

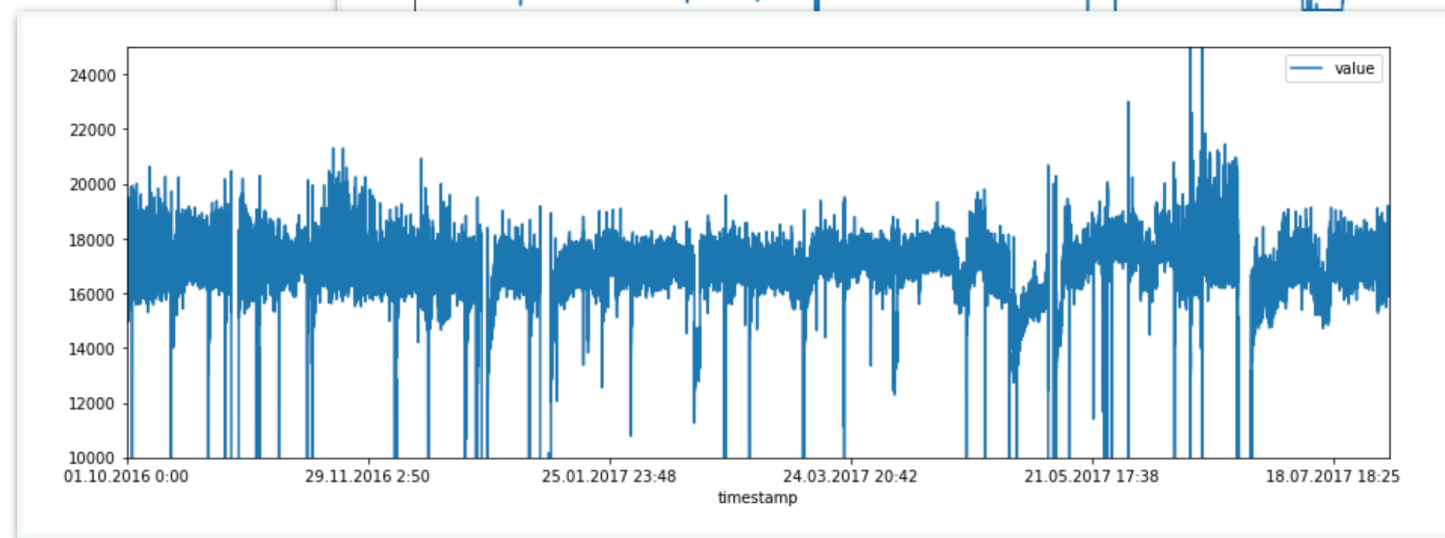
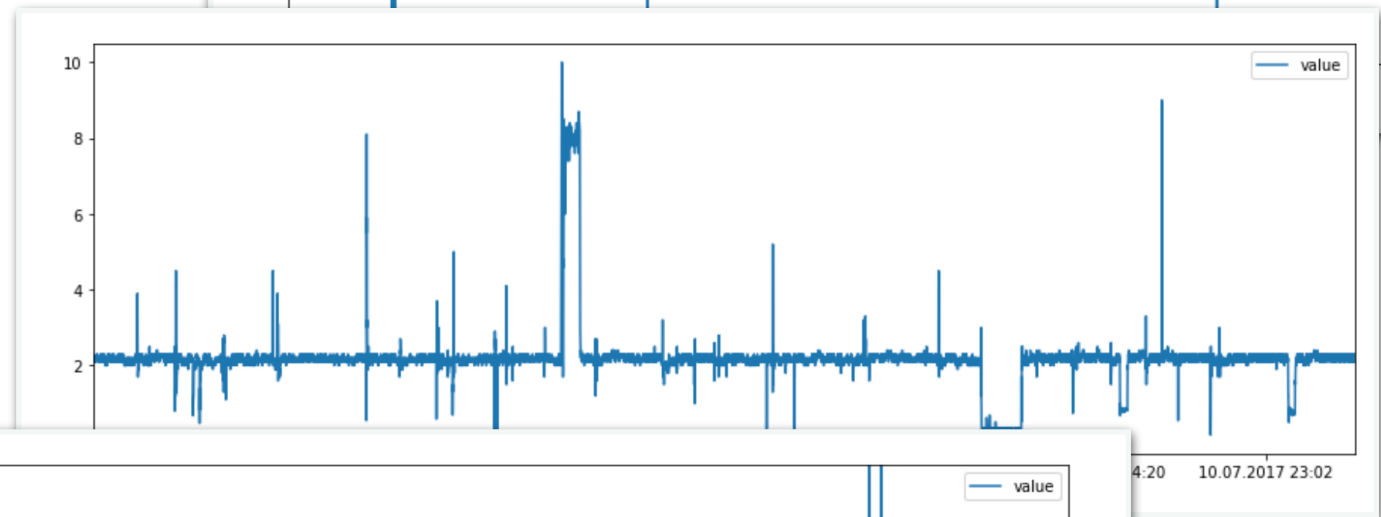
