



Case Study: Sales Drivers and Demand Forecasting

Jiacheng Yao



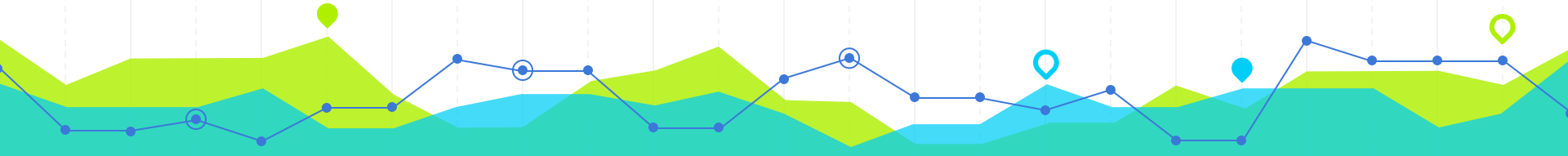
The Goals

1

“

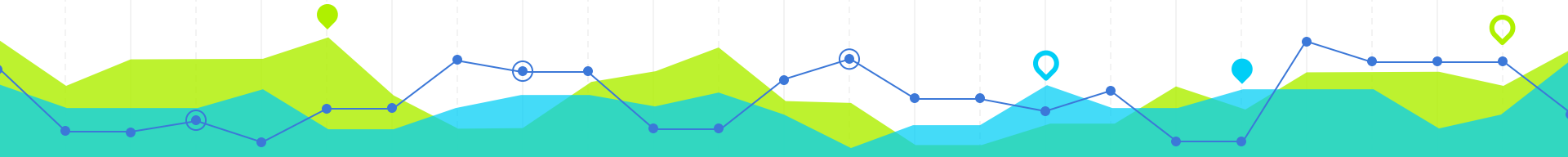
*Know yourself and know your enemy,
and you will never be defeated*

- Art of War



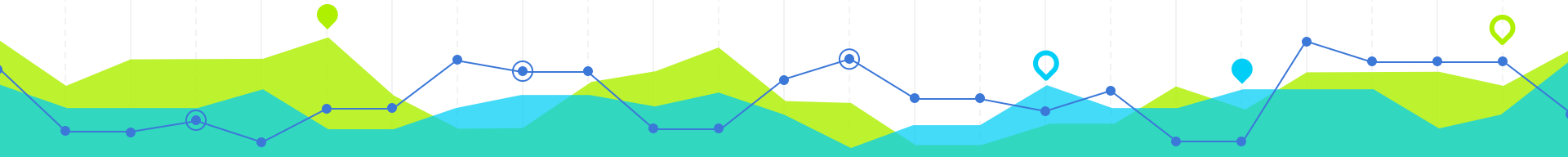


◎ What happened to the sales in the history?





© What will (likely) happen in the future?





◎ What do we do about it?





◎ Where do we go from here?





The Approaches

2

Approaches

Unified

One model for all articles.

Individuals

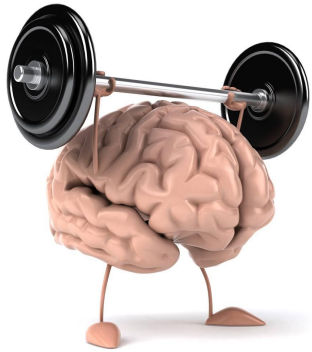
One model for each individual article.



Approaches - Unified

Gradient Boosting [Fri02]

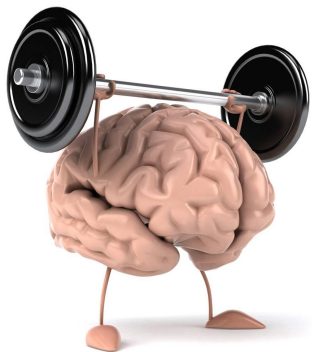
I can be weak today, but will be strong tomorrow!



