

Local Evaluation of Time Series Anomaly Detection Algorithms

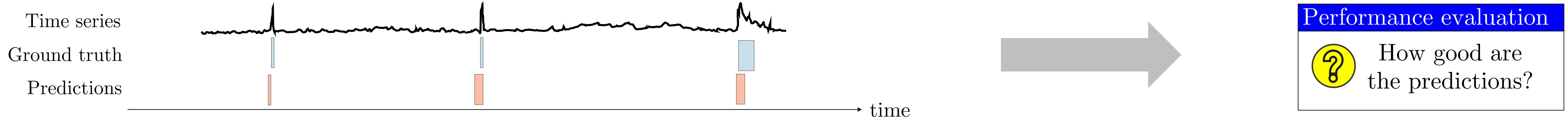
Alexis Huet, Jose Manuel Navarro, Dario Rossi
 alexis.huet@huawei.com

Presentation
 Thursday, August 18
 1:30 PM-1:50 PM
 Room 5

Link to article/code
doi.org/10.1145/3534678.3539339

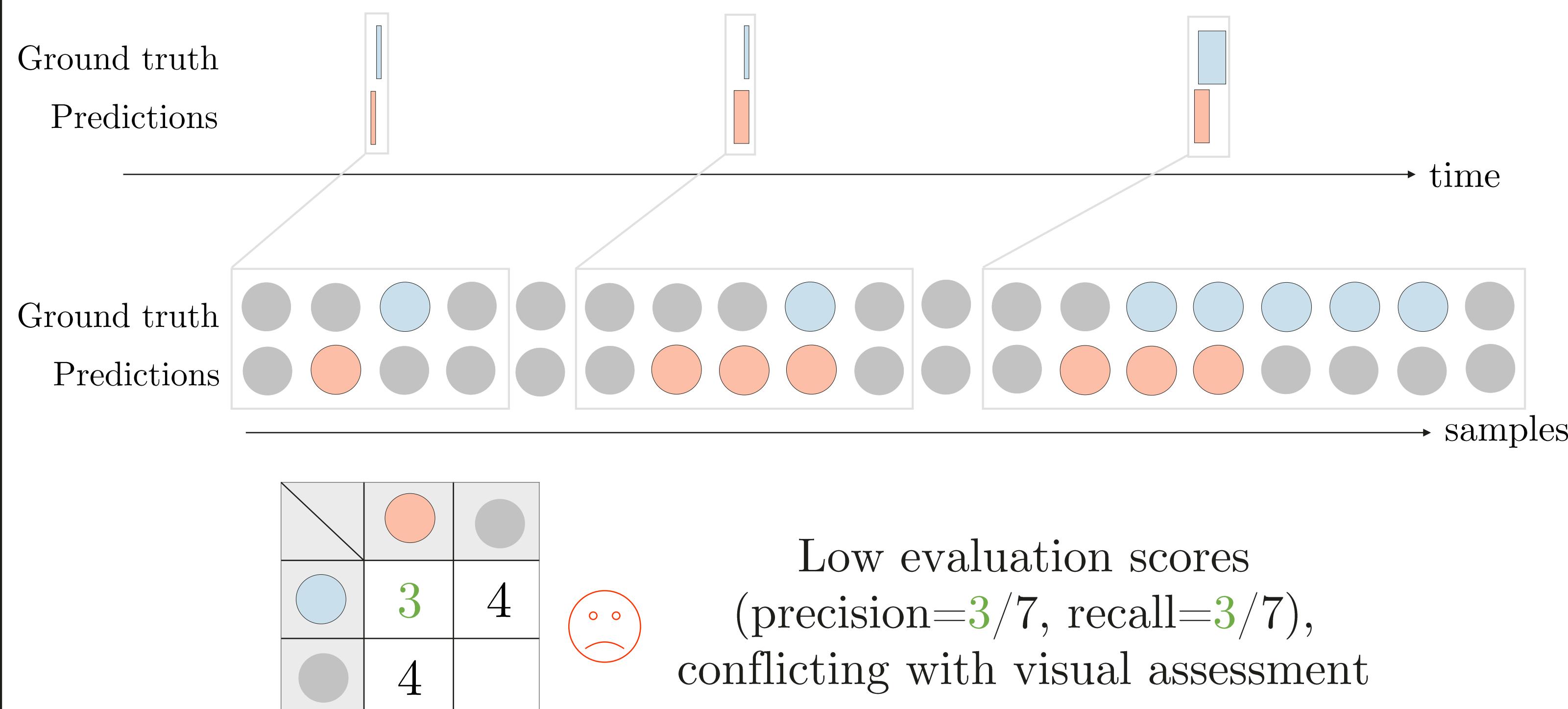
Goal

We define a new pair of precision/recall metrics for evaluating time series anomaly detection tasks: the *affiliation metrics*.



