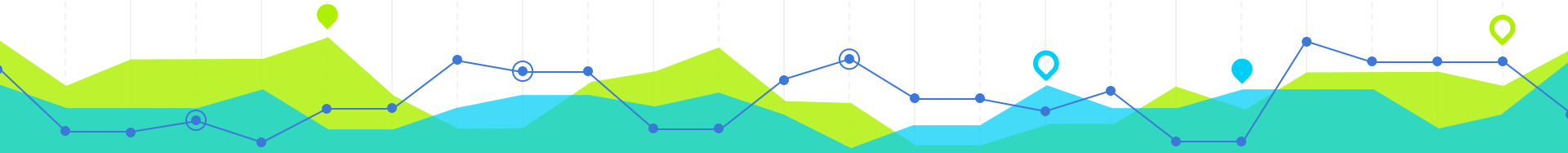
Case Study: Sales Drivers and Demand Forecasting

Jiacheng Yao

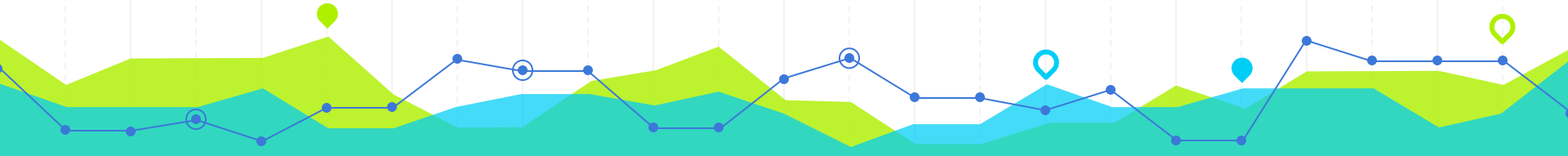


The Goals

1

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

- Art of War

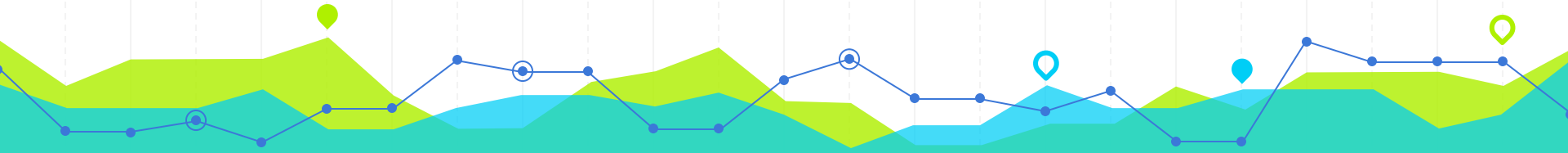


- What happened to the sales in the history?

- 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.

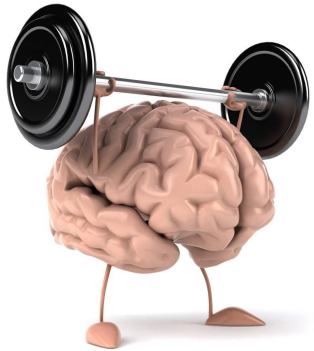
Individuals

One model for each individual article.

Approaches - Unified

Gradient Boosting [Fri02]

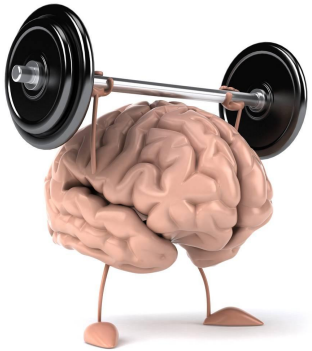
I can be weak today, but will be strong tomorrow!



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

Grundregeln der Straßenverkehrsordnung und Straßenverkehrs-Zulassungsordnung

Grundregel. 1. – Jeder Teilnehmer am öffentlichen Straßenverkehr hat sich so zu verhalten, daß der Verkehr nicht gefährdet werden kann; er muß sein Verhalten so einrichten, daß kein anderer geschädigt oder mehr als nach den Umständen unvermeidlich behindert wird.

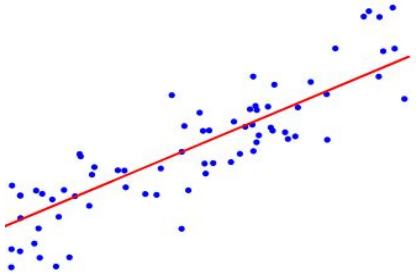
. . . . . .

