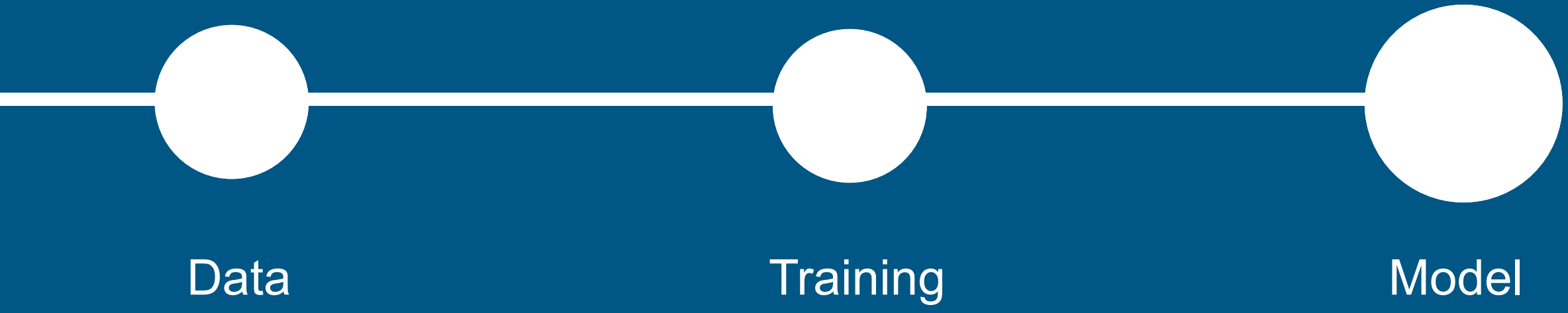
Maintainging the Data Quality in ML development



Our group at Statistics Finland

- Stats Finland's departments were reorganized in September 2020
- *Digitalization services* established, responsible for
  - Managing and assisting with innovations
  - Developing ML-based solutions
- Eight persons, half with ML in job description

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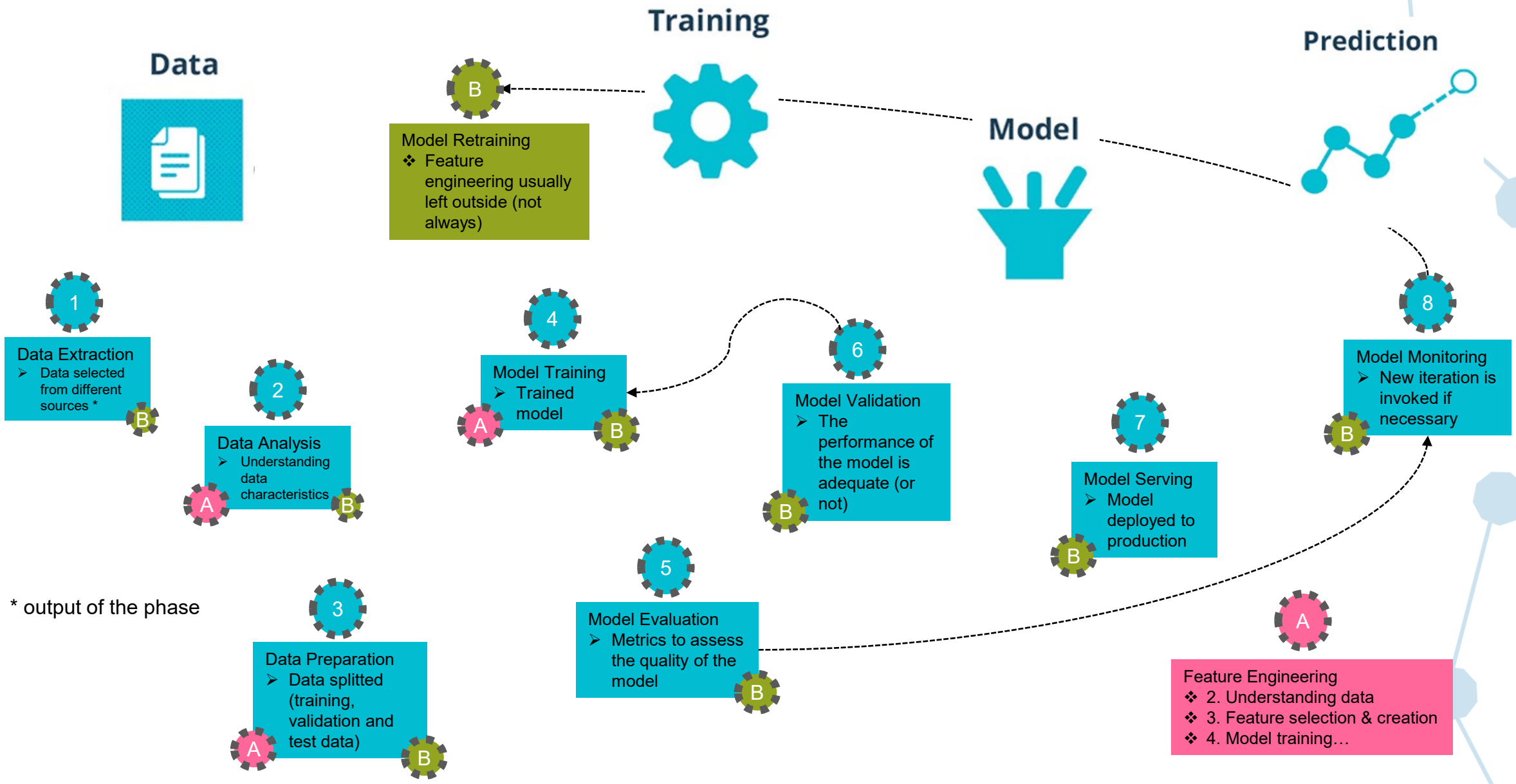
ML at Stats Finland

