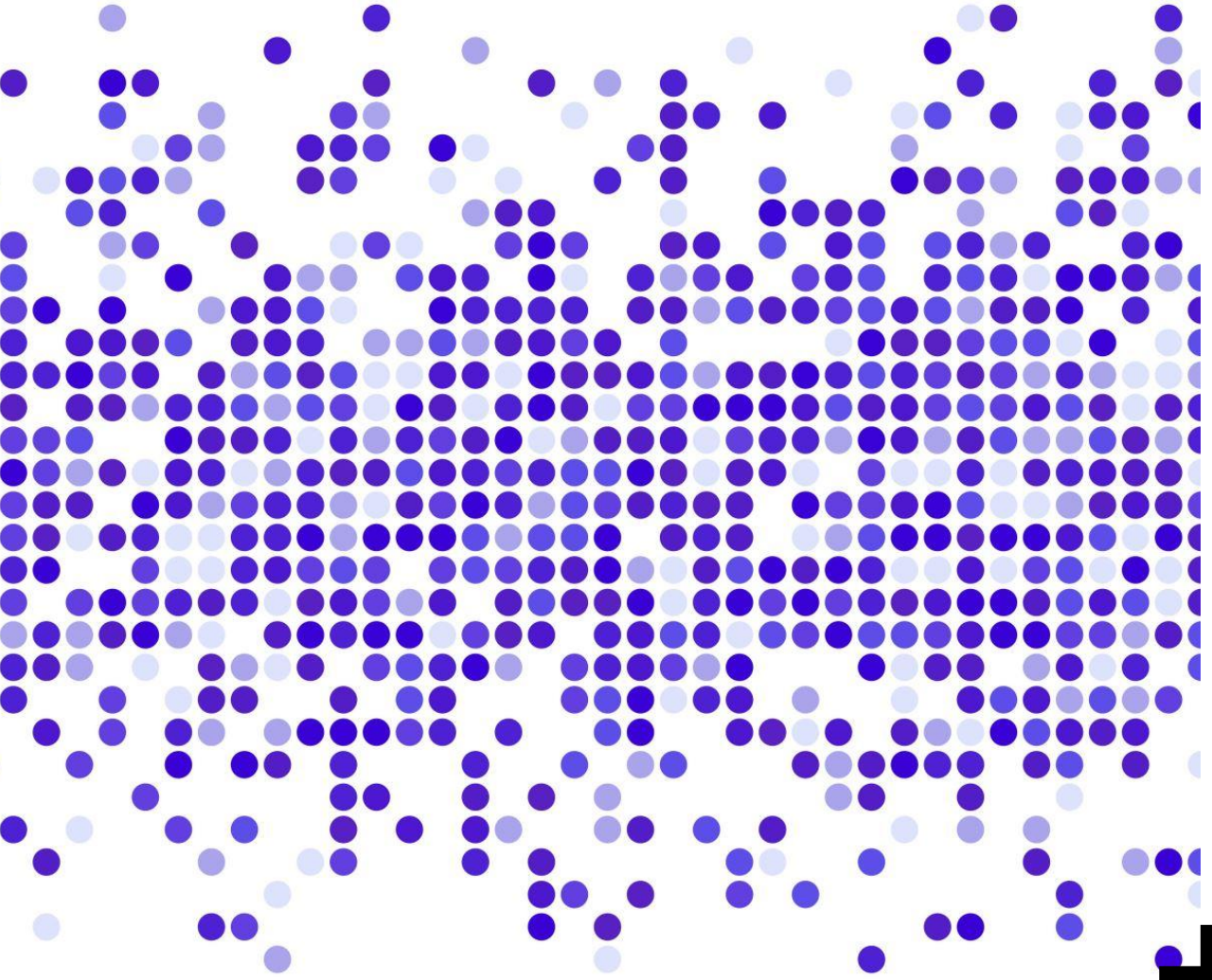


Predicting sales prices for US houses

Team 1

Bart Lesschen

Bhinawa Putra Raja

Martijn Ma

Sebastian Piest

BI meets Data Science

– Learn PowerBI
– Explore use of R Studio (and similar)
– Experiment with Power BI + R
– Create a working ML pipeline
– Sharpen/update data science skills
– Have fun ☺