Approach - Wide and Deep - Wide

Approach - Wide and Deep - Wide

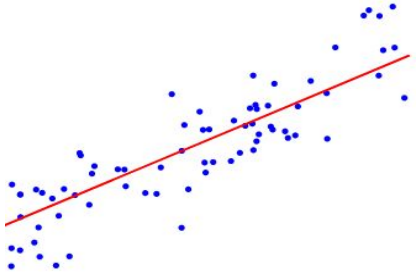
Approaches - Individuals

Linear Regression

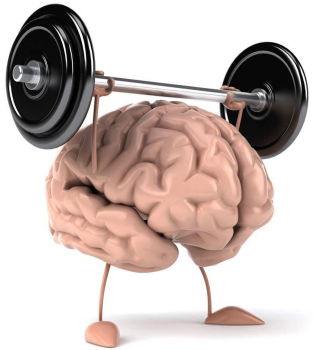


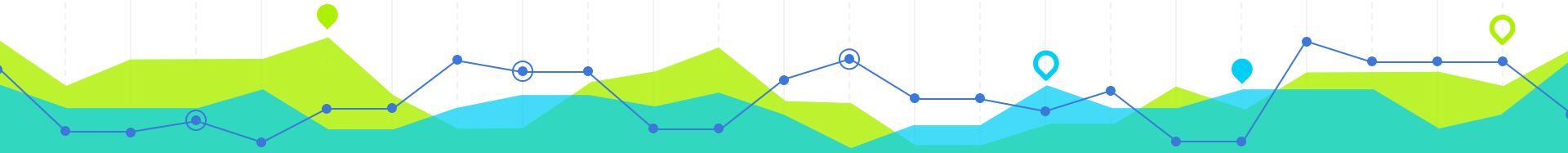
Approaches - Individuals

Linear Regression



Gradient Boosting [Fri02]