- Limited experience with ML
  - A couple of rudimentary classification models in production
  - A few more cases investigated but have not made it to production
- Finland's public sector policy: If a cloud service offers the best service benefit and guarantee, it should primarily be selected for new IT-solutions, provided no other barriers exist
- Our aim for 2021
  - Implement a generic platform in Azure allowing classification models to be rapidly developed, put into production and reliably maintained
  - Follow *MLOps* principles, automate as much as possible
  - Deploy models for two classification cases to production

”Garbage in, garbage out…”

- In the machine learning context, "garbage in..." means that the ML model is only as good as your data
- Therefore, the data, which has been used for training of the ML model, indirectly influence the performance of the whole ML system
- Better understanding of “DS”-process could be the first step in improving the performance of the ML model, how mature is your process?
- After good understanding of DS-process, automate it!



➢ * output of the phase

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”Quality in, quality out…”

1

Data Extraction

- *Select and integrate relevant data*

Key conciderations: Ground Truth, Data Relevance, Quantity of Data, Ethics

2

Data Analysis

Perform Exploratory Data Analysis to understand the available data

Key conciderations: Missing values, Outliers, Un-balanced data, Feature engineering

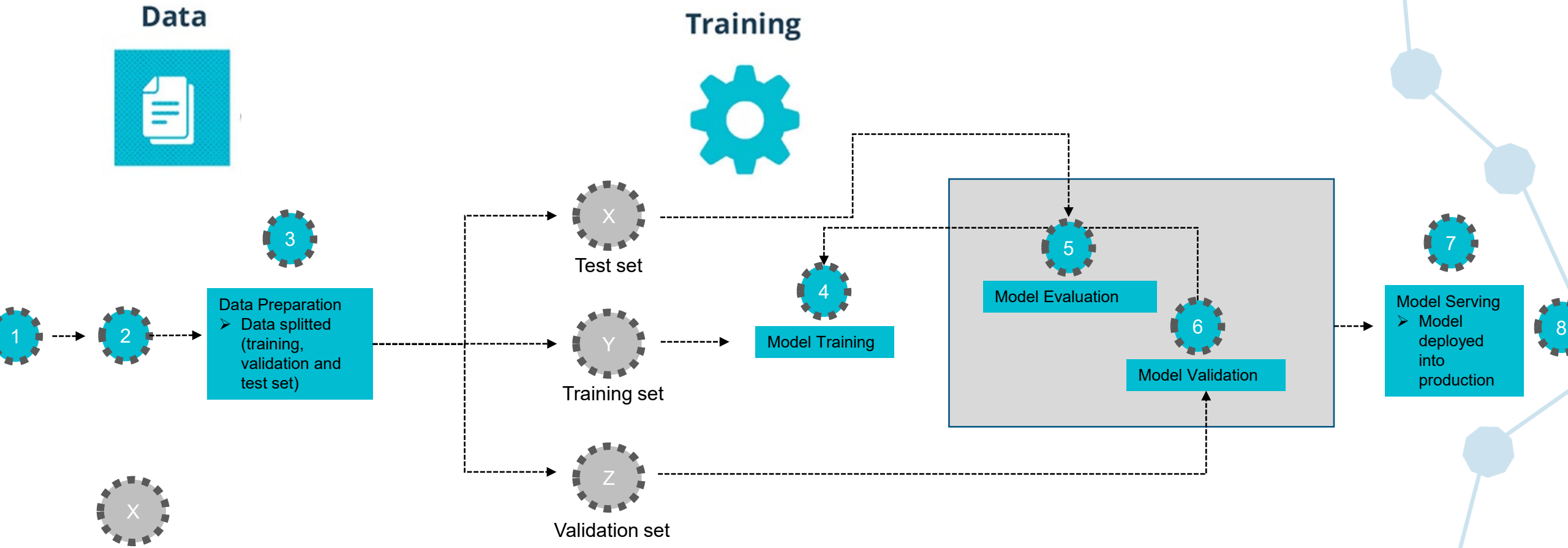
3

Data Preparation

Perform Data Cleaning, Data Splitting and Data Transformations

Key conciderations: Categorical encoding, Dealing with skewed data, Scaling, Bias Mitigation
Feature engineering: Feature extraction, Capturing Feature relationships

