



INSEAD

LOUMIDIS COFFEE SHOPS

AI FOR A 100-YEAR-OLD FAMILY BUSINESS

LOUMIDIS HAS A RICH FAMILY HISTORY, BUT SUFFERS FROM LOW-TECH OPERATIONS

A Beloved Greek Brand

- Founded in 1919, the business is celebrating its 100th anniversary
- It specializes in ground coffee, which it sells in six stores in Athens and Thessaloniki
- The business is family-owned and run by the 3rd generation of Loumidis

Reliant on Low-Tech

- Data synthesis not standardised or automated
- Analysis conducted by hand in excel
- Few business insights collected from the firm's data



TWO BUSINESS CASES THROUGH DATA SCIENCE



➤ **Product Association :** Understand which products and categories are commonly purchased together to inform deals and product mix



➤ **Sales Prediction:** Predict sales data per store to optimize P&L, set budget, and estimate daily cash flow

1 IDENTIFYING PRODUCT ASSOCIATIONS



Large portfolio, lack of data on associations

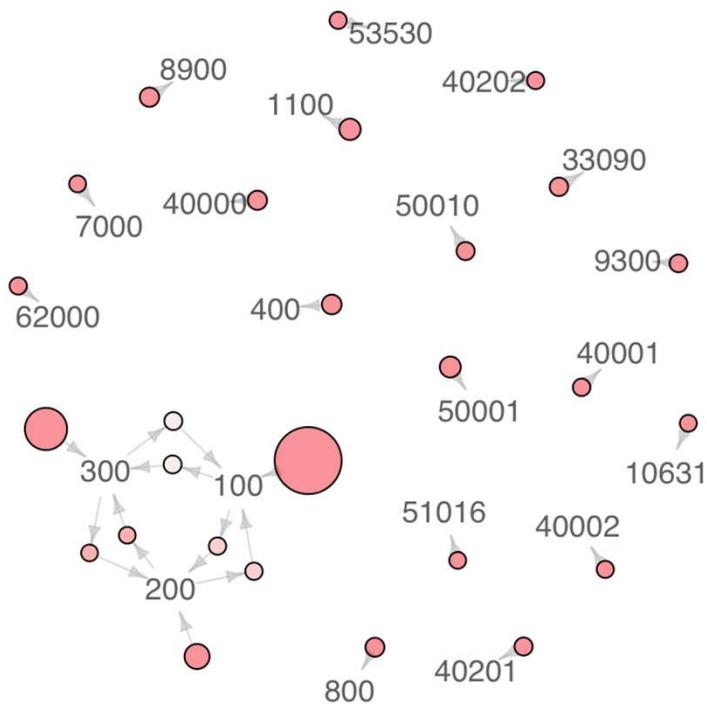
- Loumidis Coffeeshops **sell many products** (450SKU's) from coffee to chocolate, candy, and spreads
- Customer orders are recorded by invoice number, but when multiple products bought together this is not recorded
- **Little insights beyond anecdotal knowledge** about what is sold together



Invoice.Number	Prod.Segment.3
1 ΑΣΥ-X-0000000038	Ελλ. Χαρμάνια
2 ΑΣΥ-X-0000000037	Ελλ. Χαρμάνια
3 ΑΣΥ-X-0000000048	Ελλ. Χαρμάνια
4 ΑΣΥ-X-0000000039	Ελλ. Χαρμάνια
5 ΑΣΥ-X-0000000047	Ελλ. Χαρμάνια
6 ΑΣΥ-X-0000000045	Ελλ. Χαρμάνια
7 ΑΣΥ-X-0000000042	Ελλ. Χαρμάνια
8 ΑΣΥ-X-0000000044	Ελλ. Χαρμάνια
9 ΑΣΥ-X-0000000049	Ελλ. Χαρμάνια
10 ΑΣΥ-X-0000000043	Ελλ. Χαρμάνια
11 ΑΣΥ-X-0000000045	Ελλ. Χαρμάνια
12 ΑΣΥ-X-0000000048	Ελλ. Χαρμάνια
13 ΑΣΥ-X-0000000039	Ελλ. Χαρμάνια
14 ΑΣΥ-X-0000000038	Ελλ. Χαρμάνια
15 ΑΣΥ-X-0000000044	Ελλ. Χαρμάνια
16 ΑΣΥ-X-0000000049	Ελλ. Χαρμάνια

FEW ASSOCIATIONS WERE PRESENT AT THE PRODUCT LEVEL

- Product-level analysis shows that very few individual products are bought together
- Many customers buy only coffee
- This analysis did not generate any learnings, and has little business significance

