Case Study Data Scientist Production Planning

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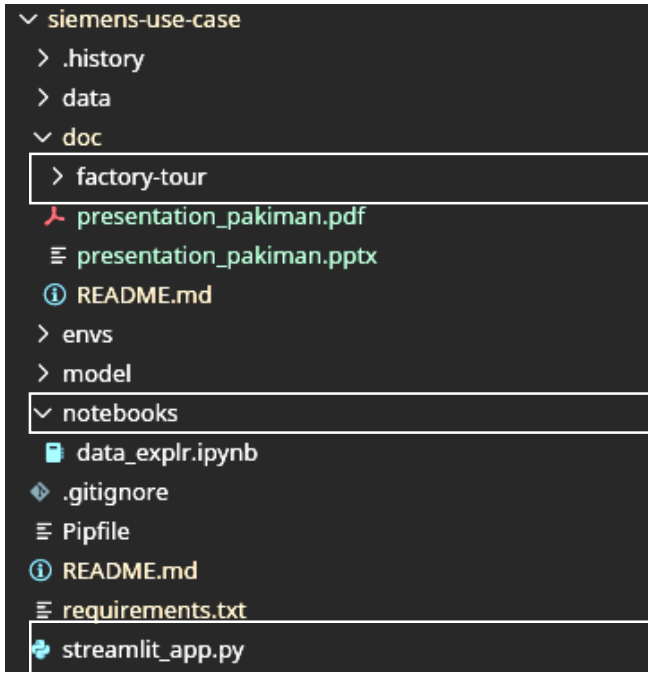
Work Flow

GitHub

[Repo link]



OBSIDIAN

python™

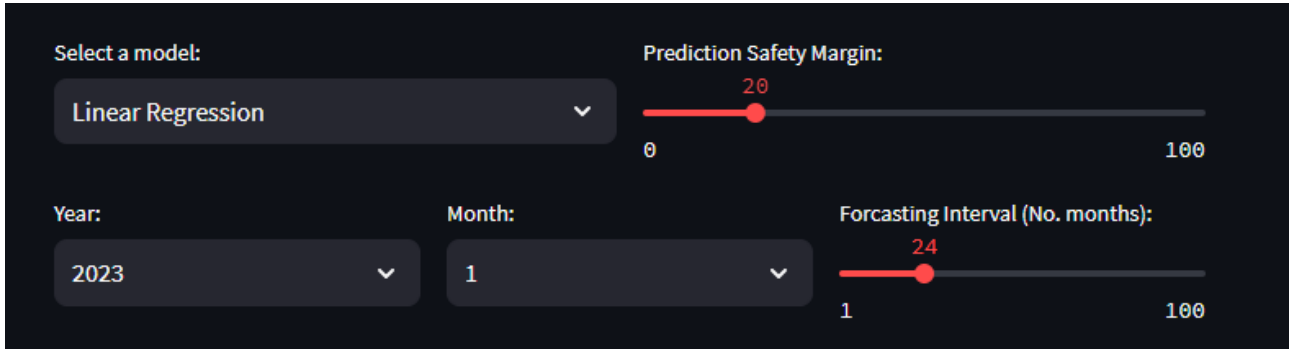
Streamlit

Packages:

pandas
numpy
scikit-learn
matplotlib
ipykernel

seaborn
streamlit
sklearn
jupyter

Consumption forecast



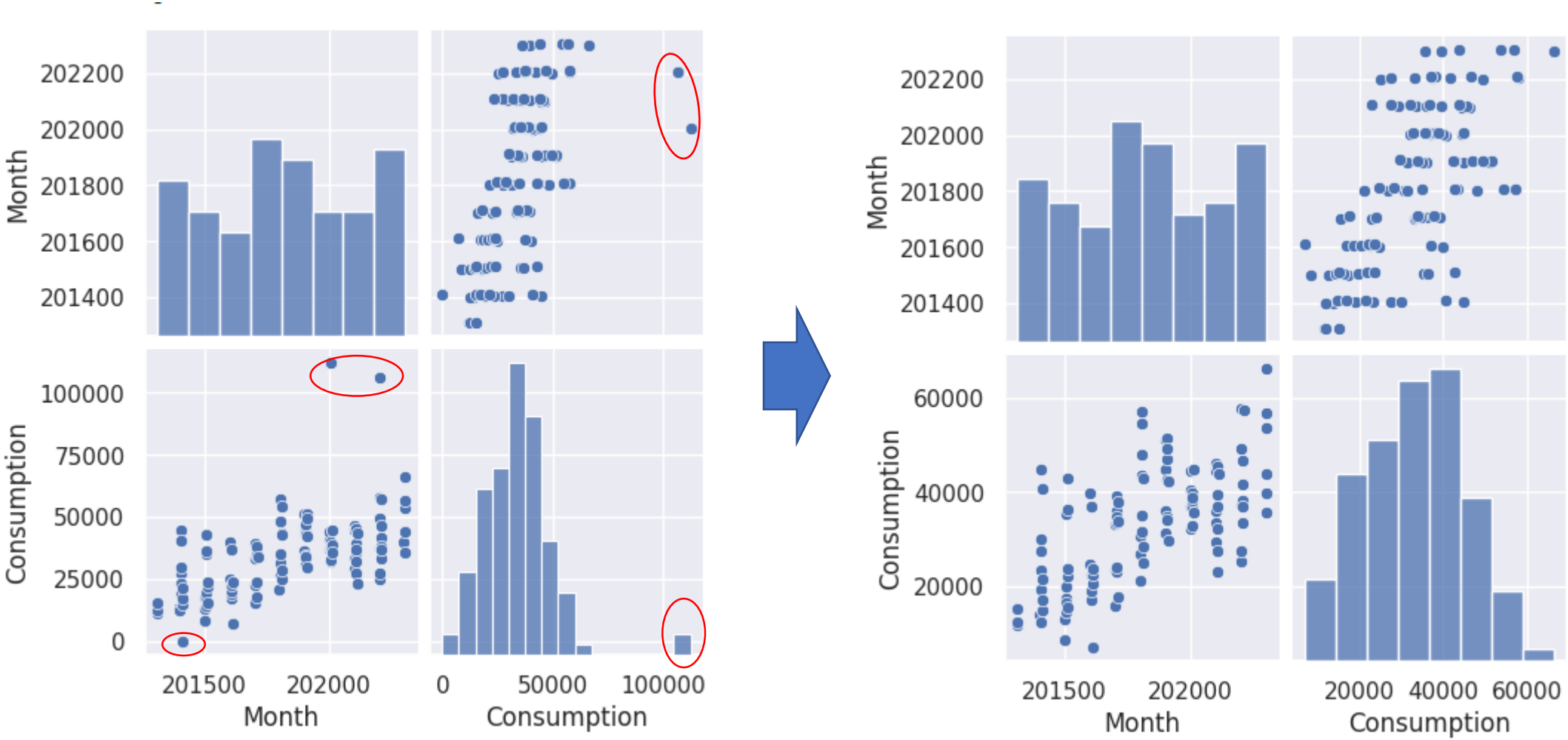
Predict Consumption APP

Models:

- Linear Regression - annual
- Random Forest - monthly
- Decision Tree – monthly
- Autoregressive Integrated Moving Average – Time series

