DIGITAL FINANCE

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MARIE CURIE ACTIONS

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eXplainable AI in Public Employment Services

08.10.2025 - MSCA Training Week on Explainable AI

Julius Kooistra - BFH

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Canton de Berne

Outline

Introduction to the use case

Modelling choices

System design under real-world constraints

Explainable AI layer

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Introduction to the use case

- AVA Bern
- Social insurance of financial damages from unemployment

- Help unemployed with:
  - Finding a new job
  - Improving employability

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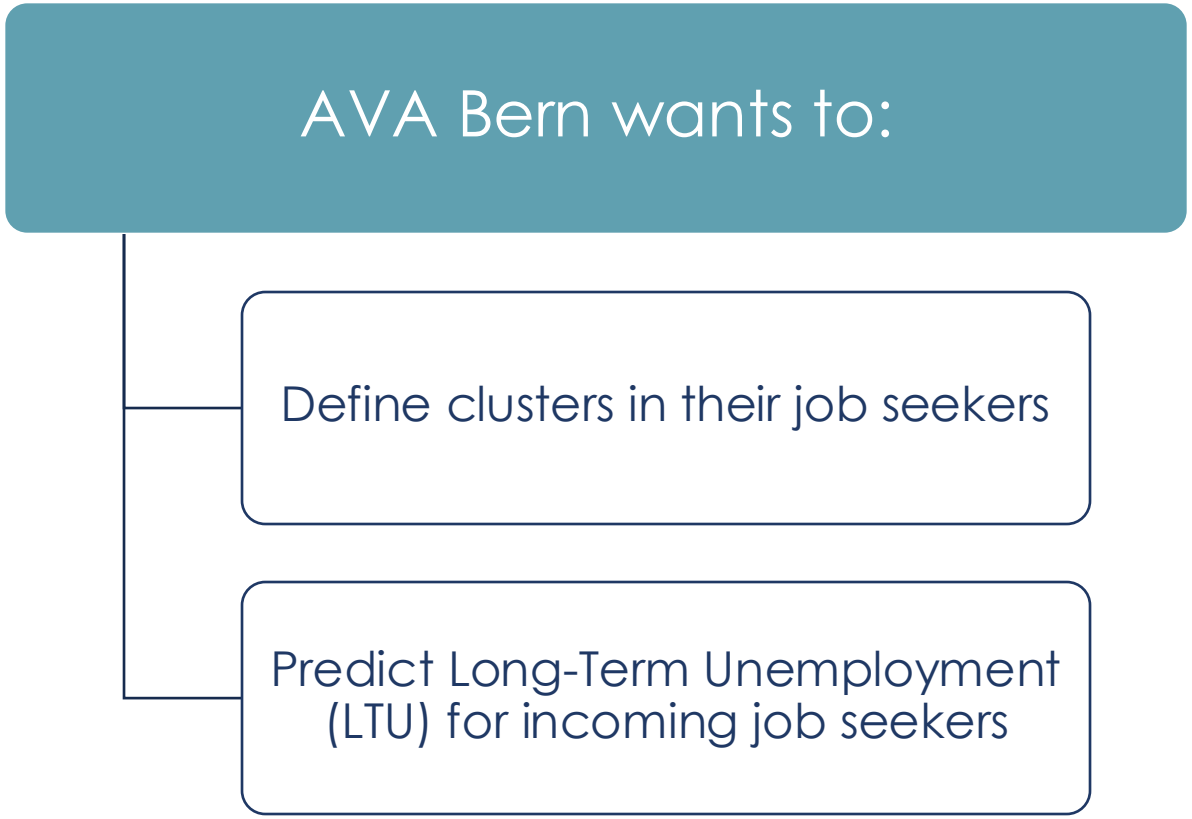
Problem statement



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Data sources

- 1.5 years of data
- 80,000 observations

- Financial administration
- Personal information
- Labour market meassures
- Sanctions imposed

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- 1.5 years of data
- 80,000 observations