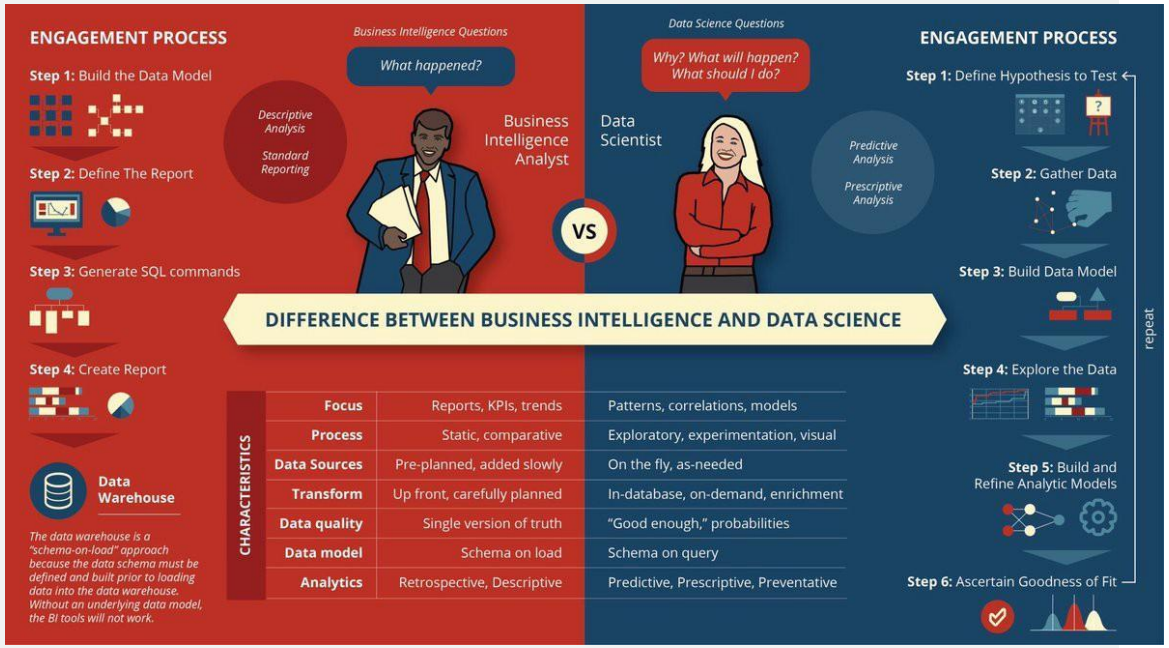


Image source:
https://caiomsouza.medium.com/difference-between-bi-business-intelligence-and-data-science-1a9c7628bbdb (23-09-2022)

Starting with some science before diving into the data (swamp)

- Variety of approaches:
  - Machine learning (Komagome-Towne, 2016; Ravikumar, 2017; Phan, 2018; Truong et al., 2020)
  - Deep learning (Wang et al., 2021)
  - Lineair- and Logistic regression (He, He, 2021), Fuzzy (Sarip, 2016) and Multiple regression (Zhang, 2021)
  - Time series (Wang, Juntao, et al. 2018)
  - AutoML (Li et al., 2020)
  - Particle swarm optimization (Zhou, 2021)
- Different sources:
  - Mainly based on historical data
  - Economic parameters (Li and Chu, 2017)
  - News data (Kirkeby and Larsen, 2021)