Motivations

1. Sample-based precision/recall cannot handle time series well



- A Unaware of temporal adjacency
- B Unaware of the event duration

2. Recent range-based metrics [1, 2] are easily gamed by adversary predictions.

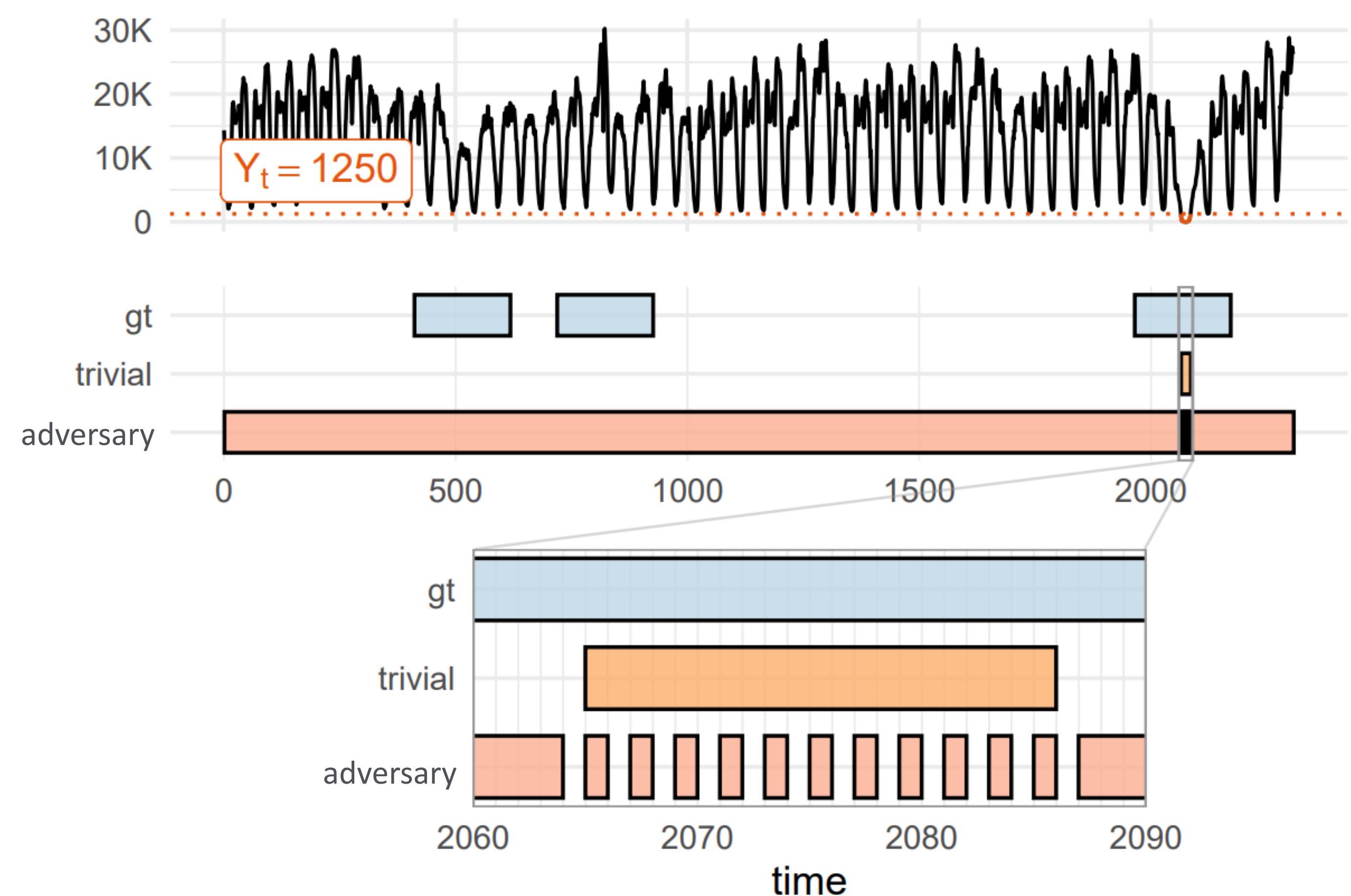
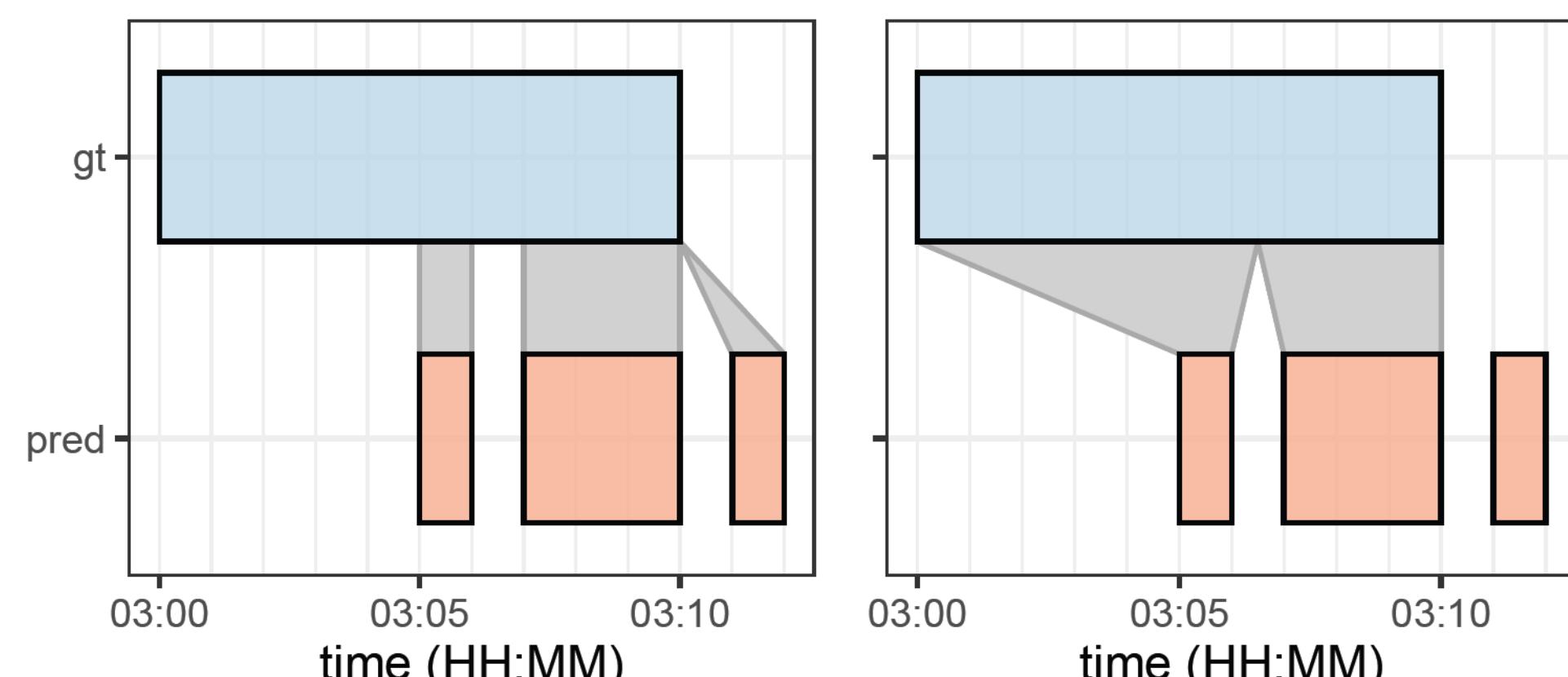