Approaches - Unified

Gradient Boosting [Fri02]

I can be weak today, but will be strong tomorrow!



Wide and Deep [Che+16]

Memorize and Generalize.



Approach - Wide and Deep - Deep



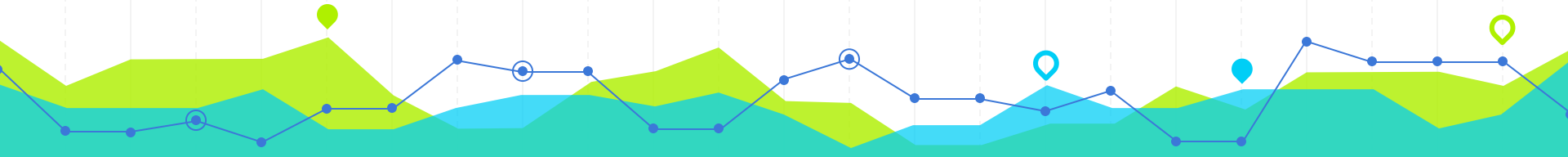
Hier gilt
die StVO

Grundregeln der
Straßenverkehrsordnung und
Straßenverkehrs-Zulassungsordnung
Grundregel. 1. - Jeder Teilnehmer am
öffentlichen Straßenverkehr hat sich so
zu verhalten, daß der Verkehr nicht ge-
fährdet werden kann; er muß sein Ver-
halten so einrichten, daß kein anderer
geschädigt oder mehr als nach den Um-
ständen unvermeidlich behindert wird.

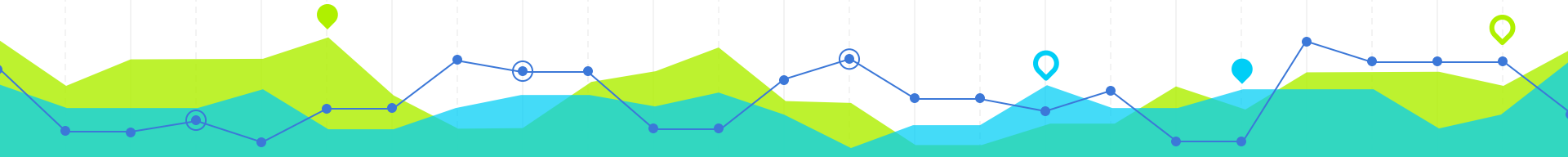
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Approach - Wide and Deep - Wide

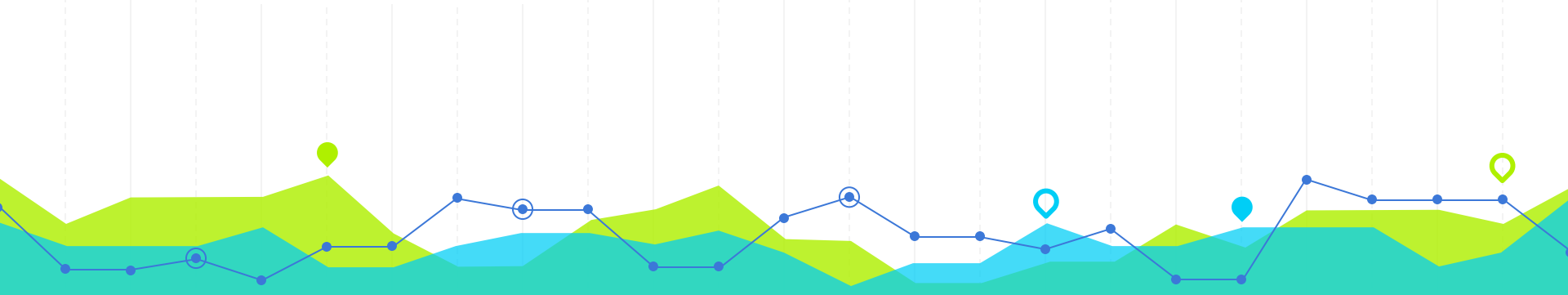
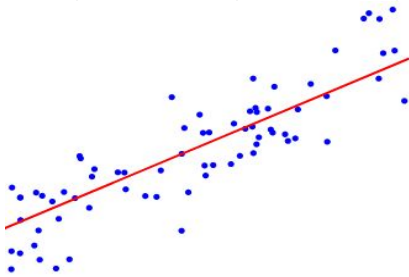