Clearly no “silver bullet” solution or generalized set of features

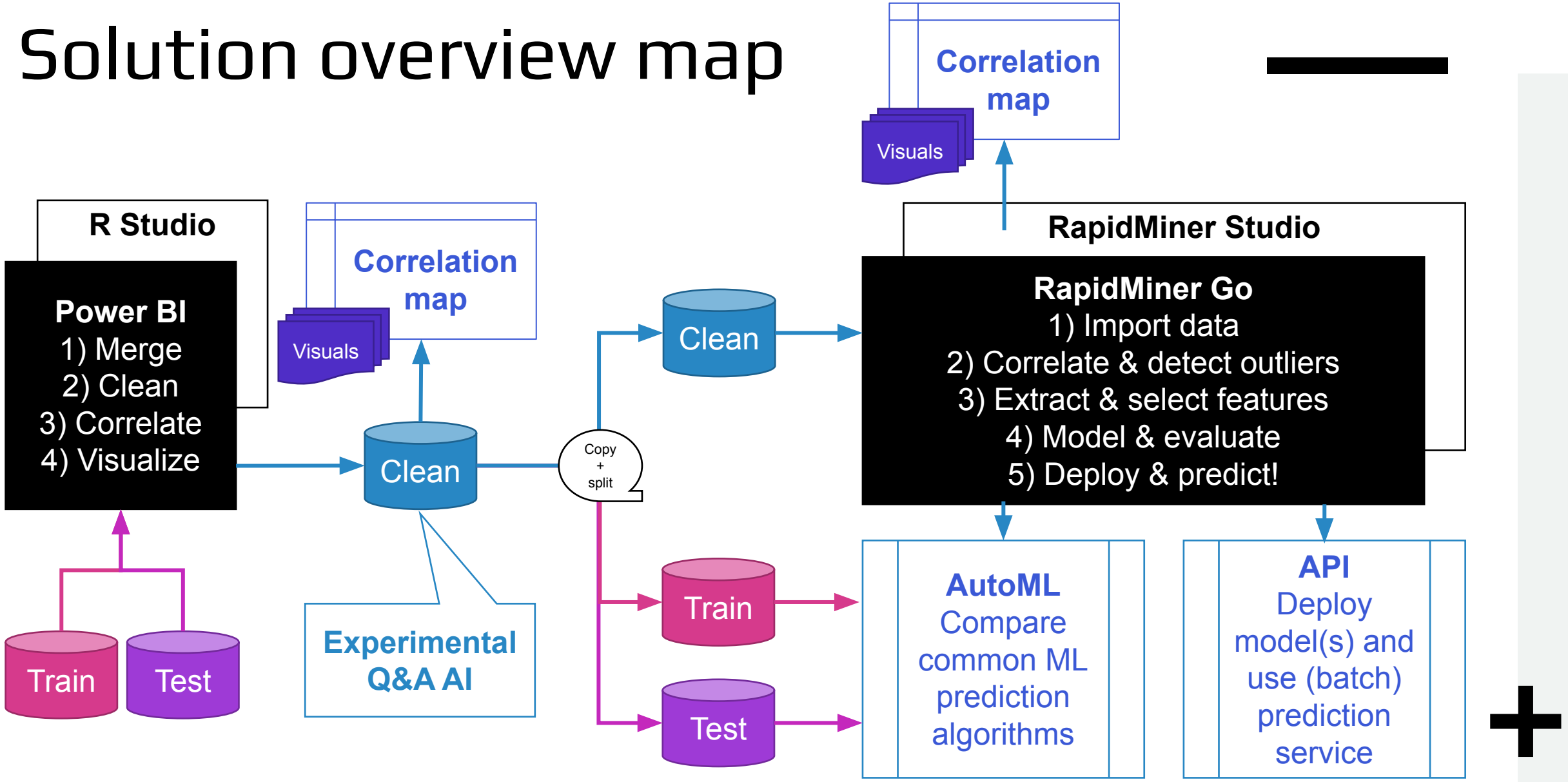
Questions for this week:

- How to test historical, spatial and temporal influences?
- Which risk of bias is in the data?

Questions for later/others:

- Which indices correlate with housing prices?
- What influence does public opinion and sentiment have?