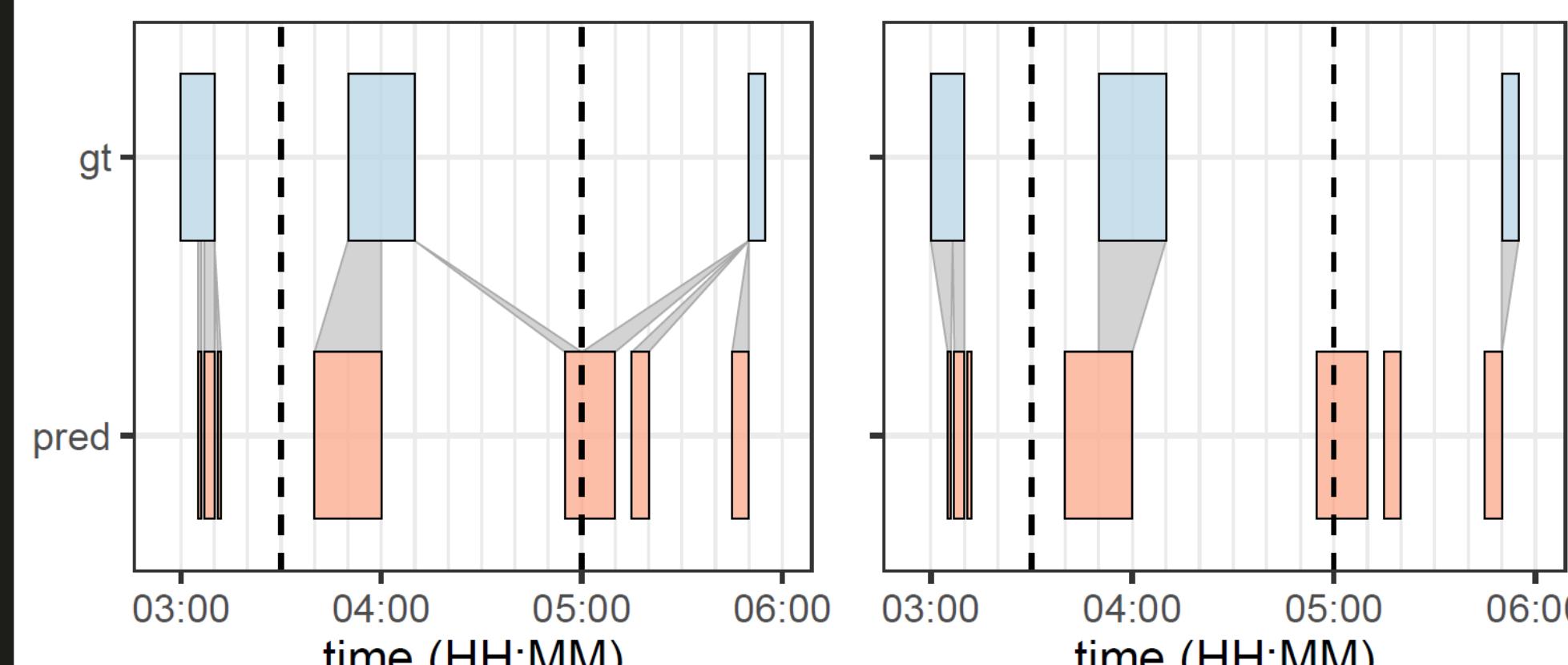
Figure 3: Construction of the adversary predictions