- **Financial administration**
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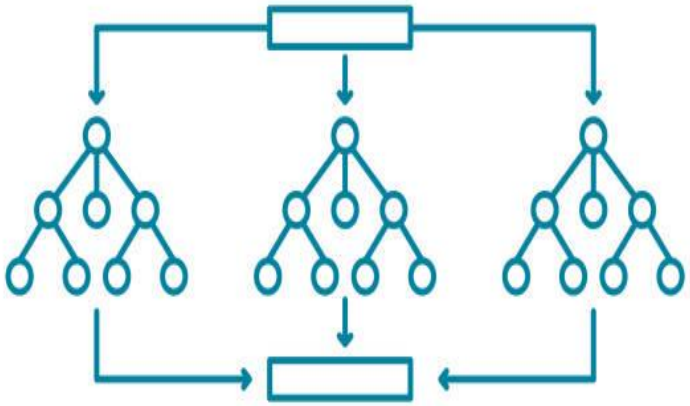
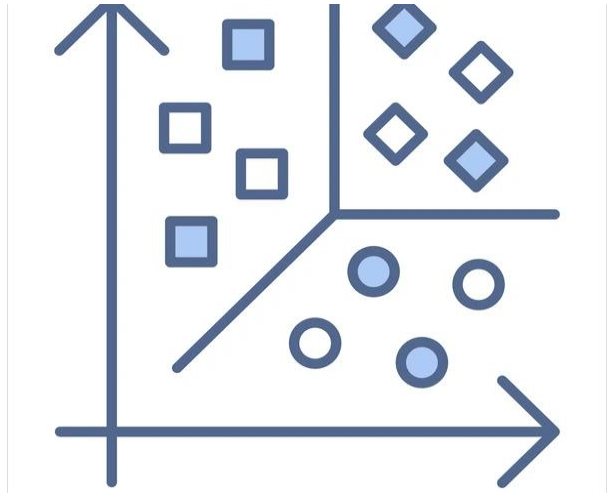
Modelling choices



Predictive modelling



Clustering

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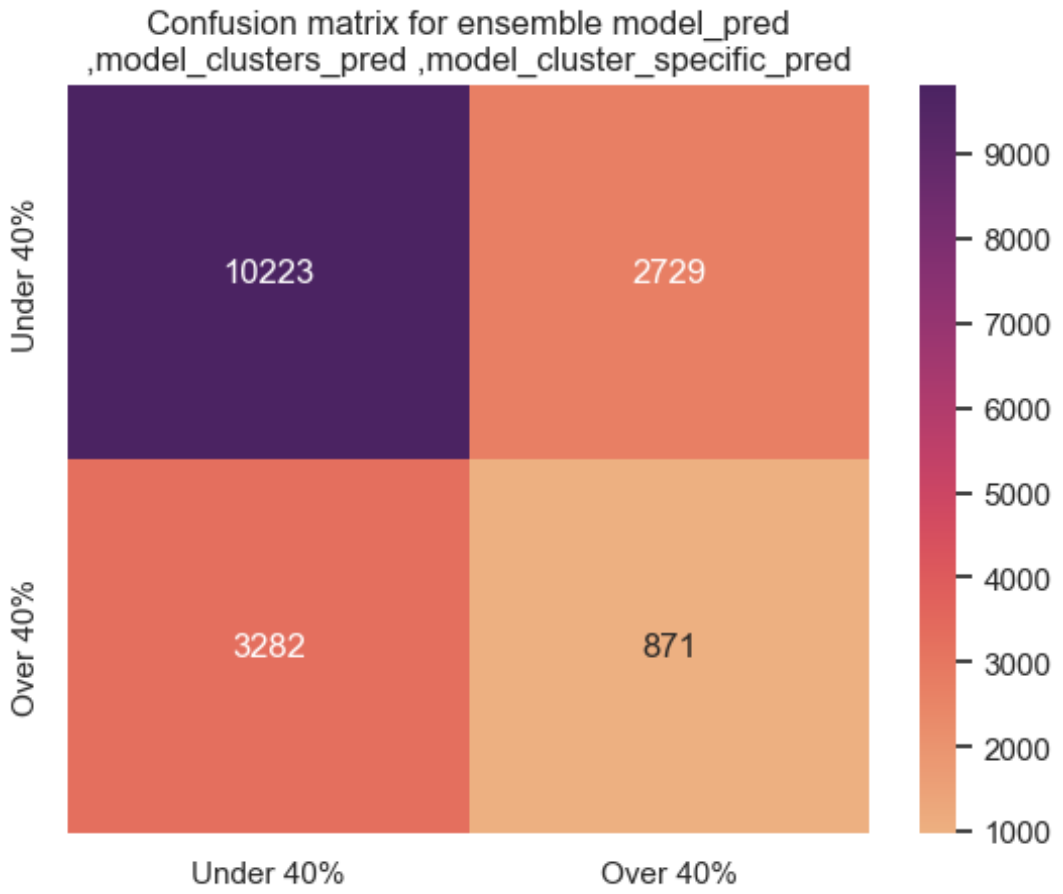
Predictive modelling