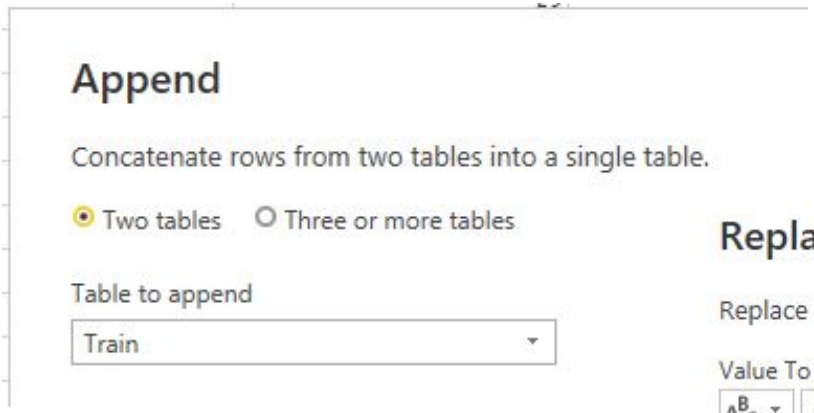
Solution overview map

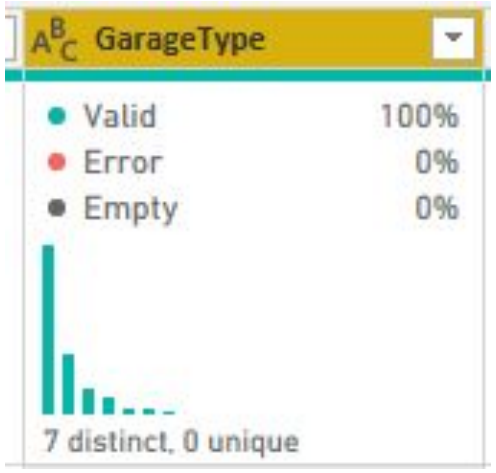


Use of PowerBI

Data crunching

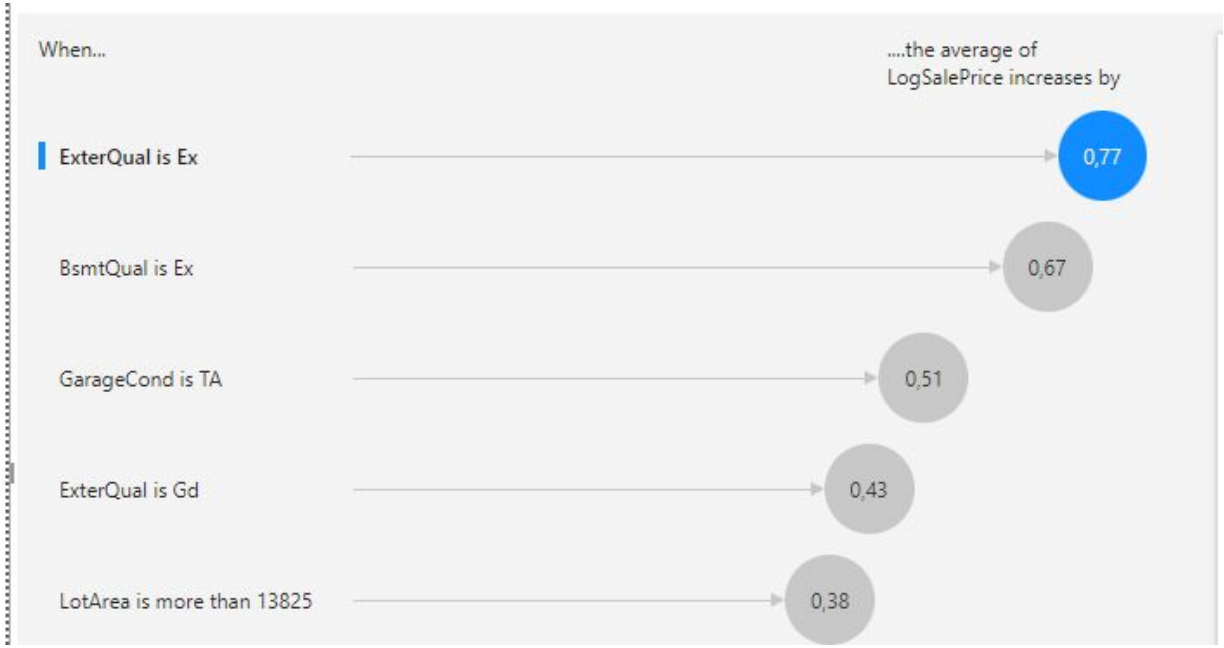
- Dataset merge
- Data cleaning
- Data exploration/visualizations
- Correlation map
- Influencing factors
- Experimental AI: Q&A
- Experimental: integrate R script