Concept 1: Proximity



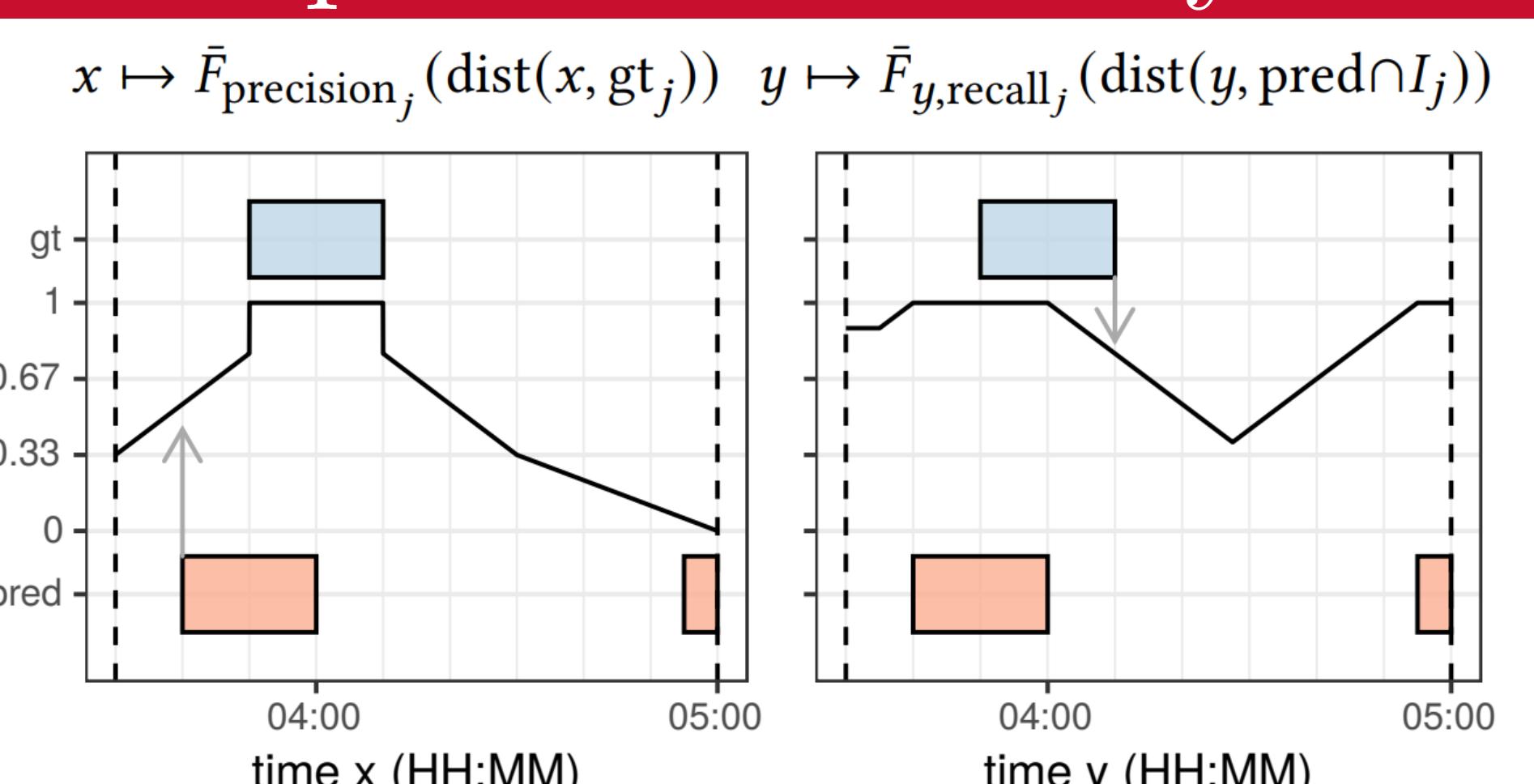
(a) *Average distance between sets:*
 example of the directed distance
 computed from predicted events to
 ground truth (left) and from ground
 truth to predicted events (right).

