

## Method & Process

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Crisp & Green is a fast-casual, healthy salad and grain bowl restaurant with 8 locations across MN and TX

Labor costs represent one of the food-service industries' largest variables and most significant hurdles. Poor labor efficiency can handicap a restaurant's profits

The current staffing approach had been to use a time-intensive simple moving average model, resulting in inefficient labor supply across non-peak hours, and thus excess labor cost

Our project seeks to analyze customer and sales data to project sales by 15-minute intervals to create better, more efficient labor staffing models and reduce excess cost

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Our solution utilizes sales data out of the client's NCR system, which is then cleaned to remove erroneous values and better fit targeted sales demand

We employed 6 different Machine Learning Regression & Time Series models (OLSR, KNN, Random Forest, SVM, Multivariate Moving Average, and ARIMA) to find the best method for sales predictions

Date	Tender_Hour	Tender_Minute	Tender_Amount	Tender_Type_Name
Date	16	12	\$	*Hidden*
Date	13	0	\$	*Hidden*
Date	10	32	\$	*Hidden*
Date	10	36	\$	*Hidden*
Date	18	18	\$	*Hidden*
Date	18	20	\$	*Hidden*
Date	18	24	\$	*Hidden*
Date	20	21	\$	*Hidden*
Date	10	36	\$	*Hidden*
Date	2	0	\$	*Hidden*
Date	9	34	\$	*Hidden*
Date	13	11	\$	*Hidden*
Date	14	18	\$	*Hidden*
Date	15	49	\$	*Hidden*
Date	10	4	\$	*Hidden*
Date	11	23	\$	*Hidden*
Date	15	3	\$	*Hidden*
Date	9	37	\$	*Hidden*
Date	9	42	\$	*Hidden*
Date	14	50	\$	*Hidden*
Date	16	3	\$	*Hidden*

## Results & Conclusion

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The Stacking Ensemble method had the highest average % improvement in RMSE over the client's current prediction method (avg of 6.5% for a given week)

We chose the multivariate moving average model (where the weights were determined using a hyperparameter grid search built via R) due to the ease of upkeep and automation

The final program automatically compiles usable weekly reports also visible at granular levels of 15 segments minutes per day