- Binary classification
- Ensemble of different CatBoost configs
- Calibrated

- Acc: 0.749
- F1: 0.560



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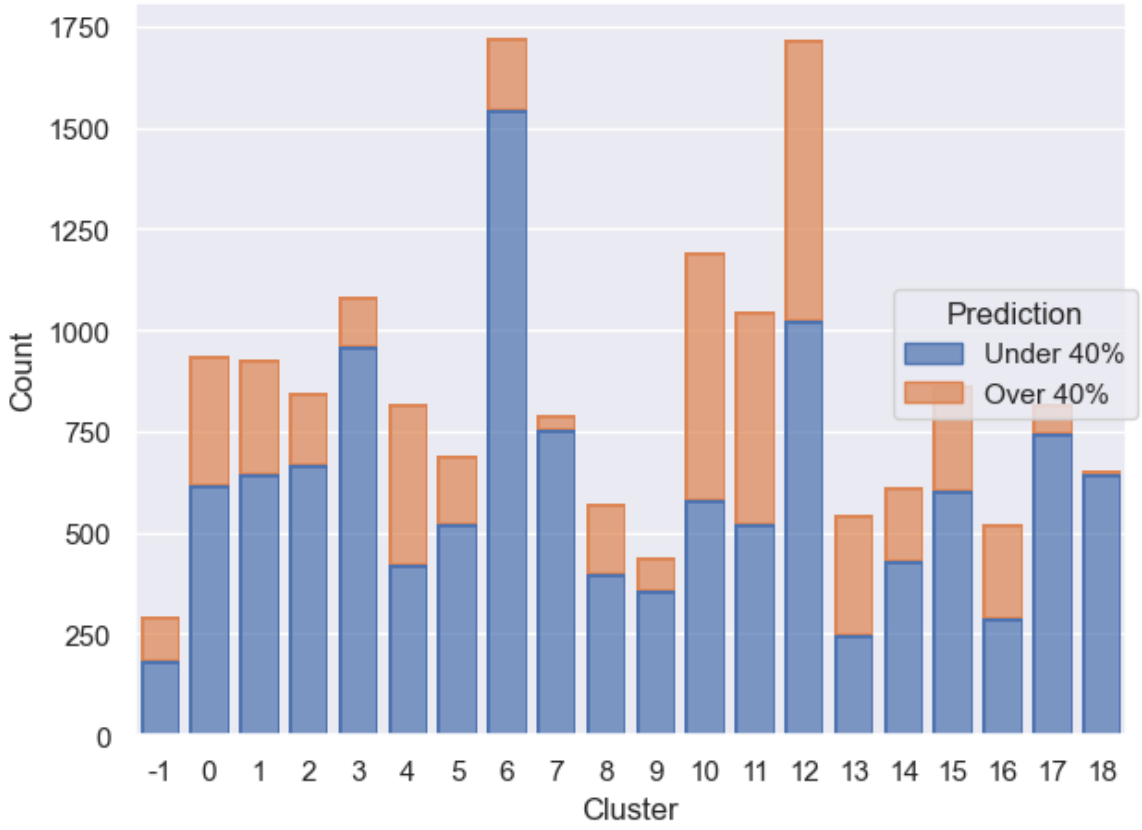
Clustering

- HDBSCAN
- Clustering of subset of features
- Explain > 80% of variance
- Predicted value