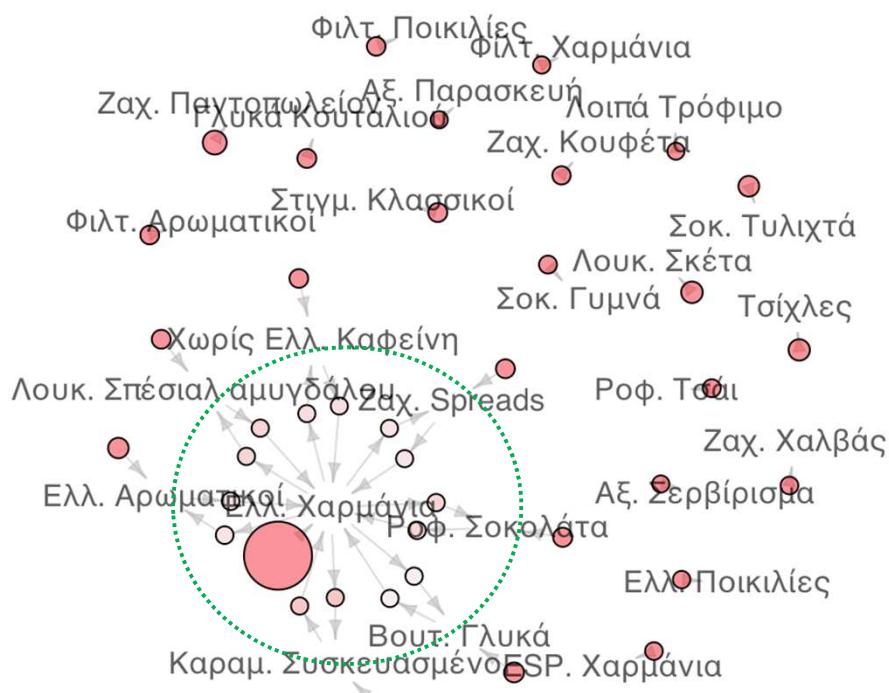


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CATEGORY LEVEL ANALYSIS INDICATED 7 FREQUENTLY ASSOCIATED CATEGORIES



- As before, there are several consumers who only buy coffee. However, at the category level we can see some meaningful associations.
 - There are 7 product categories that are frequently associated with Greek coffee:
 - Loukoumia
 - Greek coffee with flavors
 - Caffeine free Greek coffee
 - Spreads
 - Chocolate drinks
 - Spoon sweets
 - Packaged candy



TWO BUSINESS CASES THROUGH DATA SCIENCE

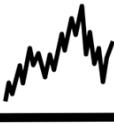


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➤ **Product Association** : Understand which products and categories are commonly purchased together to inform deals and product mix

2



➤ **Sales Prediction**: Predict sales data per store to optimize P&L, set budget, and estimate daily cash flow