Concept 2: Locality



(b) *Local affiliation to the closest ground truth event:* example resulting
 in zones delimited by the dashed lines.
 The zones are similar for both
 directions: precision (left), and recall
 (right).

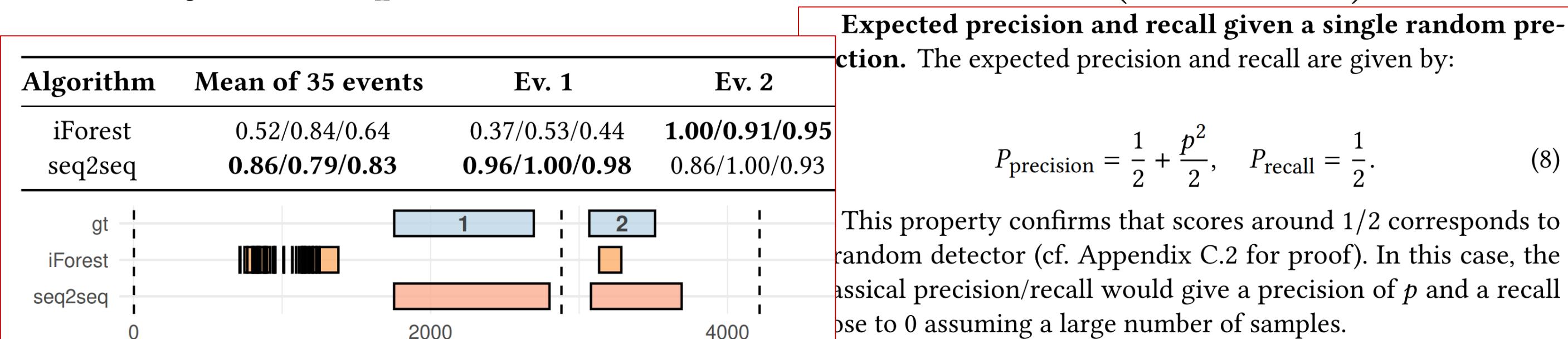
Concept 3: Probability



(c) *Comparison against random sampling:* example for converting
 each predicted sample to a precision
 score (left) and each ground truth
 sample to a recall score (right).

And more...

Locally interpretable and visualizable (Sec. 4.3)...



...Theoretical bounds on the score (Sec. 4.4)

Summary

- Parameter-free,
- Retain a physical meaning as linked to a time,
- Locally interpretable and visualizable (Sec. 4.3),
- Robust against adversary predictions (Sec. 4.2),
- Existence of statistical bounds of the score (Sec. 4.4),
- Aware of temporal adjacency (A) and of event duration (B).

References

- [1] N. Tatbul et al. 2018. Precision and recall for time series. NeurIPS.
- [2] W. Hwang et al. 2019. Time-series aware precision and recall for anomaly detection. In ACM CIKM