- MSC: 0.580



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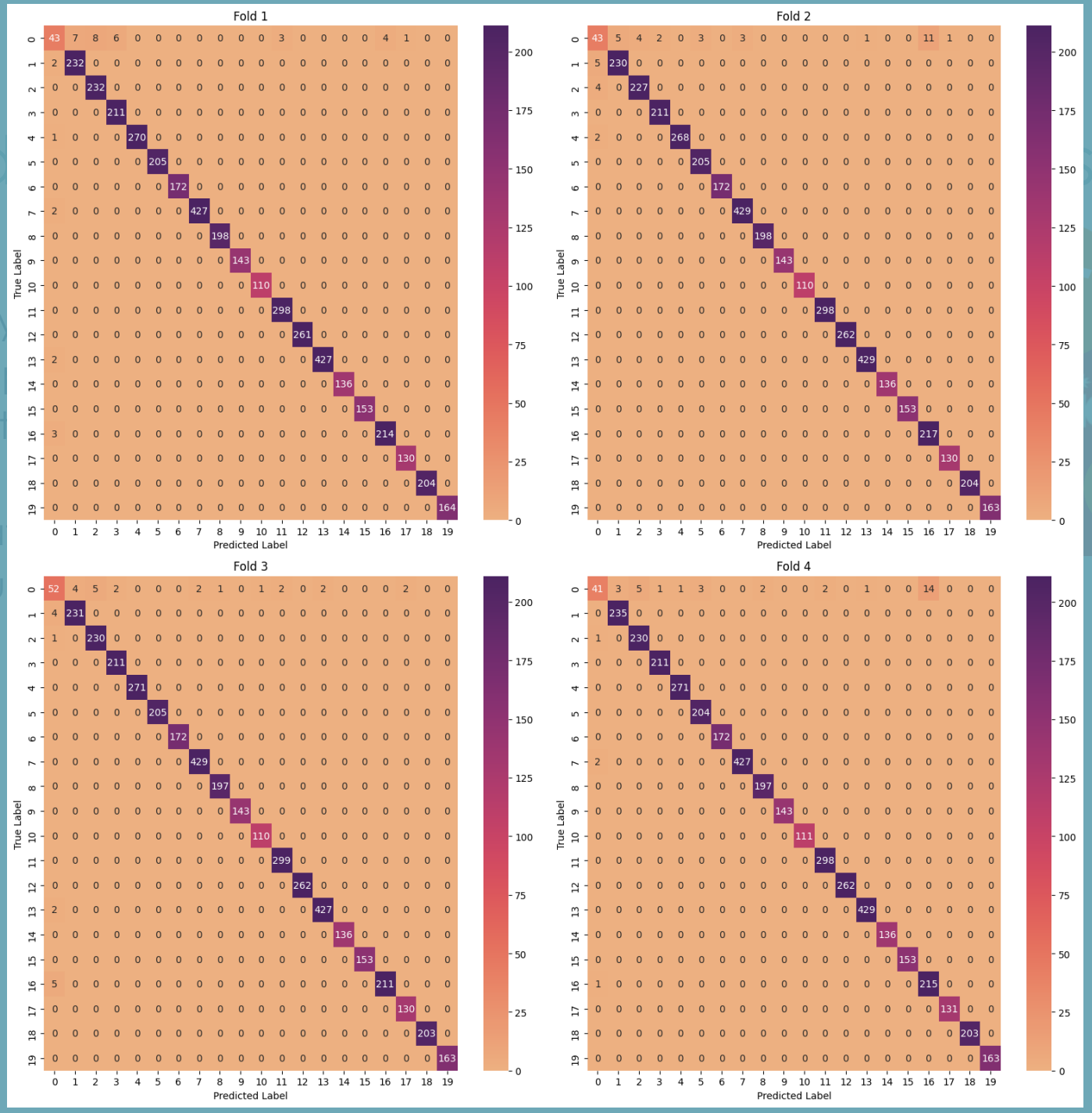
System design under real-world constraints

- MicroStrategy environment
  - How to fit the ML pipe into the system?
  - Daily ETL pipeline

- New observations change the distance matrix :(
  - Train a supervised classifier based on the clustering output


Fold 1
Fold 2
Fold 3
Fold 4
True Label
Predicted Label

eXplainable AI layer

- Predictive model
  - Problem: we are using an ensemble
  - Solution: Using the additive property of SHAP, we average the SHAP values of all the models in the ensemble.