2

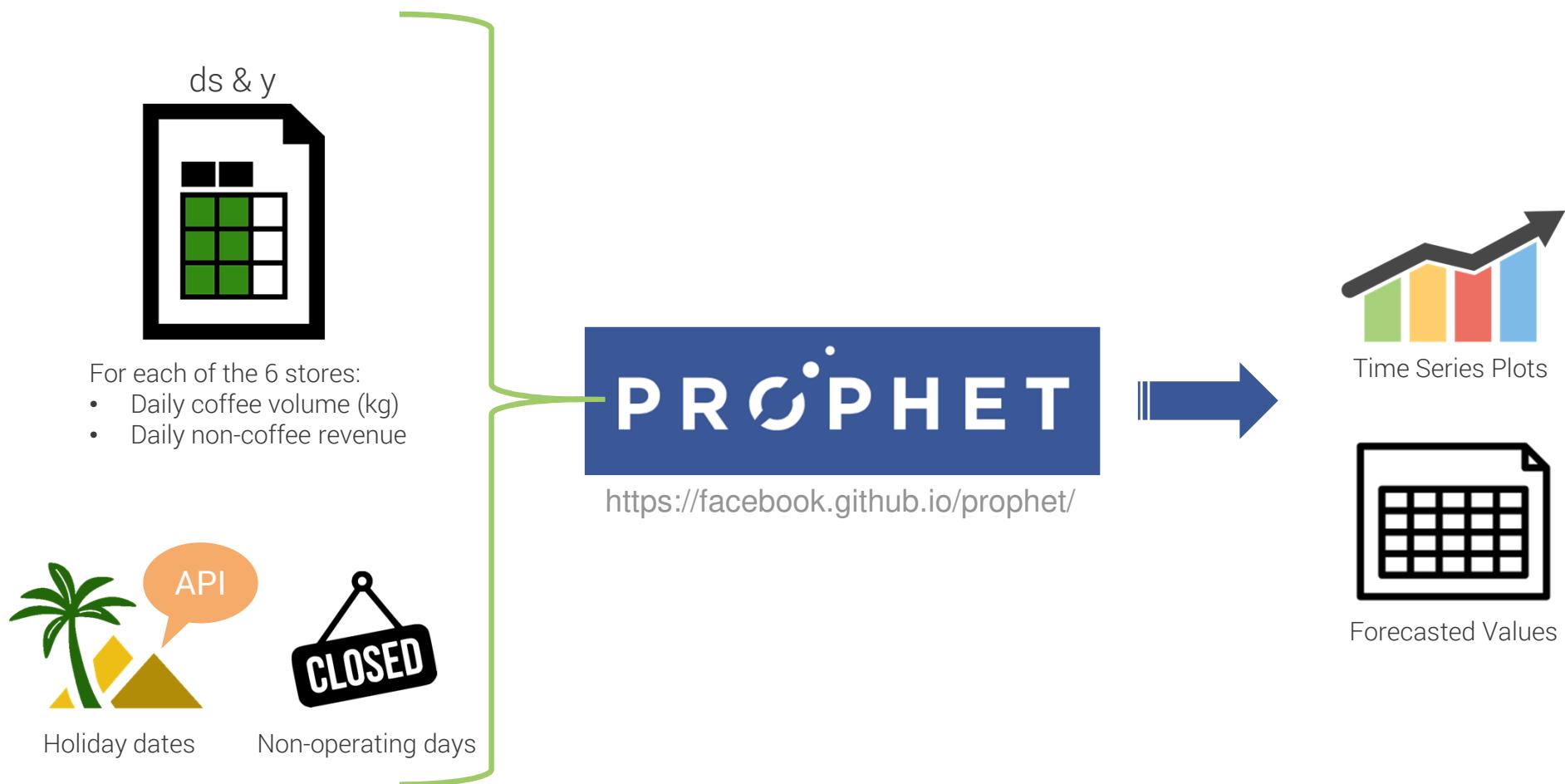
LOUMIDIS' CURRENT SALES PREDICTION METHODS ARE SUBJECTIVE AND INACCURATE

Today's Sales Prediction Methodology

- **Sales people** use last year's data, intuition, and a global percentage change to "estimate" next year's figures
- **3-4 year sales forecasts** are highly unreliable and **rarely used**
- **Daily cash flow allowances** are **estimated** based on an average of an annual figure, with no modulation for day of week, holidays, etc.