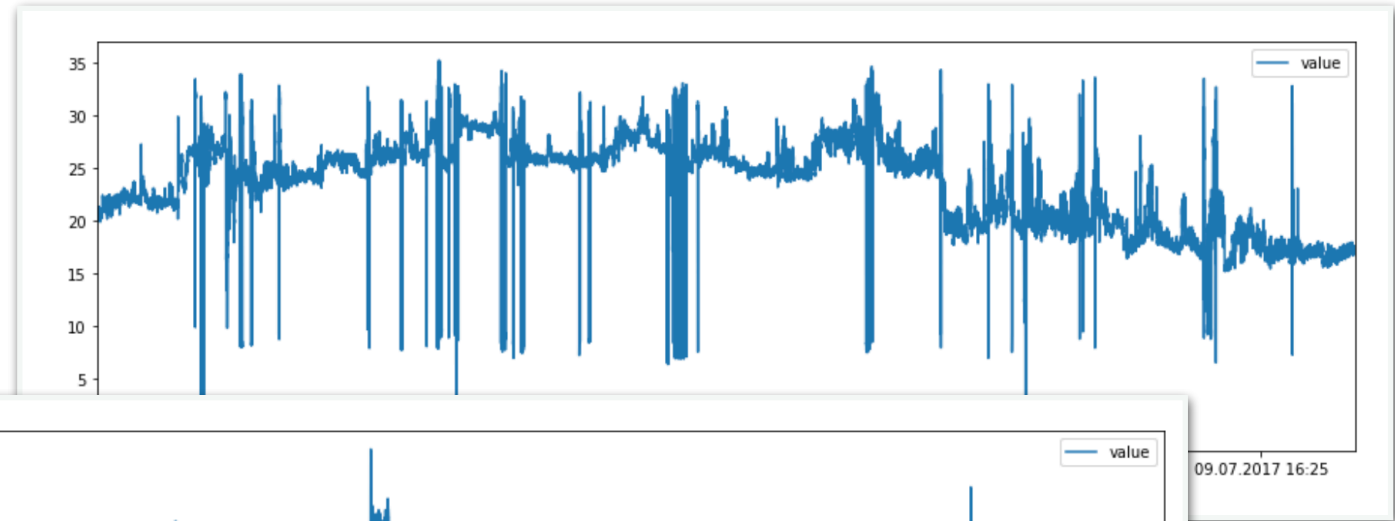
Global Changers SIBUR Challenge

