

Improving Delivery Performance Through Transit Time Prediction

Motivation / Background

Less-than-truckload (LTL) shipments are less predictable than truckload shipments due to:



For a logistics company that leverages an external LTL network, these uncertainties pose a problem for scheduling shipments to deliver on time.

In the sponsor company's data, **74%** of shipments took longer to deliver than the estimated transit time.

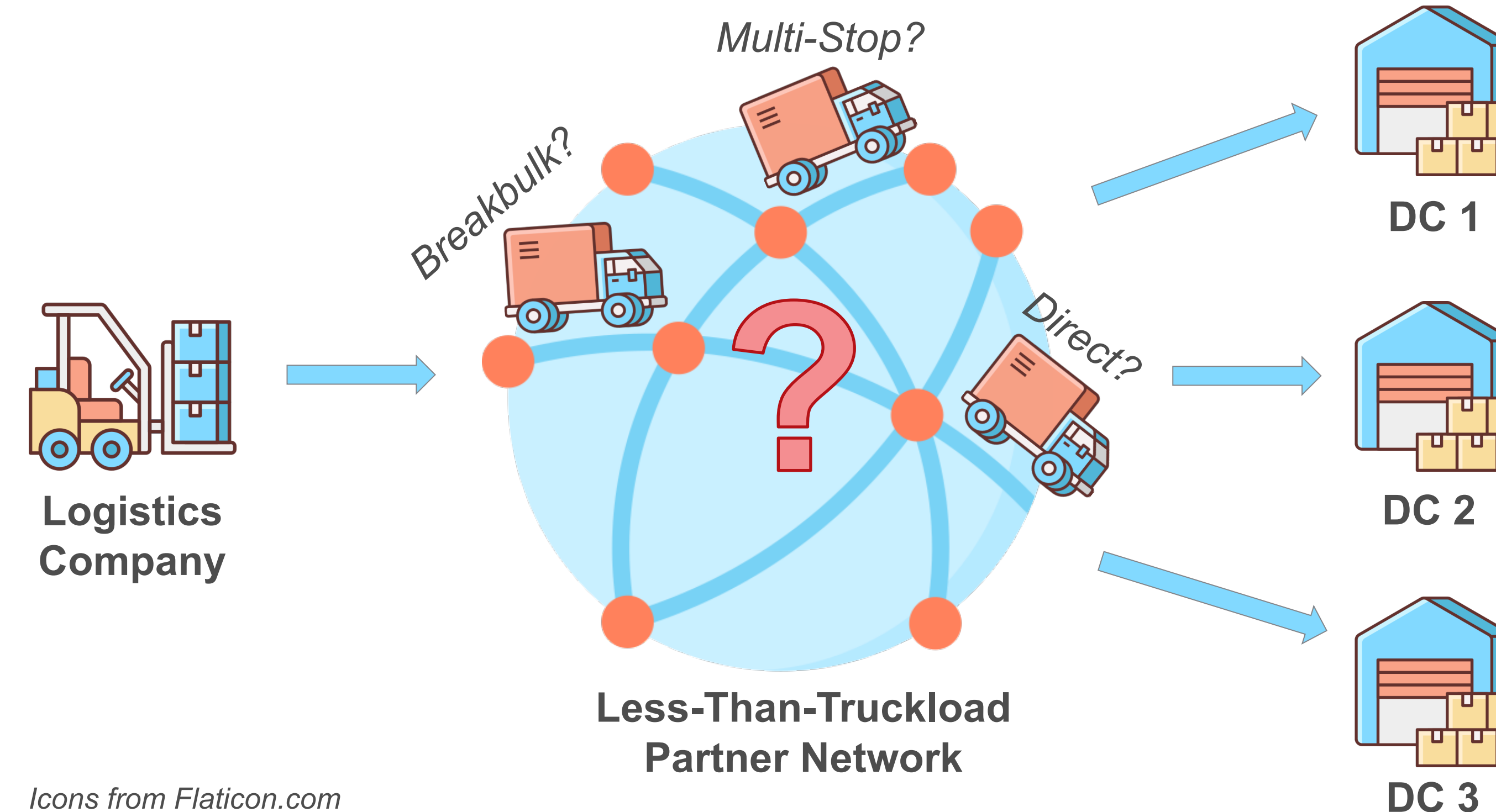
Key Question / Hypothesis

How can we use predicted transit times to streamline LTL shipment scheduling and maximize on-time delivery performance?