Approach - Wide and Deep - Wide



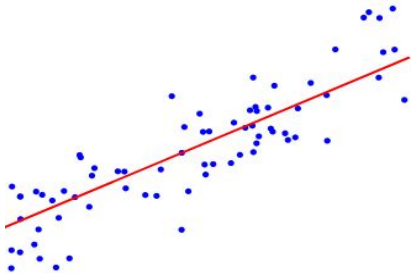
Approaches - Individuals

Linear Regression

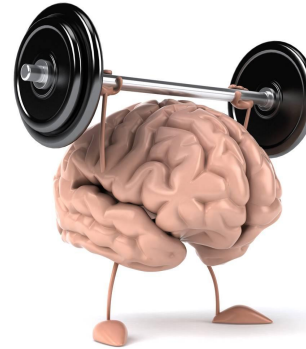


Approaches - Individuals

Linear Regression



Gradient Boosting [Fri02]

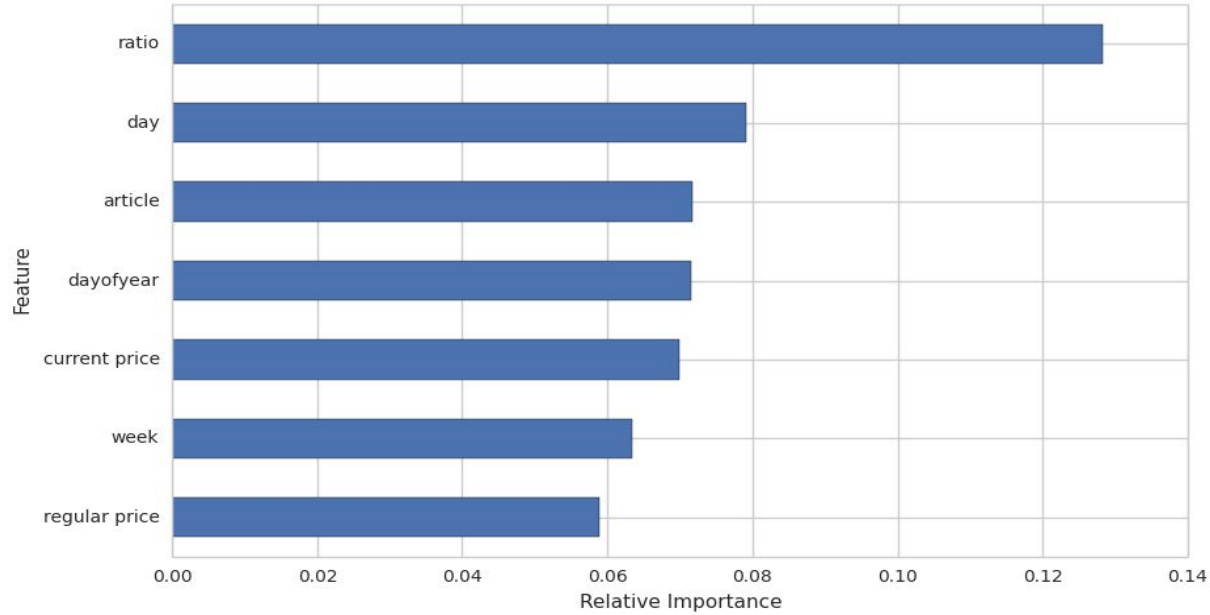




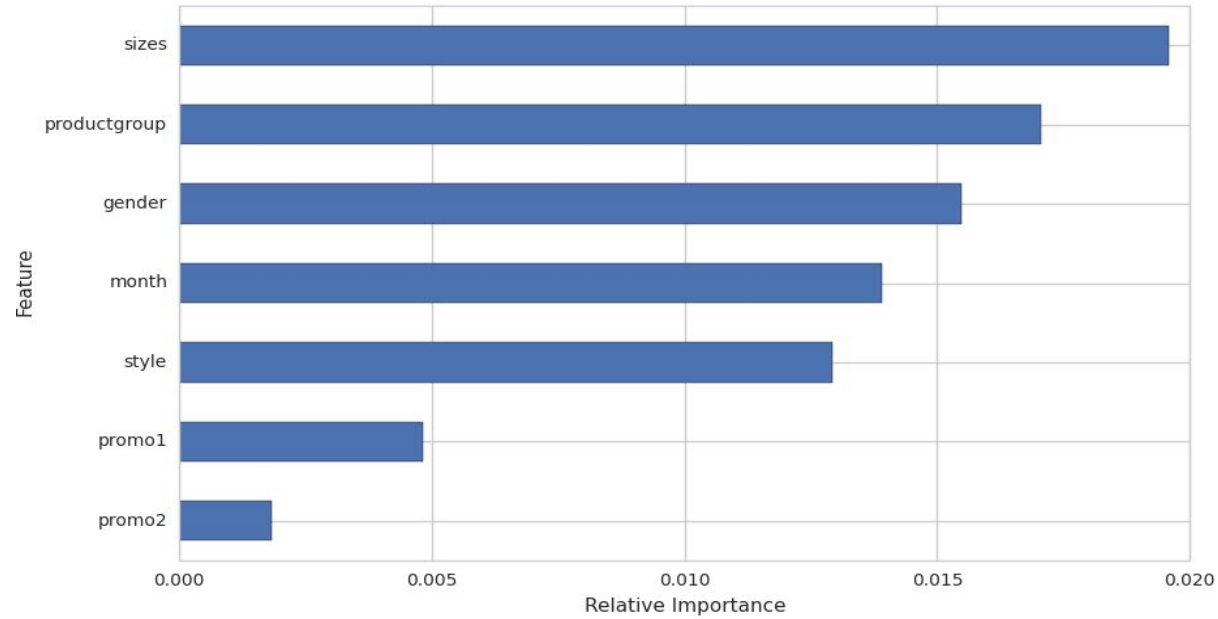
The Findings

3