Use of PowerBI

Correlations and AI-based Q&A

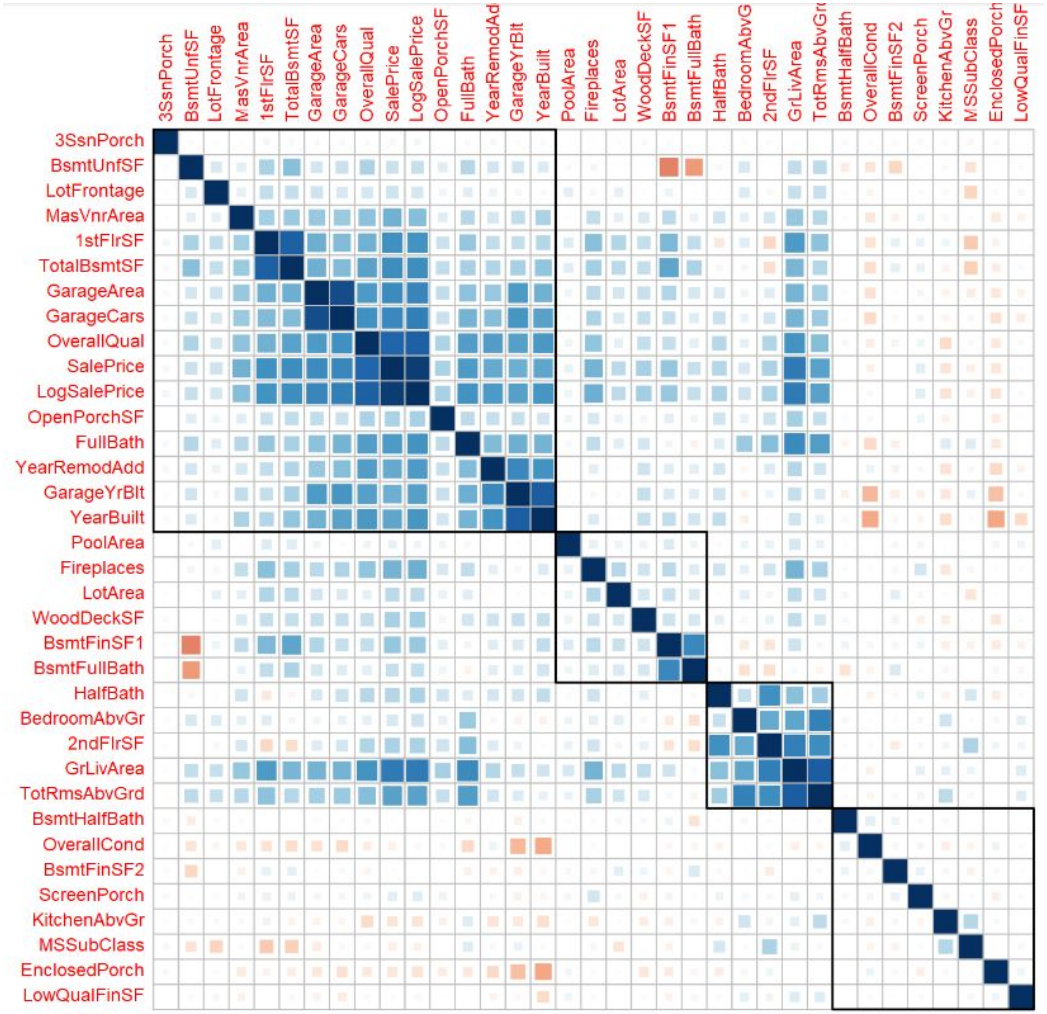


Use of R in Power BI

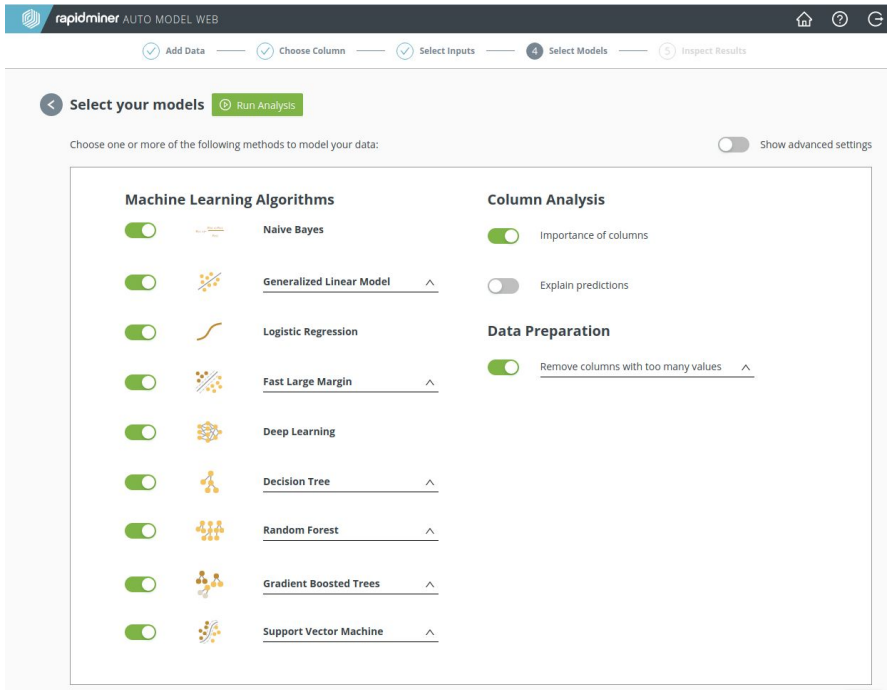
- Data visualization (library: corrplot)
- R script editor in PowerBI
- Explored functionalities in R
- Continued in RapidMiner