Relevant Literature

Conforti, M., Cornuéjols, G., & Zambelli, G. (2014). Integer Programming (Vol. 271). Springer International Publishing. <https://doi.org/10.1007/978-3-319-11008-0>

Truong, G. (2014). Forecasting linehaul transit times & on time delivery probability using quantile regression forests [Massachusetts Institute of Technology]. <http://dspace.mit.edu/handle/1721.1/7582>



Icons from Flaticon.com

Methodology

LTL Transit Time Prediction

- Select machine learning algorithm
- Tune parameters
- Select variables
- Train & test algorithm

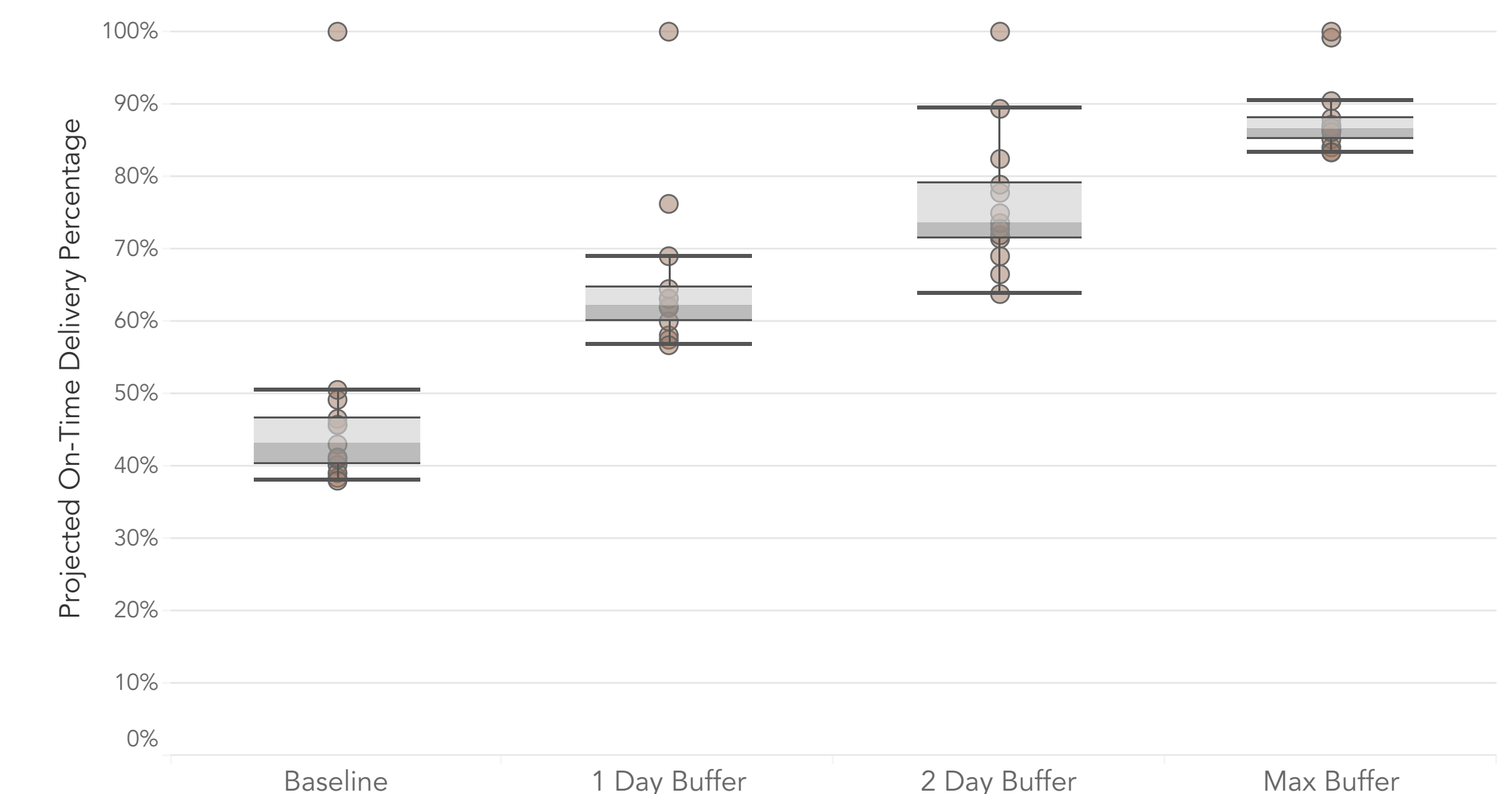
Shipment Scheduling Optimization

- Formulate four Integer Programs to maximize on-time delivery subject to capacity constraints
- Explore effects of implementing different numbers of buffer days

Results

The predicted transit times from the machine learning model reduced RMSE from **3.07** days to **1.97** days.

Delivery performance improved by **41%** for the best of the four optimization models tested.



Expected Contribution

- ✓ Improved on-time delivery performance
- ✓ Increased operational efficiency
- ✓ Better ability to respond to growth and changes in the transportation landscape
- ✓ Applicability to other modes of transportation

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