(Feature is an attribute used as input for the model to train, or perhaps better definition: individual versioned and documented data column (in a feature store) or even better definition …)



X

Test Set
- ❖ The sample of data used to provide an unbiased evaluation of a final model fit on the training dataset
- ❖ Used in model quality evaluation

Y

Training set
- ➢ The sample of data used to fit the model

Z

Validation set
- ➢ The sample of data used to provide an unbiased evaluation of a model fit on the training dataset while tuning model hyperparameters. The evaluation becomes more biased as skill on the validation dataset is incorporated into the model configuration

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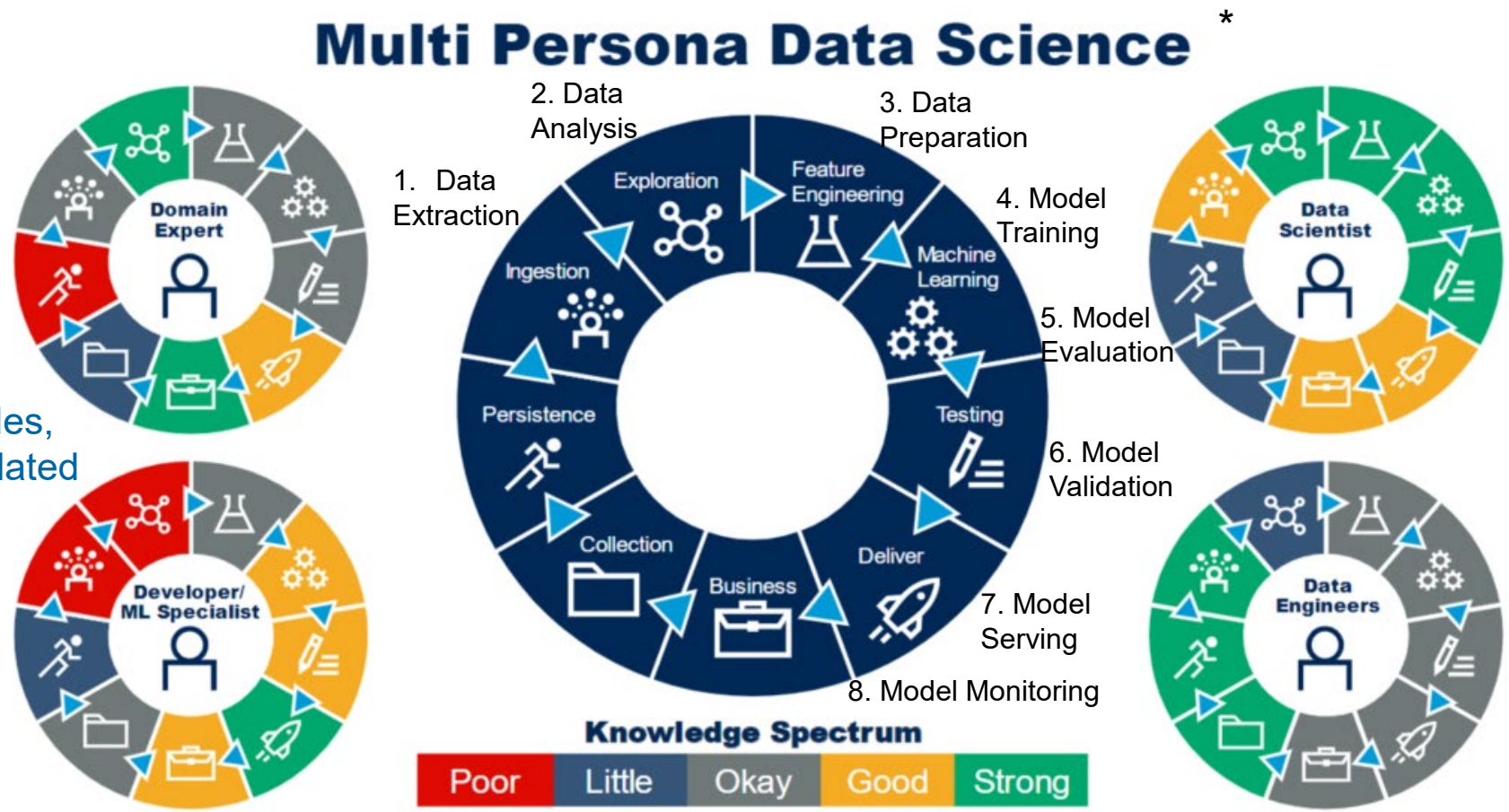
Circumstances triggering retraining

- ML process easily ends up in struggling with all kind of anomalies: decays, skews, drifts and biases…
- Model performance may be affected by numerous factors
- What then?
  - Identify all those unwanted circumstances and what are the factors behind them
  - Improve the weak parts in your DS-process (improve the degree of maturity of DS-process)
  - Create metrics, monitors and build triggers and *automate*

- Identify necessary roles, and how tasks are related to them



* Concept and picture are both from Gartner

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ML workflow could be something like this?

- "DS"-process is in the middle of many other components