The Findings

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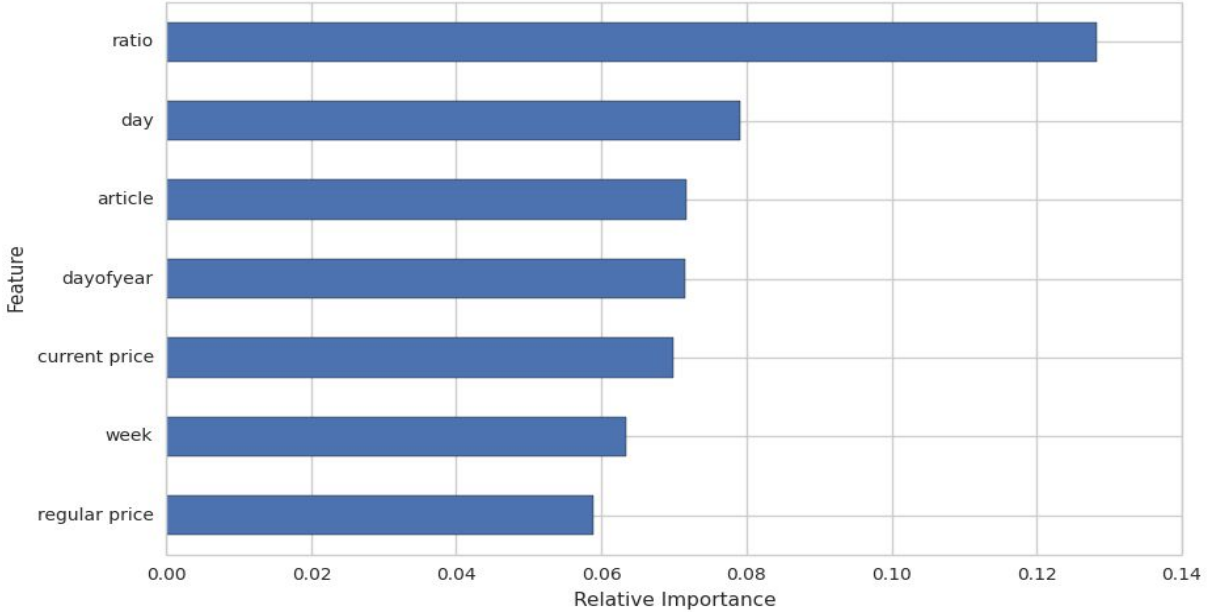
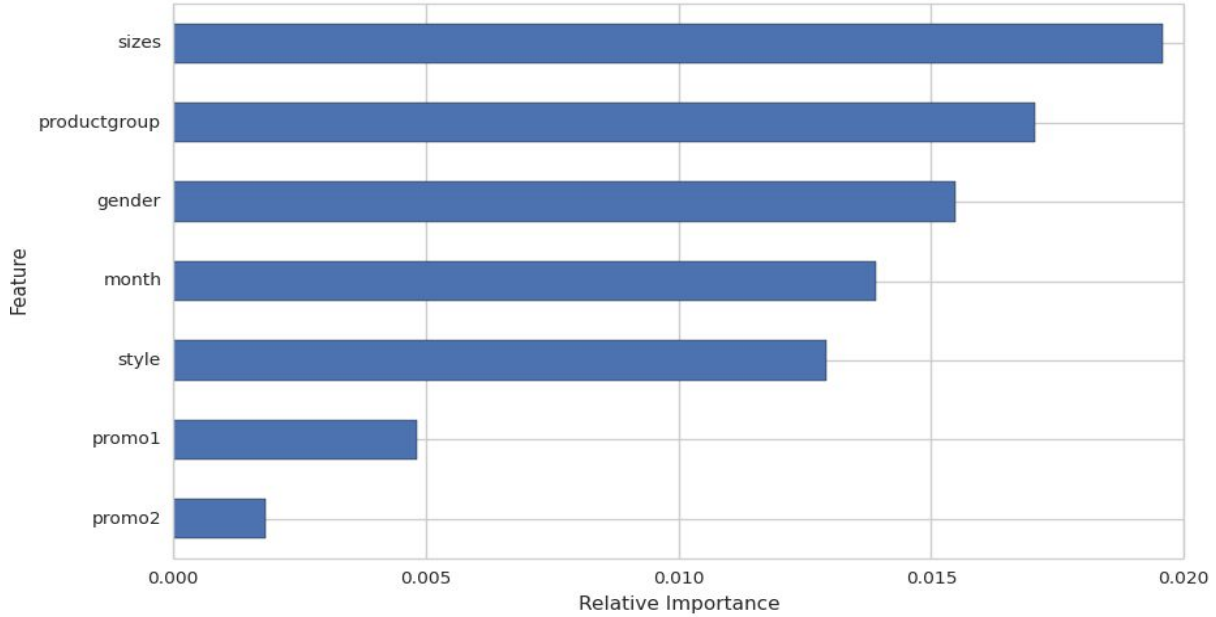
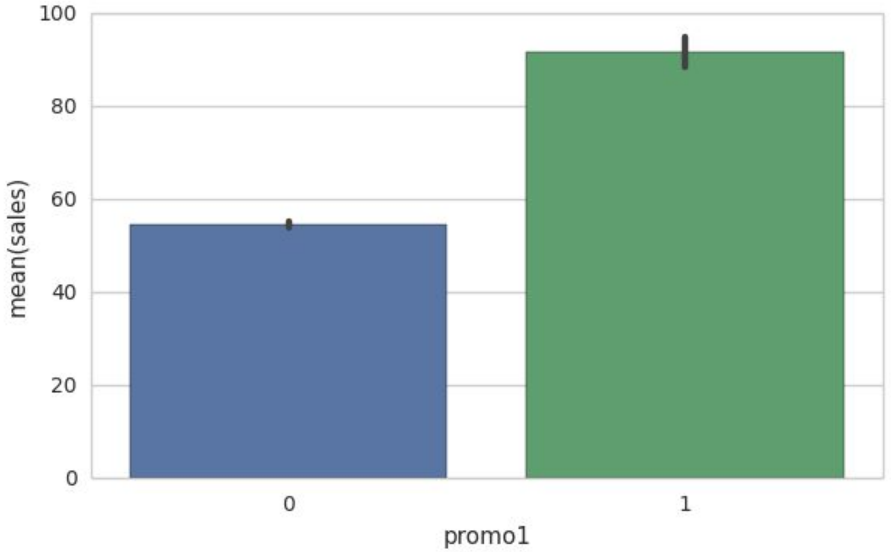
Sales Major Drivers (top 7)