$$f(x) = \frac{1}{M}\sum_{m=1}^{M}\phi_{m,0} + \sum_{j=1}^{p}\left(\frac{1}{M}\sum_{m=1}^{M}\phi_{m,j}\right)$$

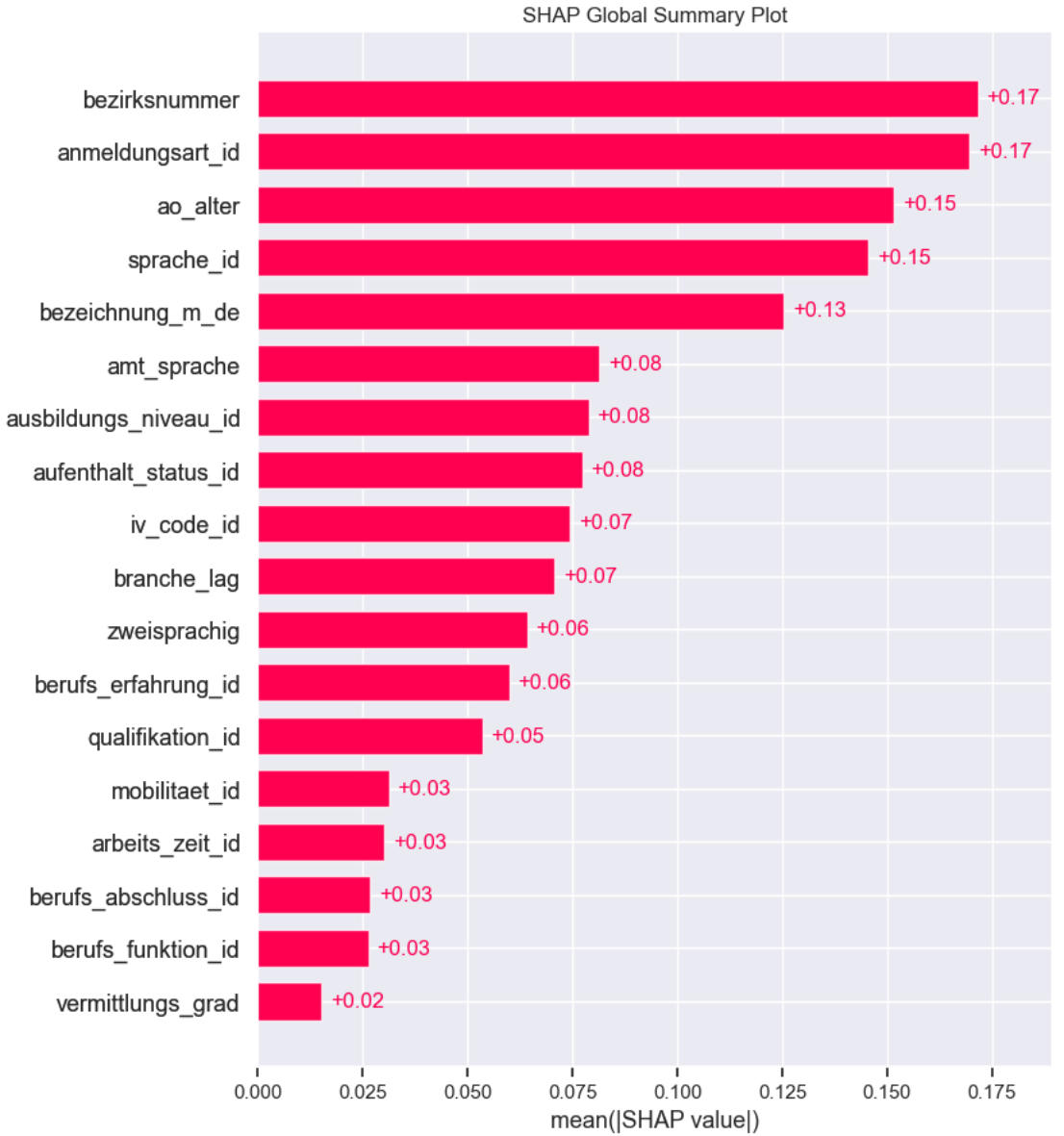
where M is the number of models in the ensemble, and p is the number of features

- Clustering:
  - Unexpected benefit of clustering solution: explainable clustering

XAIs potential

- Graphs
- Generating natural language explanations
- ….

