EC2, Amazon S3, Amazon RDS
- ETL Processing
- Amazon Redshift
- Serverless Computing
- CloudFront CDN
- AWS Batch Jobs
- Model Fine-Tuning and Data Expansion
- Real-Time Feedback Loop
- Predictive Analytics

## Our Partnerships and Certifications