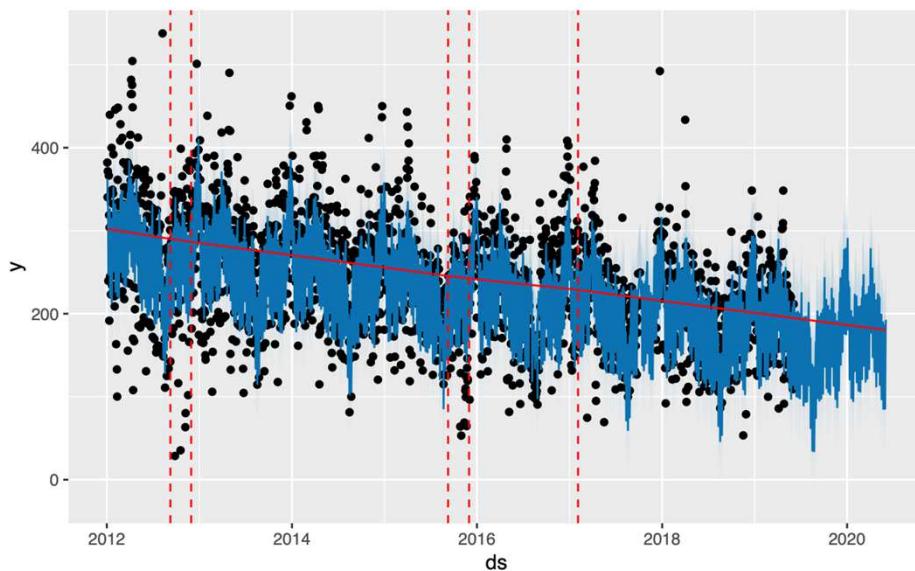


LEVERAGING PROPHET AND EXTERNAL SOURCES FOR TIME SERIES ANALYSIS

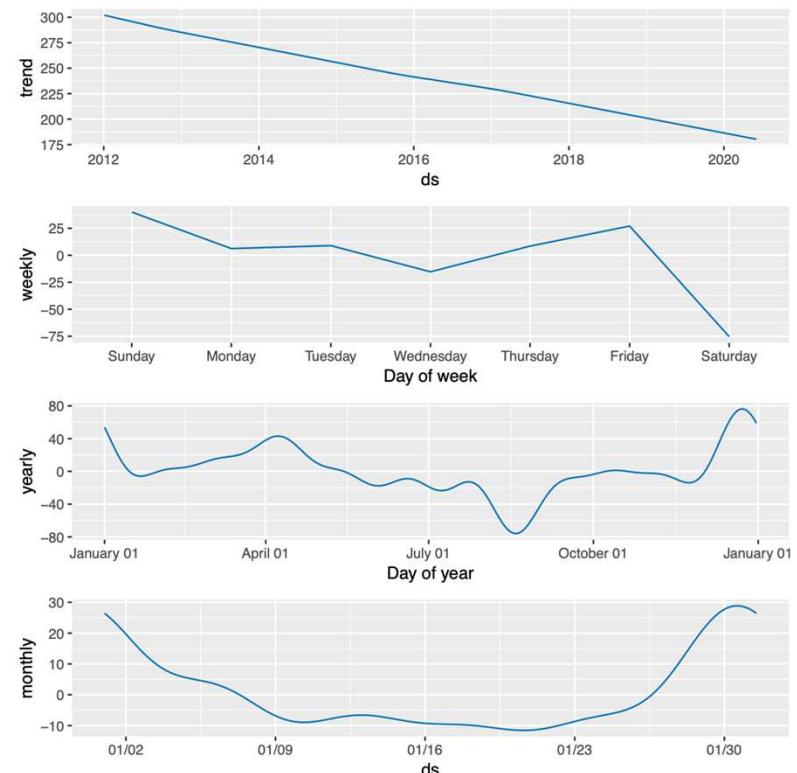


PROPHET OUTPUT SHOWS DETAILED SEASONALITY AND IDENTIFIES TRENDS

- Time series plot indicates trend, changepoints and future forecast
- “Components” break down yearly, monthly, weekly seasonality
- Intuition from experience confirmed with numbers



Omonoia Store Time Series



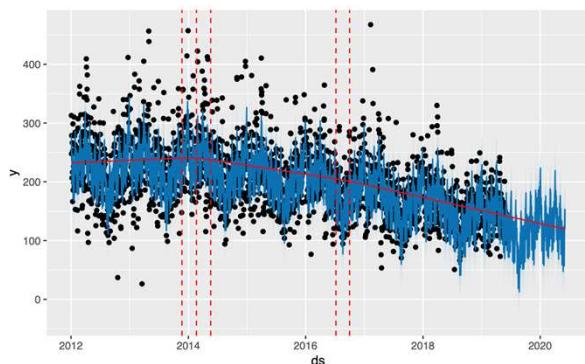
Omonoia Store Components

2

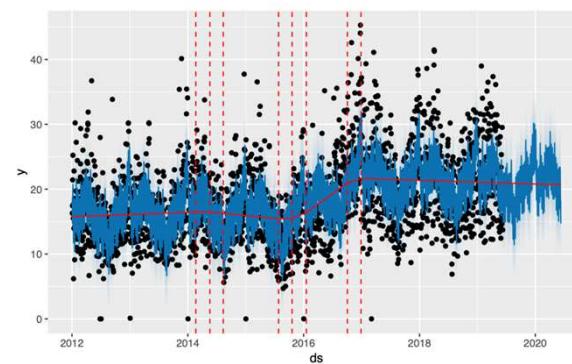
TIME SERIES ANALYSIS HELPS QUANTIFY AND VISUALIZE THE DIFFERENCES BETWEEN STORES