Time Series Anomalies Detection

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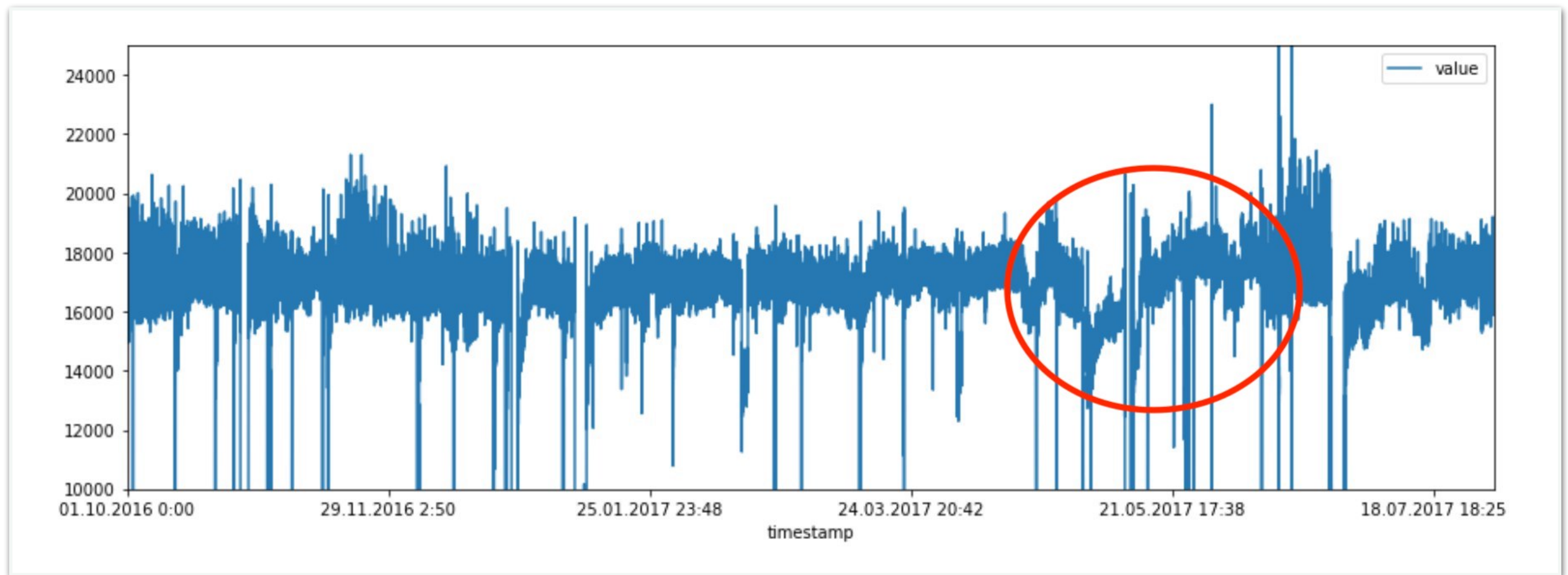
Data

- energy consumption
- efficiency
- quality



Problem

- 1) Определение нестабильных режимов
- 2) Предсказание нестабильных режимов



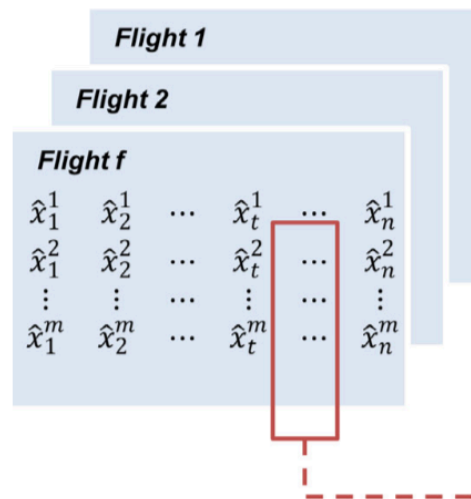
Approach

- 1) Seasonal Decomposition + TS Differentiation
- 2) ClusterAD-DataSample (Gaussian mixture)
- 3) Supervised ML algorithms

Unsupervised Anomaly Detection

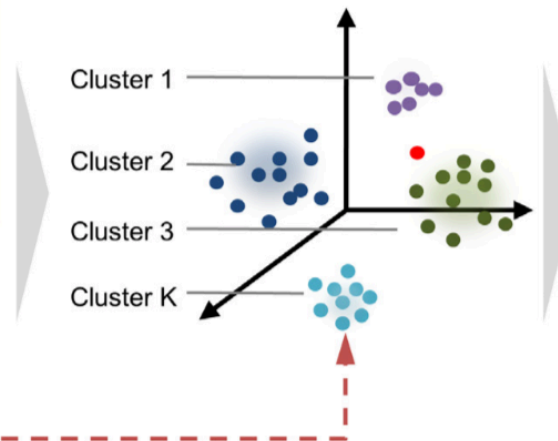
Normalized vectors

Every flight parameter is normalized to have “zero mean and unit variance”