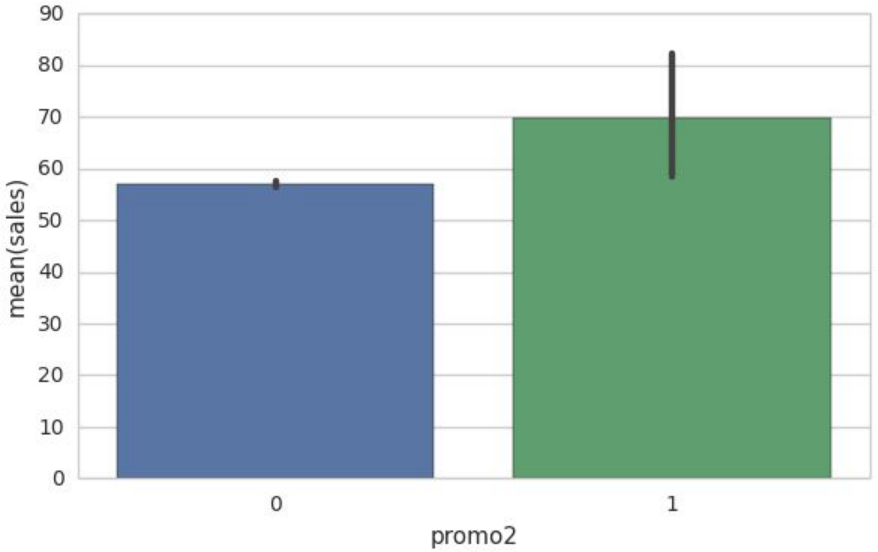


Sales Major Drivers (last 7)



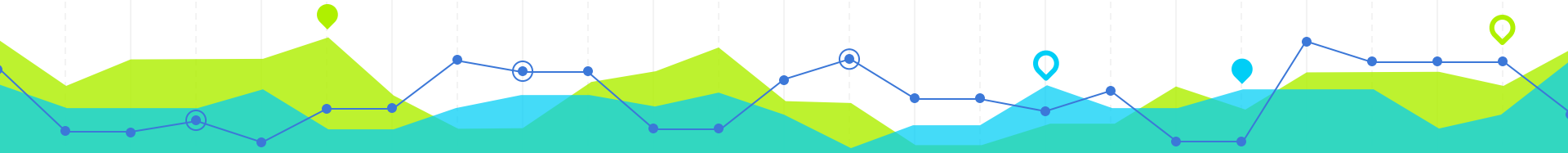
Promotion Impact Comparison





Forecasting Performance Comparison

	MAPE
Gradient Boosting (Unified)	0.309
Wide and Deep (Unified)	**0.236**
Linear Regression (Individuals)	0.269
Gradient Boosting (Individuals)	0.246



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

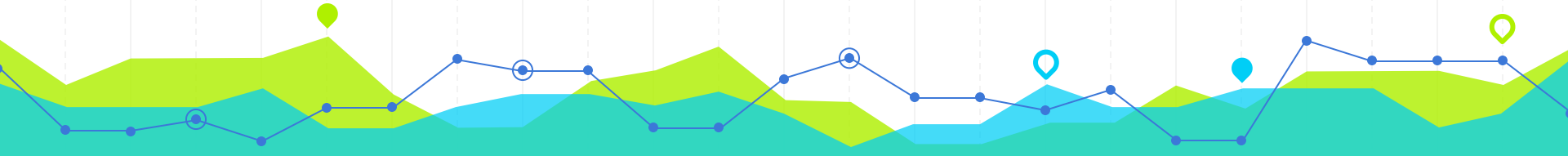
- **Fine-grained to Region**
- **Online Keyword Bidding based on key regional Sales Drivers**

The Next Steps

Targeted Production Scaling

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

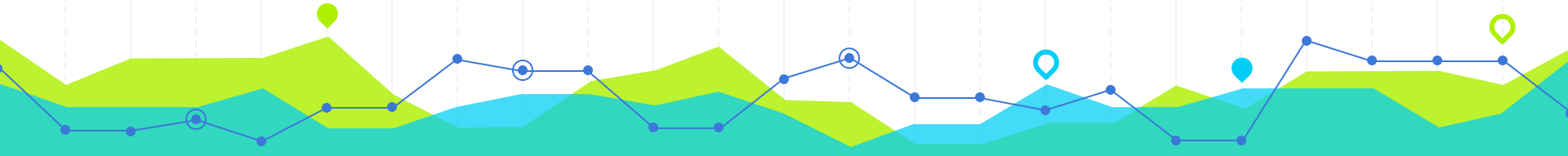
Questions?



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