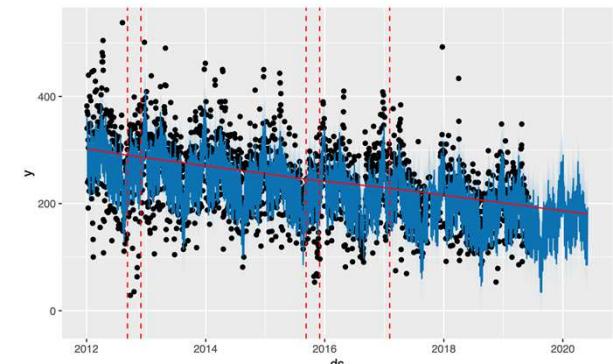
Piraeus Store



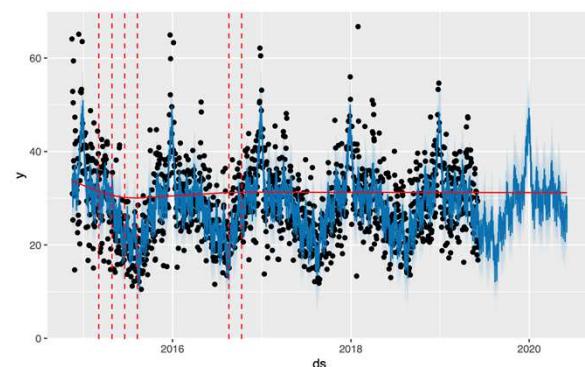
Kallithea Store



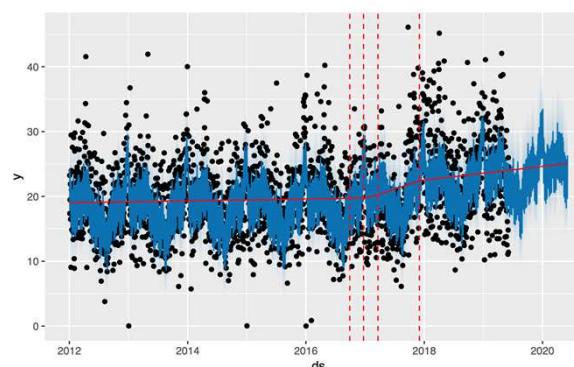
Omonoia Store



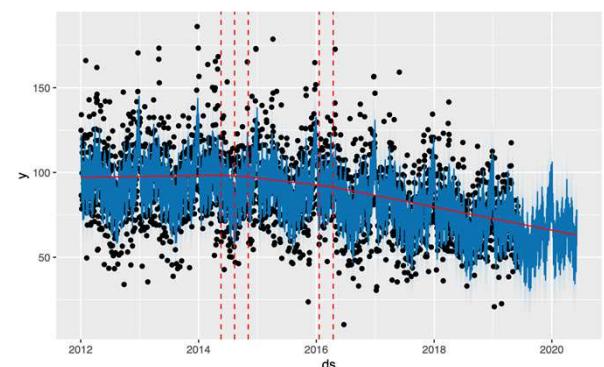
Peristeri Store



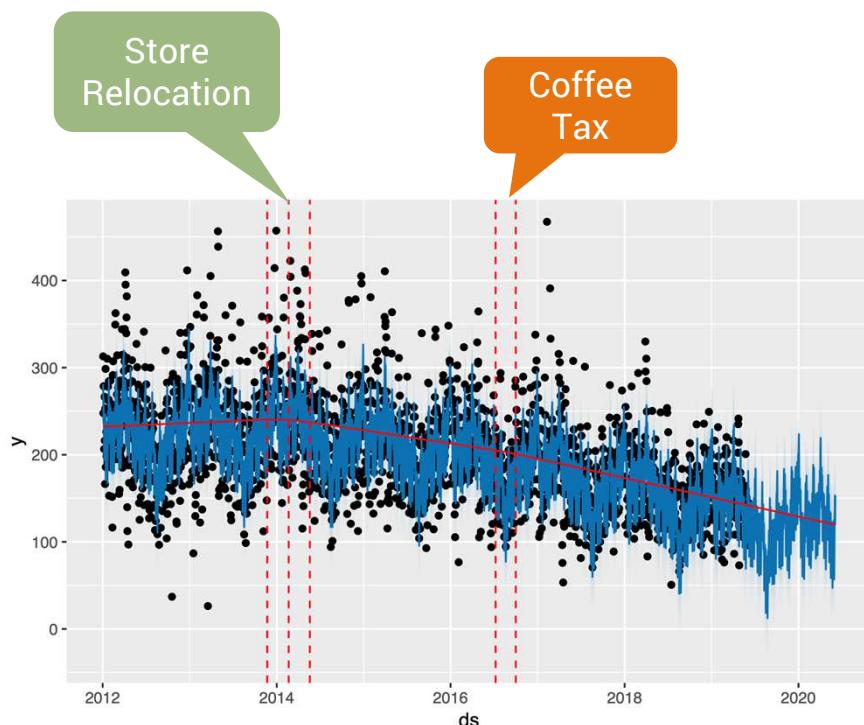
Marousi Store



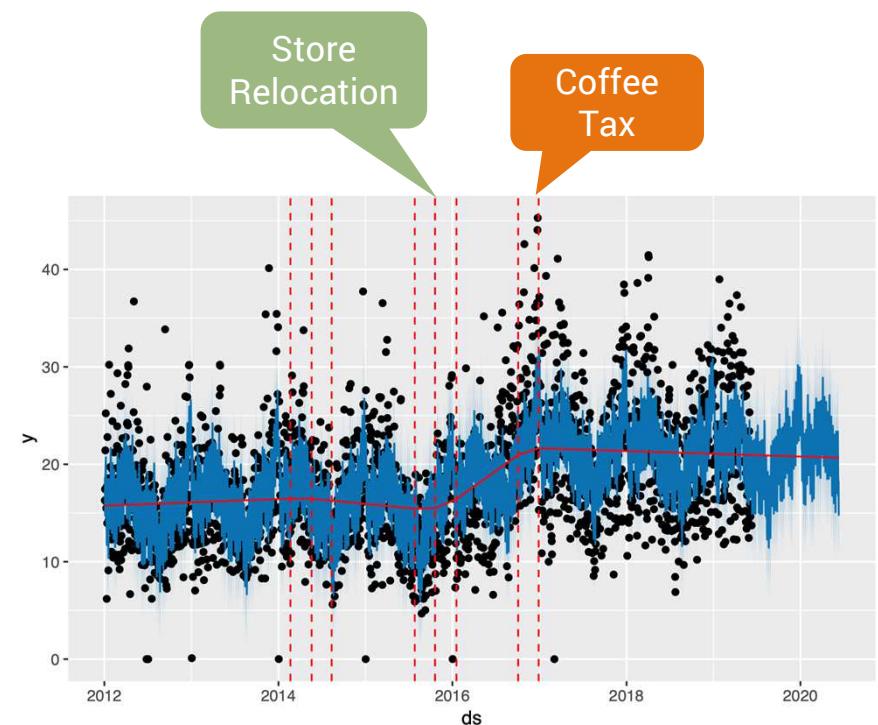
