Progress Report

Mon 10 Apr

Radioactive Element Detection

Develop a data-driven approach to detect the radioactive elements

Metode

Data Collection → Data Preprocessing → Feature Engineering → Model Selection

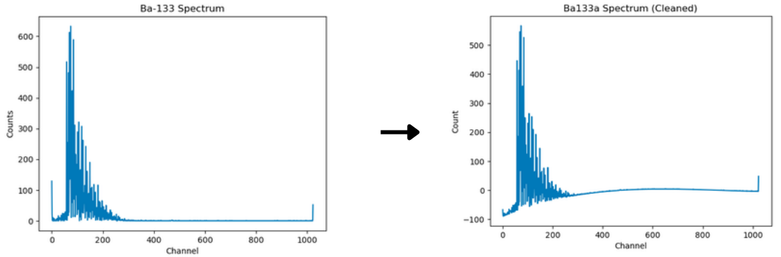
- ± 8 elements
- each element:

Kanal	Cacahan
0	129
1	23
2	3
3	0
4	8
5	10
6	0
7	1
8	0
9	1
10	7
11	1
12	0

1023

- EDA
- Data Labelling
- Data cleaning: baseline removing
- Transforming data

(contoh baseline removing)



	Element	0	1	2	3	4	5	6
0	Ba-133	129.0	23.0	3.0	0.0	8.0	10.0	0.0
1	Ba-133	239.0	42.0	7.0	0.0	17.0	17.0	0.0
2	Ba-133	455.0	83.0	19.0	0.0	39.0	28.0	1.0
3	Ba-133	499.0	94.0	20.0	0.0	42.0	30.0	1.0
4	Co-60	2596.0	601.0	32.0	0.0	254.0	68.0	4.0
5	Co-60	24126.0	5318.0	200.0	12.0	2352.0	620.0	15.0
6	Co-60	98256.0	21826.0	859.0	49.0	9107.0	2588.0	65.0
7	Cs-137	168.0	42.0	0.0	0.0	12.0	6.0	0.0
8	Cs-137	2310.0	523.0	14.0	0.0	161.0	53.0	0.0
9	Cs-137	7324.0	1586.0	52.0	1.0	535.0	136.0	4.0
10	Cs-137	819.0	195.0	6.0	0.0	74.0	15.0	0.0
11	Cs-137/Co-60	14182.0	3419.0	122.0	6.0	1597.0	435.0	6.0
12	Cs-137/Co-60	38128.0	8954.0	315.0	20.0	4006.0	1083.0	19.0

- Extract features
  - spectral analysis
  - peak counts?
  - pulse shape?
  - time-dependent count rate?

- Decision tree classifier
- Random forest classifier
- and more...

Metode (2)

Model Training → Model Evaluation → Deployment

- Split data
  - 80% Training
  - 20% Testing
- Train w/ ML models
- Cross-validation?

- accuracy: ±0.66
- precision
- recall
- F1-score

- test using new data

```
: import pandas as pd

  # Load the new data
  new_data = pd.read_csv("CS137 d.csv")
```

```
: import numpy as np

  # assume the new data is stored in a dataframe called `new_data
  counts = new_data['Cacahan'].values.reshape(-1, 1)
  counts = scaler.transform(np.hstack([counts, np.zeros((counts.s

  # now we can use the model to make predictions
  predictions = rf.predict(counts)
  predictions
```

```
: from scipy.stats import mode

  # get the most frequent prediction from the output array
  prediction = mode(predictions)[0][0]

  print(prediction)
```

```
Cs-137
```