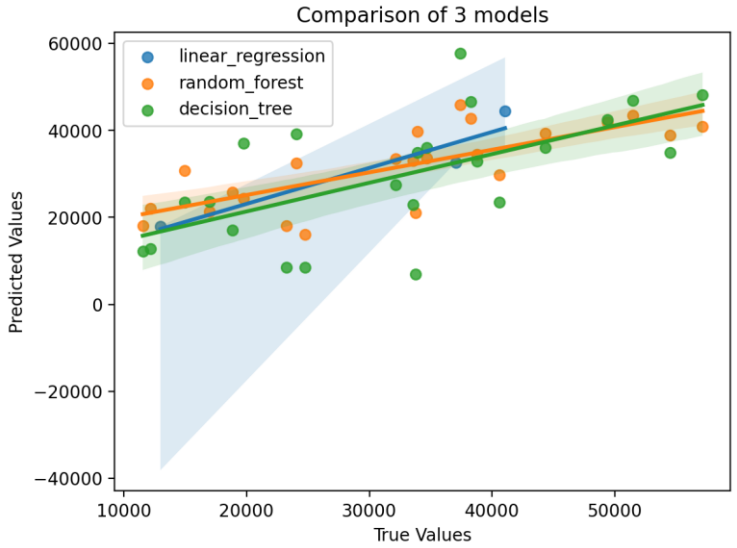
$$Consumption = pred + SM * RMSE$$

Data Cleaning



Models

Predict Consumption APP



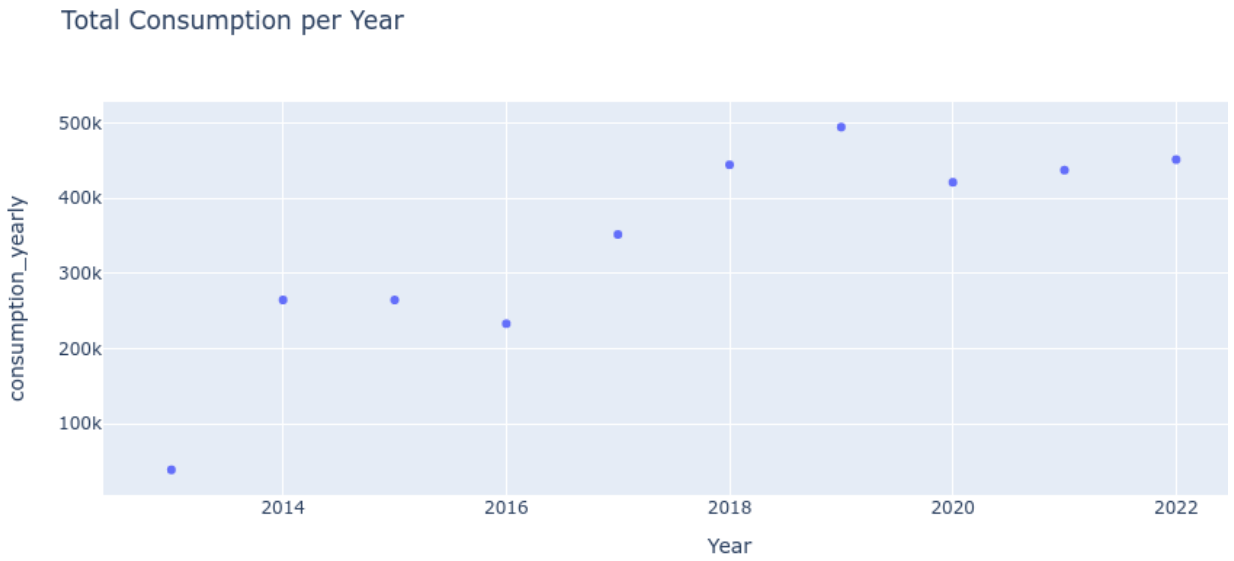
Methods	RMSE
• Mean	10262
• Linear Regression	4295
• Random Forest	8486
• Decision Tree	11642

Linear Regression:
- RMSE on the test data: 4295
- The future cost prediction: 99622
- with 20% safety margin = 100481