Thessaloniki Store



TIME SERIES ANALYSIS DEMONSTRATES THE EFFECTS OF KEY EVENTS ON TRENDS



Piraeus Store Time Series

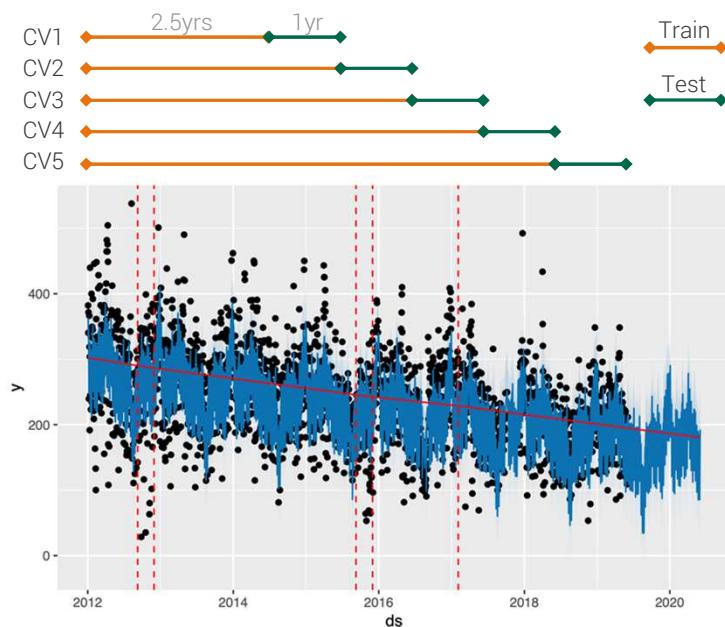


Kallithea Store Time Series

IMPROVING THE MODEL: FOUR ITERATIONS, MEASURED BY CV RESULTS

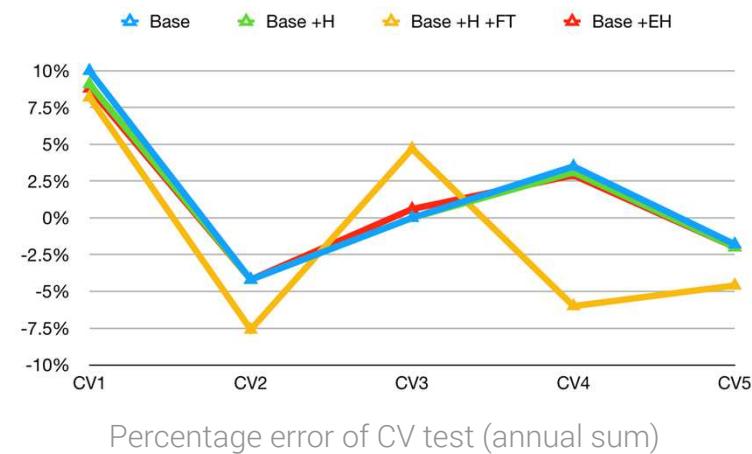
Cross Validation Methodology:

- 1 year test horizon, repeated 5 times



Description of 4 iterations:

1. Base → Base Prophet Package with no inputs
2. Base +H. → Prophet package with Holiday input
3. Base +FT → Prophet with more flexible trend
4. Base +EH → Prophet with extended holidays



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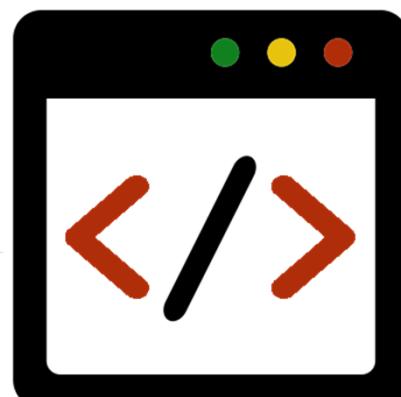
CREATING A TOOL ANYONE CAN USE



One or multiple dataframes?

How far into the future?

I found X outliers, remove them?



R Script



Time Series Plot



Component Plots



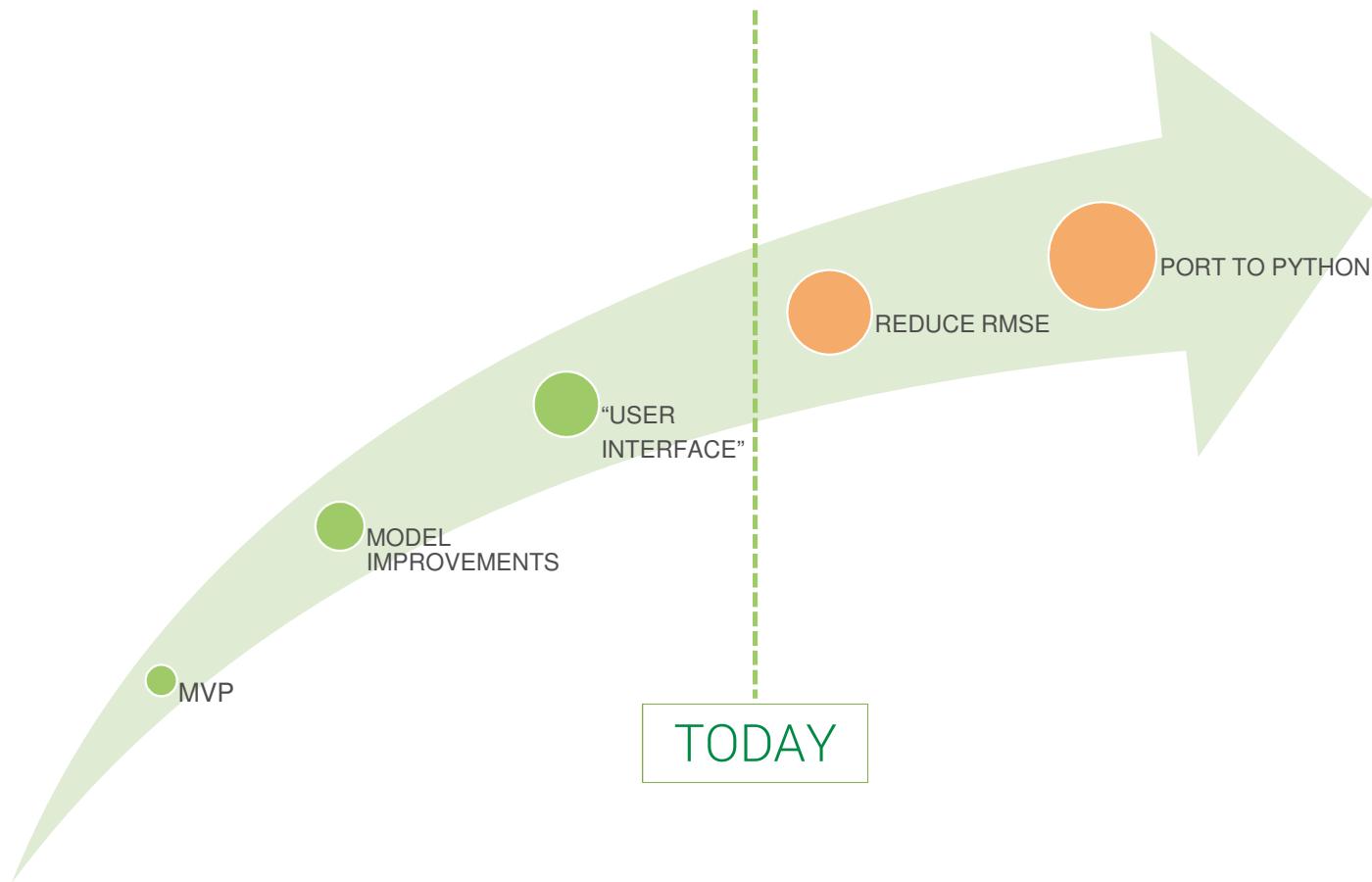
Forecasted Values



RMSE Scatterplot