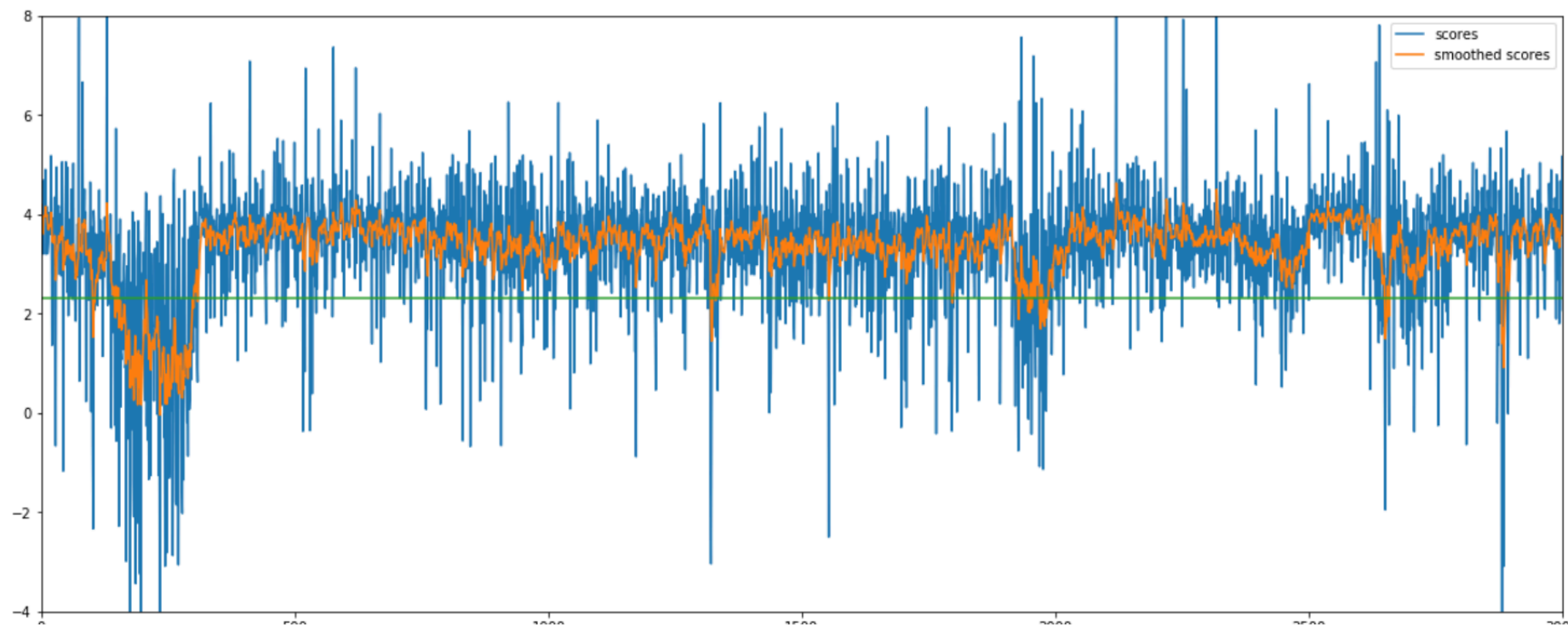
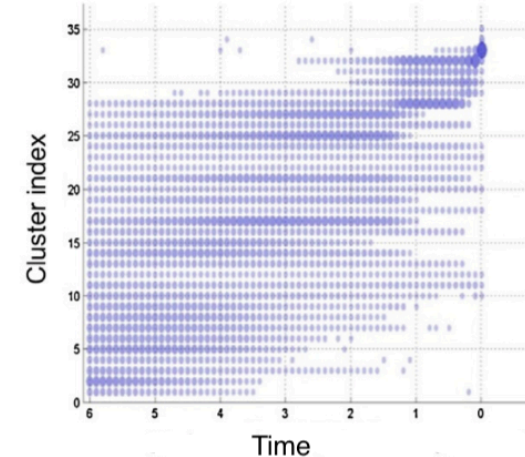
Clusters

GMM clustering is performed on normalized vectors; each cluster represent a typical operation