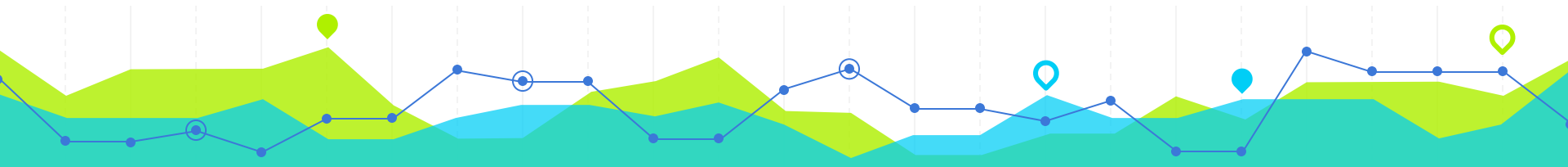
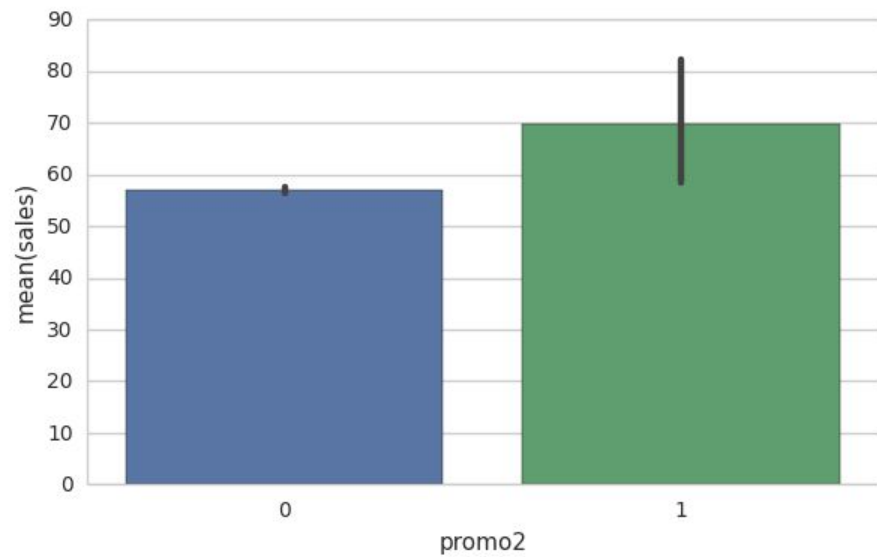
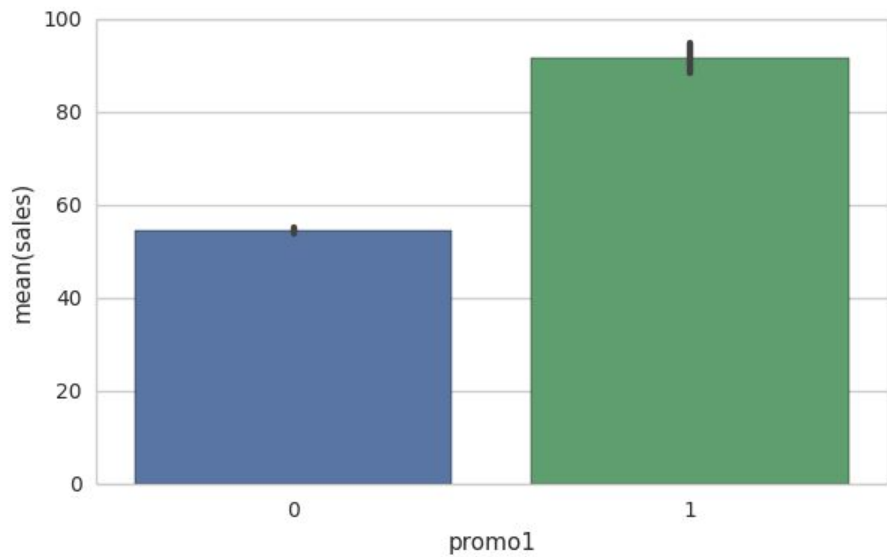
Sales Major Drivers (top 7)



Sales Major Drivers (last 7)