2

NEXT STEPS FOR THE PROJECT



THANK YOU!



APPENDIX – PROPHET CORE

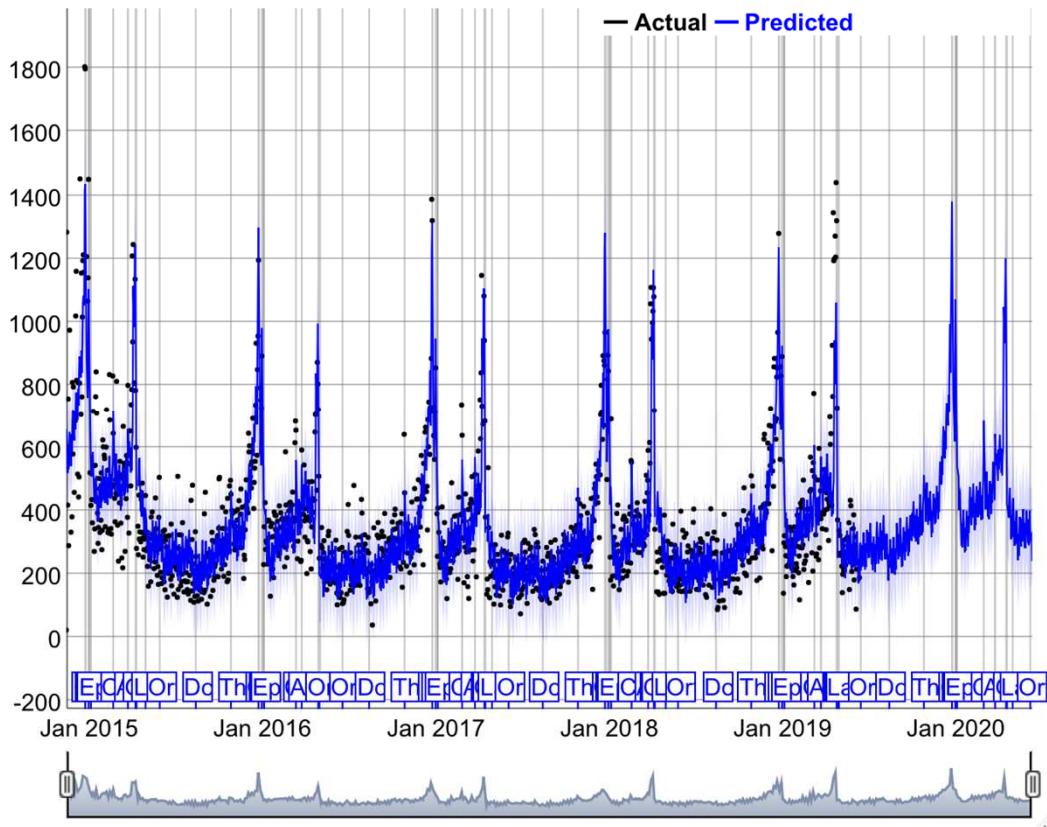


How Prophet works

At its core, the Prophet procedure is an additive regression model with four main components:

- A piecewise linear or logistic growth curve trend. Prophet automatically detects changes in trends by selecting changepoints from the data.
- A yearly seasonal component modeled using Fourier series.
- A weekly seasonal component using dummy variables.
- A user-provided list of important holidays.

APPENDIX – SAMPLE DYPLOT



APPENDIX – SAMPLE RMSE SCATTERPLOTS