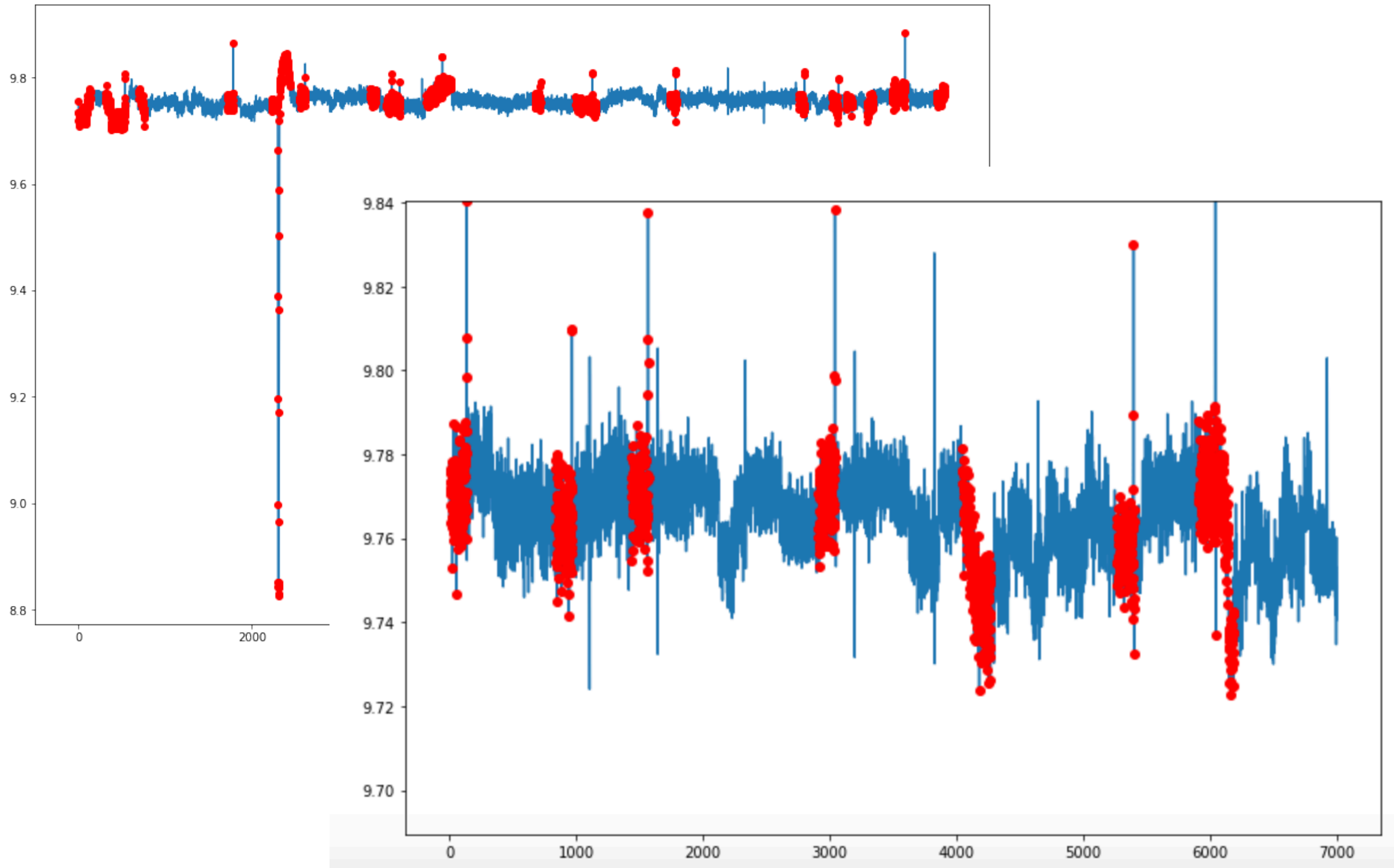
Temporal distribution of clusters

The temporal distribution of clusters is summarized by observation frequency of each cluster along the temporal reference



$$p(\mathbf{x}_t^f \text{ is normal}) = \sum_{q=1}^K p(\mathbf{x}_t^f \text{ is from cluster } q) \cdot p(\text{cluster } q \text{ is appropriate at time } t)$$

Marked Data



Results

Metrics:

- P(anomaly will happen) - ROC AUC
- Dispersion - R^2

Constraints:

- anomaly_top = 1%
- T_frame = 24h

| Series | y (roc auc score) | sigma (R2 score) |
|--------------------|-------------------|------------------|
| Efficiency | 0.63 | 0.01 |
| Energy consumption | 0.61 | -0.02 |
| Quality | 0.75 | -0.4 |

Thanks!