Die Modellvorhersage wurde beeinflusst, weil ausbildungs_niveau_id (Wert: Sek. I) hat die Vorhersage stark erhöht; anmeldungsart_id (Wert: Wiederanmeldung laenger 6 Monate) hat die Vorhersage stark erhöht; …



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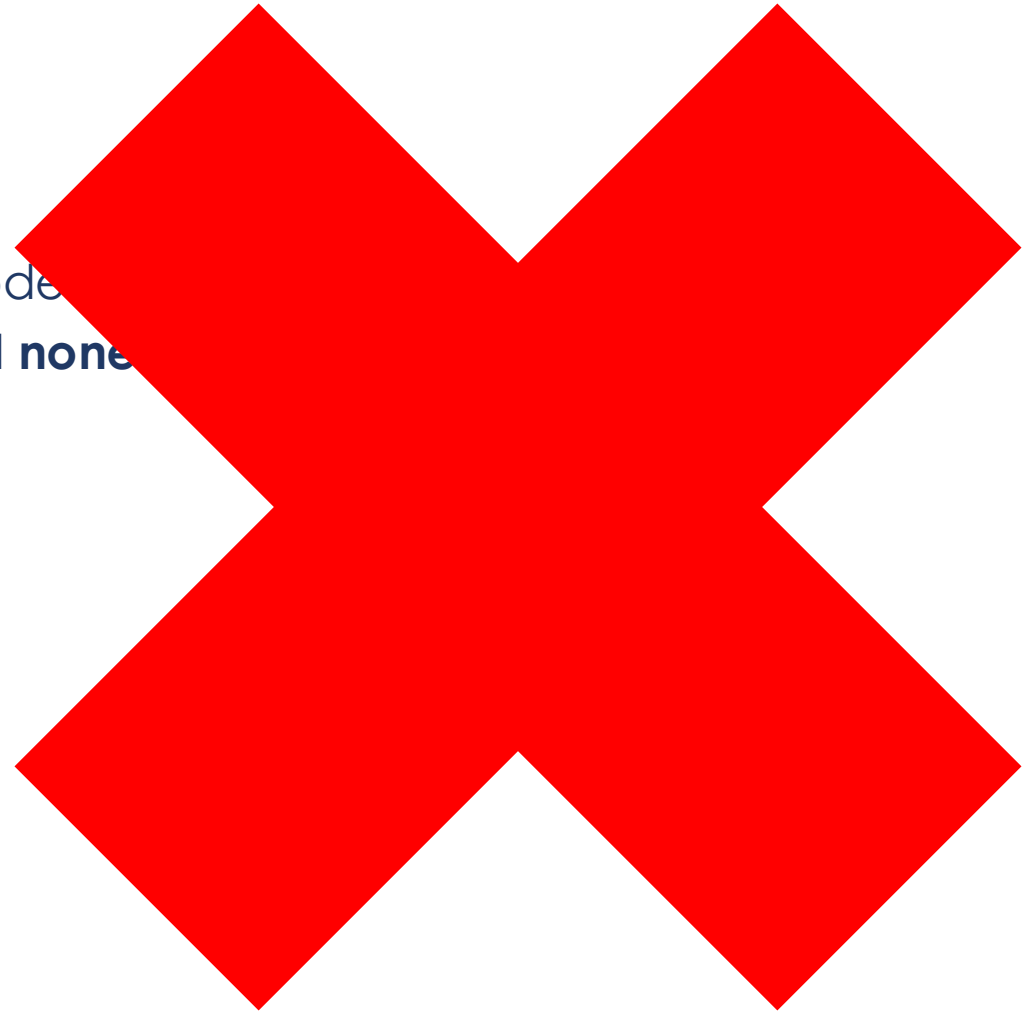
XAI in action @AVA

- Actual usage:
  - Inspecting the model after (re-)training
  - At counsellor level …….

XAI in action

- Actual usage:
  - Inspecting the mode
  - At counsellor level **none**



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“The end user is **not** a data wizard”

How to present explanations to different end users in a PES context?

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