Demand Forecasting and Inventory Management for Spare Parts

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Business Background

- Gerber Technology is a design-print-cut manufacturing company that provides integrated solution to more than 78,000 customers in 134 countries.
- The Aftermarket Division of the company supports its products through their lifecycle.
- The company has two manufacturing sites: Connecticut (US) and Shanghai (CN)
- Distribution and service centers in different regions process customers orders

Problem | Key Objectives

Customers Service level and forecast accuracy affected by irregular demand from slow moving items. This project is aimed at:

- **Exploring** the demand behavior of every product
- **Proposing** new forecasting methods upon demand behavior
- **Identifying** new ways of classifying products for inventory levels
- **Developing** unified framework for spare parts management

Relevant Literature

- Hu, Q., Boylan, J. E., Chen, H., & Labib, A. (2018). OR in spare parts management: A review. *European Journal of Operational Research, 266(2)*, 395–414.
- Syntetos, A. A., Boylan, J. E., & Croston, J. D. (2005). On the categorization of demand patterns. *Journal of the Operational Research Society, 56(5)*, 495–503.

Methodology

	Demand Planning	Supply Planning
Current	Multiple forecasting models (Regression, Winter's, Croston's, Seasonal, etc.) based on minimum MAPE	SKU classification (A|B|C|D|S) based on revenue and marketing inputs
Proposed	Croston's + Syntethos & Boylan's methods based on SKU classification	Multi-criteria inventory classification using mixed-integer linear programming (MILP)
Comparison	Impact on forecast accuracy measured by RMSE[1], GRMSE[2] and MASE[3]	Impact on inventory measured by service levels, inventory levels and inventory holding costs.

Initial Results (product demand classification example)
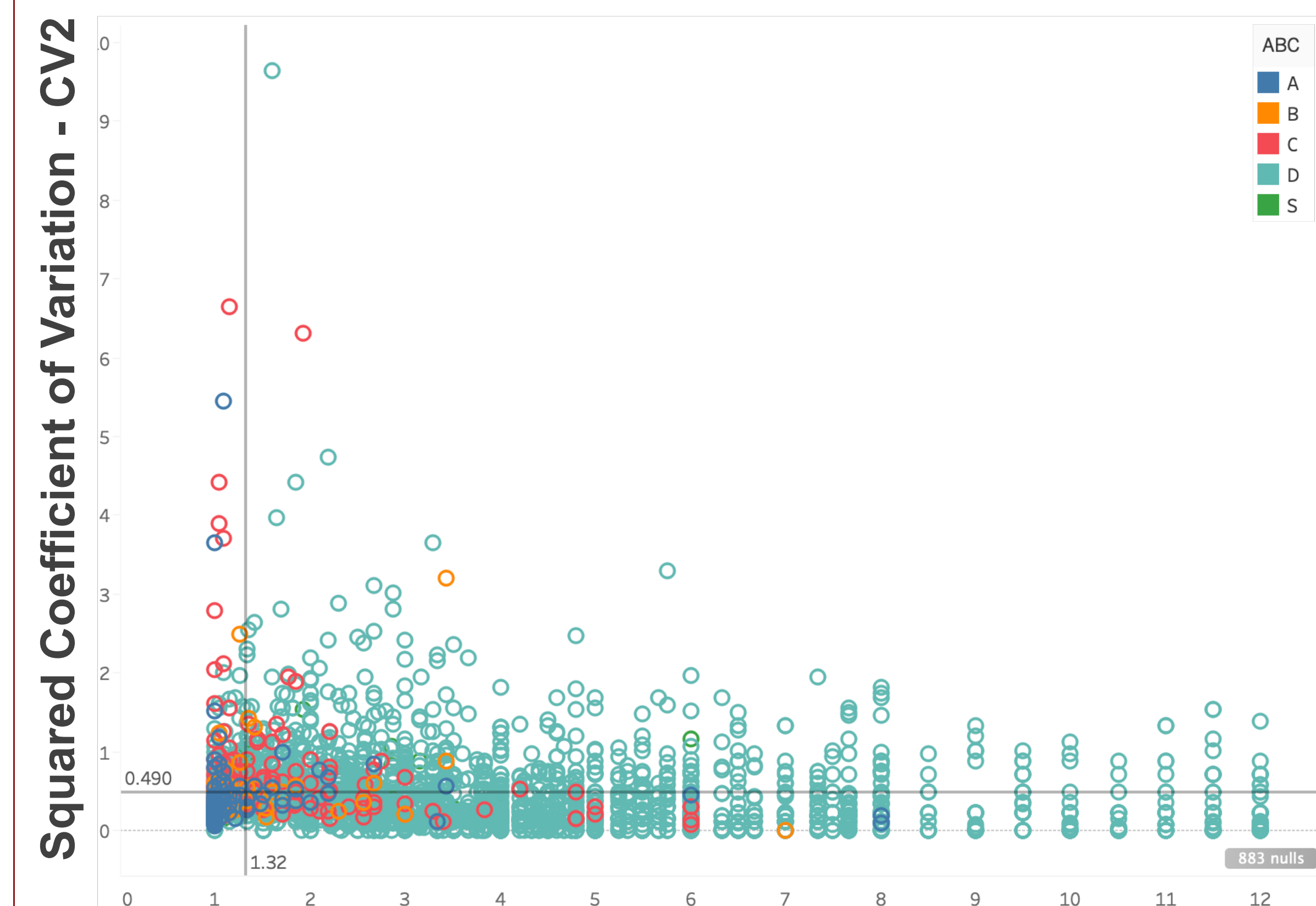
Expected Contribution

- Improving forecast accuracy and streamline forecasting process
- Product categorization for inventory purpose better aligned with the business needs
- Savings in inventory holding costs
- Development of simple and robust framework for future spare parts management

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