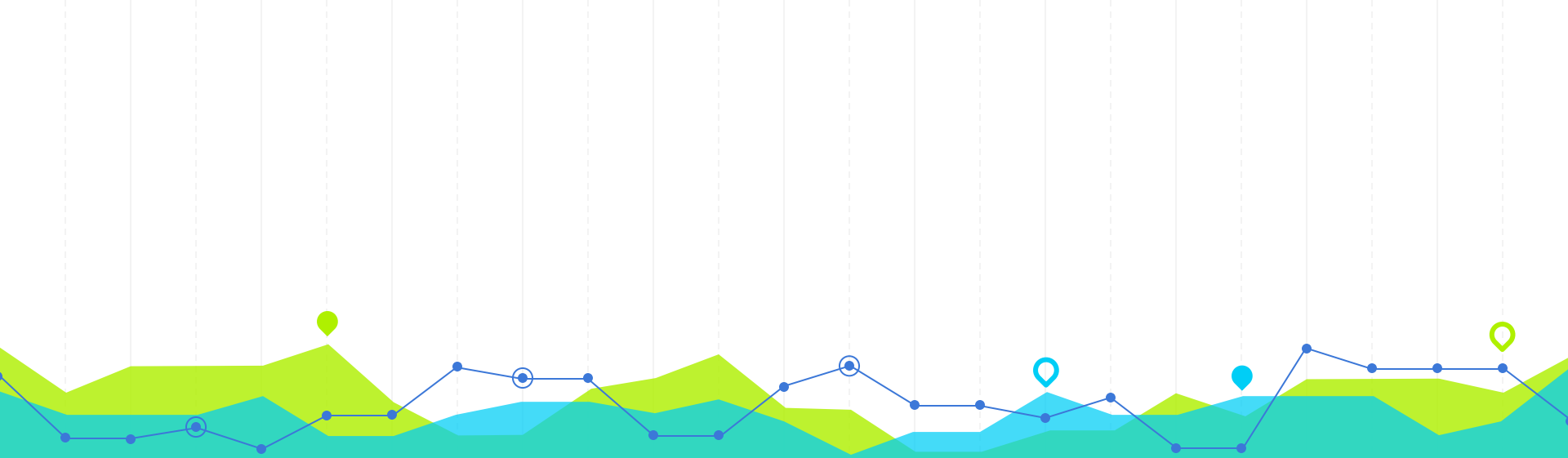


Promotion Impact Comparison



Forecasting Performance Comparison

	MAPE
Gradient Boosting (Unified)	0.309
Wide and Deep (Unified)	0.236
Linear Regression (Individuals)	0.269
Gradient Boosting (Individuals)	0.251



The Next Steps

4

The Next Steps

Data Enrichment

- **Geographical Info.**
- **Competition**
- **Misc. Info.: Economic, Temporal characteristics (vacations), etc.**



The Next Steps

Targeted Price Determination

- Fine-grained to Region, Subgroups of Articles, etc.



The Next Steps

Targeted Marketing Strategies

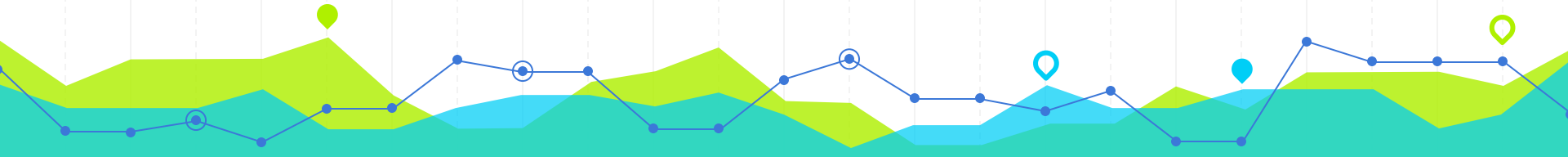
- **Fine-grained to Region**
- **Online Keyword Bidding based on key regional Sales Drivers**



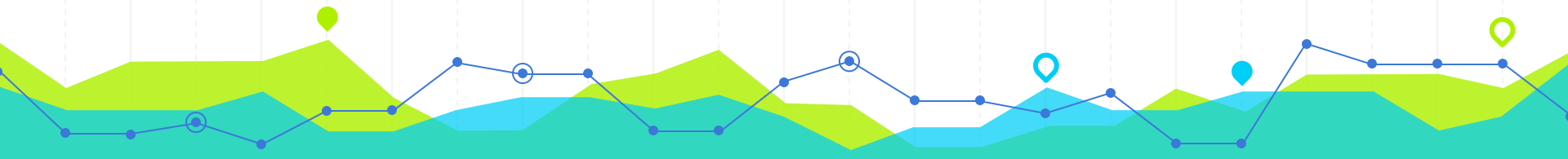
The Next Steps

Targeted Production Scaling

- Forecast the sales in different regions and adjust the production scale accordingly



Questions?



Notes

Codes and Notebooks to be found at:

https://github.com/jiacheng-yao/ml_challenges

References:

- [Fri02]: Friedman, Stochastic Gradient Boosting
- [Che+16]: Cheng, Wide and Deep Learning for Recommender Systems