R script editor

```
1 # The following code to create a datafram
2
3 # dataset <- data.frame(LogSalePrice)
4 # dataset <- unique(dataset)
```

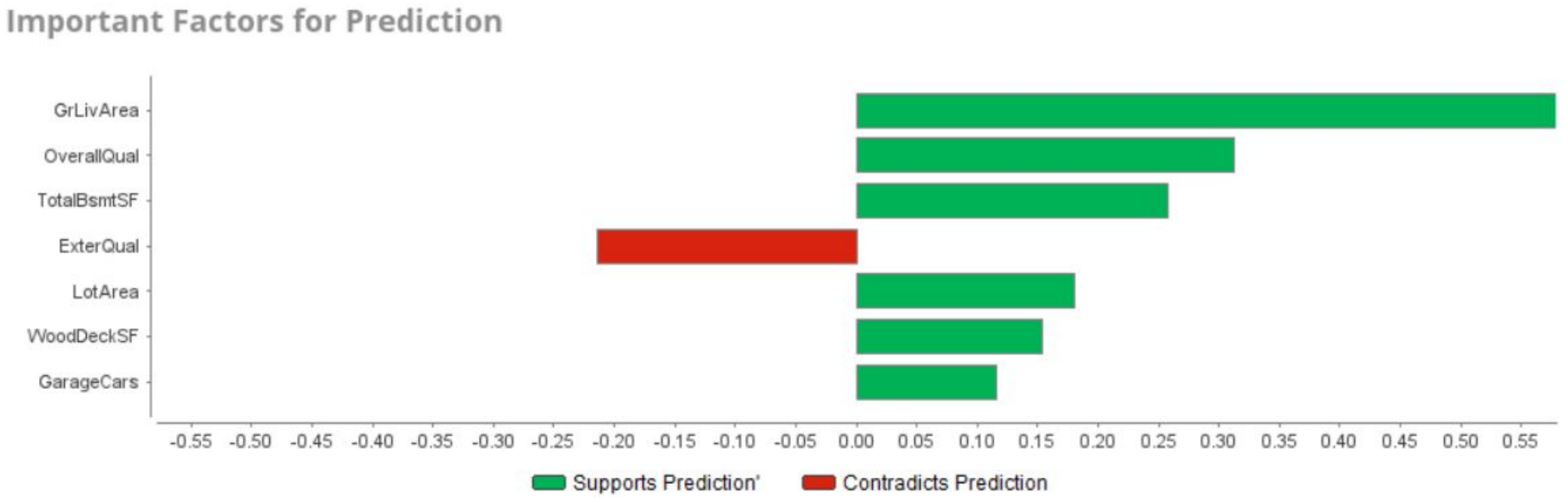


Use of RapidMiner



- Data preparation
- Statistics/visualizations
- Outlier detection
- Modeling with AutoML (6 models + correlation map)
- Model evaluation and selection: Gradient Boosted Trees
- Model deployment
- Scoring

Predicting future sales prices



Model	Relative Error	Standard Deviation	Total Time	Training Time (1,000 Rows)	Scoring Time (1,000 Rows)
Generalized Linear Model	0,70%	0,08%	1369,0	42,2	6,9
Deep Learning	0,77%	0,07%	5162,0	923,9	133,2
Decision Tree	1,40%	0,09%	1331,0	11,8	12,1
Random Forest	0,86%	0,12%	21752,0	204,8	192,0
Gradient Boosted Trees	0,69%	0,04%	32132,0	341,9	57,1
Support Vector Machine	138,15%	0,34%	27709,0	3815,2	207,6

Concluding remarks

- Nice combination of BI & Data Science
- Quite a lot features in PowerBI that go beyond BI
- RapidMiner really speeds up process with TurboPrep and AutoML - and also offers a variety of statistics / visualizations
- Working ML pipeline in 1 week based on Gradient Boosted Trees and iterative development

Didn’t go in-depth with:

- R scripting
- (Hyper)parameter tuning

PowerBI correlations limited to numeric values

We had fun and got predictions :)

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