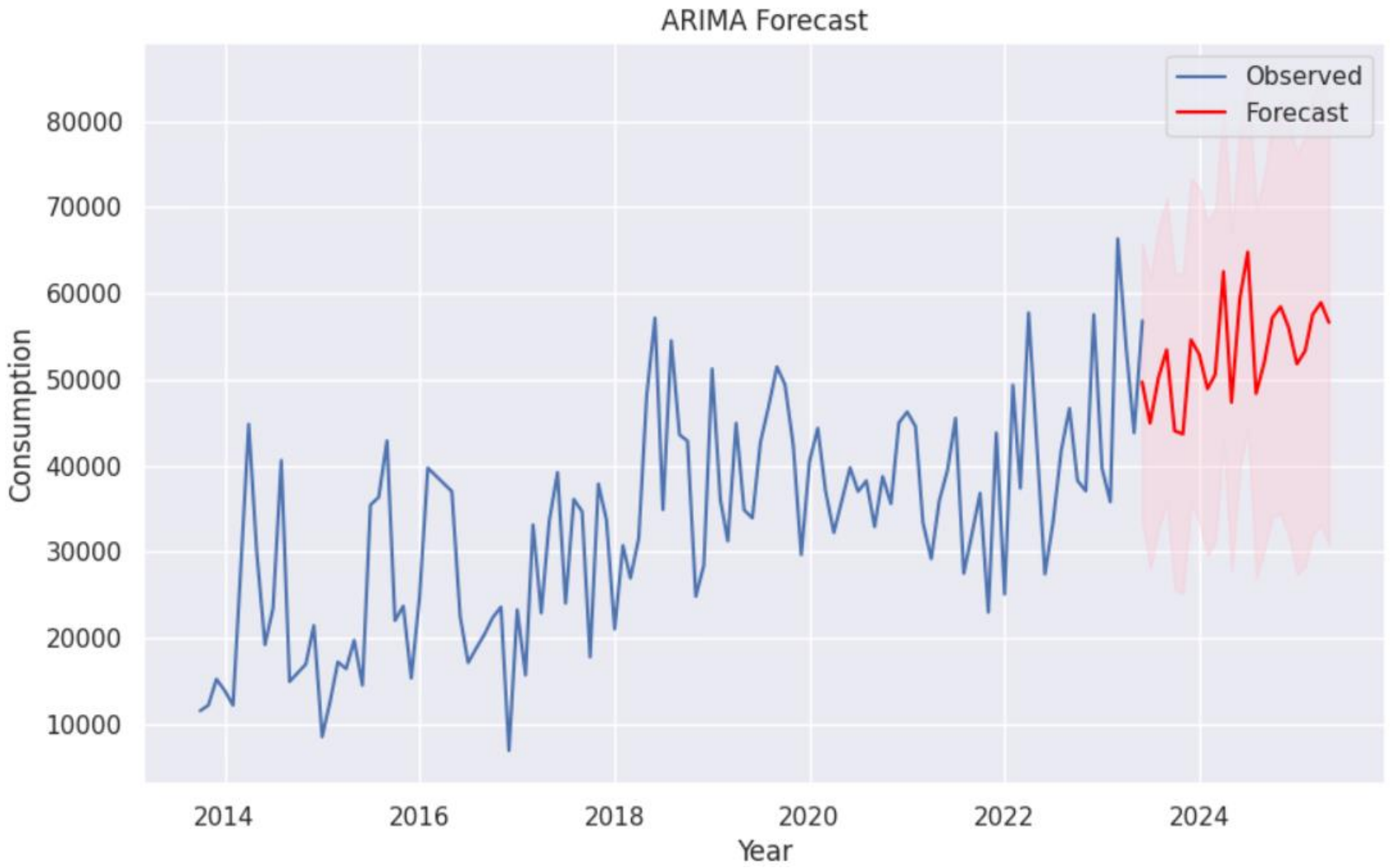
Random Forest:
- RMSE on the test data: 8486
- The future cost prediction: 1186575
- with 20% safety margin = 1188272

- Decision Tree: - RMSE on the test data: 11642
- The future cost prediction: 1274226
- with 20% safety margin = 1276554

- ARIMA: 1277340



Autoregressive Integrated Moving Average - ARIMA



Issues:

- No data split, no RSME to compare
- Dta point is not continues

Parameter:
order=(30, 2, 5)

Improvement

- **Data split**:
  Change data split for annual forecast, first split and later average annual or seasonal consumption.

- **Hyperparameter tuning**
  All models are set to their default hyperparameters (python pkgs, mlflow, hyperopt). Of the models examined, the decision tree clearly overfits the data and the model complexity needs to be reduced (max_depth).

- **Modify prediction target, Time Series**
  Current models are trained to predict for a specific year/month. However, the result could be improved if we use a time series prediction and consider the time history (e.g. average consumption) in the input data and train it on its future prediction performance.

- **Re-evaluate data cleaning**
  Check the validity of the cleaned data points and reconsider including them in the dataset.

- **Try other models**
  For example: Support Vector Regression (SVR), Autoregressive Integrated Moving Average (ARIMA)

Commercial Plant Manager

- Present the APP and the parameters study available in the APP.
- Highlight the current best prediction and the reasoning behind it.
- Ask him/her to use the app and give feedback on the visualisations he/she needs to improve the use case and understanding of the models.
- Suggest further selection of data for better prediction (e.g. material type).

Predict Consumption APP

Focus on Communication and feedback:

- Exploration accasibility > colbaorative development
- Simplifying the DS concept > extend brain strorming of problem solving

Elctronic Mounting KG

Data Sceience idea:

- Reporting
- Interdependency analyses
  - Correlation of parameters
  - Hypothesis
- Specification limits
  - In-circuit analysis > Graph embedding
- Human based inspections