EVEREST

DESIGN ENVIRONMENT
FOR EXTREME-SCALE BIG DATA ANALYTICS
ON HETEROGENEOUS PLATFORMS

HiPEAC 2023

Anomaly Detection In EVEREST

Automated Anomaly Detection to improve Security in a High- Performance Heterogeneous Environment

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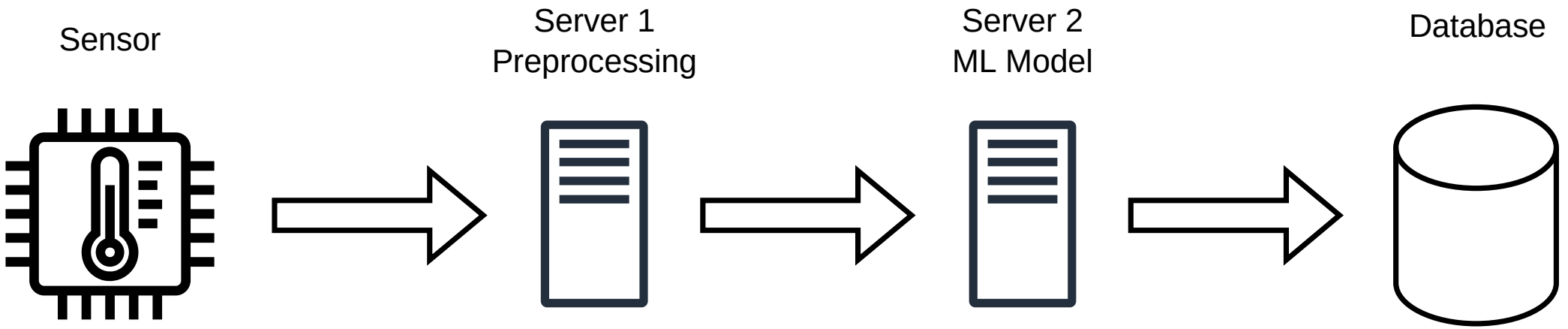
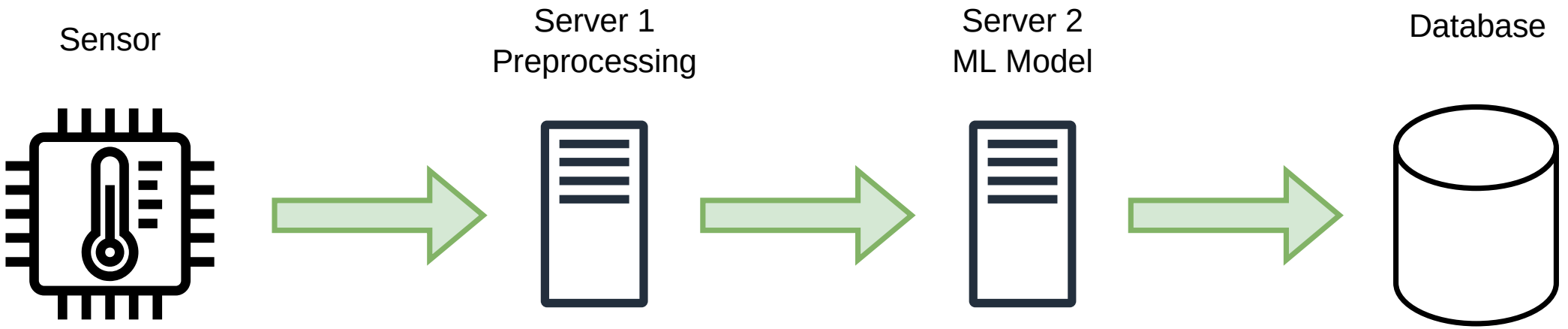
Anomaly Detection

- Detecting abnormal datapoints in datasets or data streams.
- Security?

Example Workflow



Example Workflow



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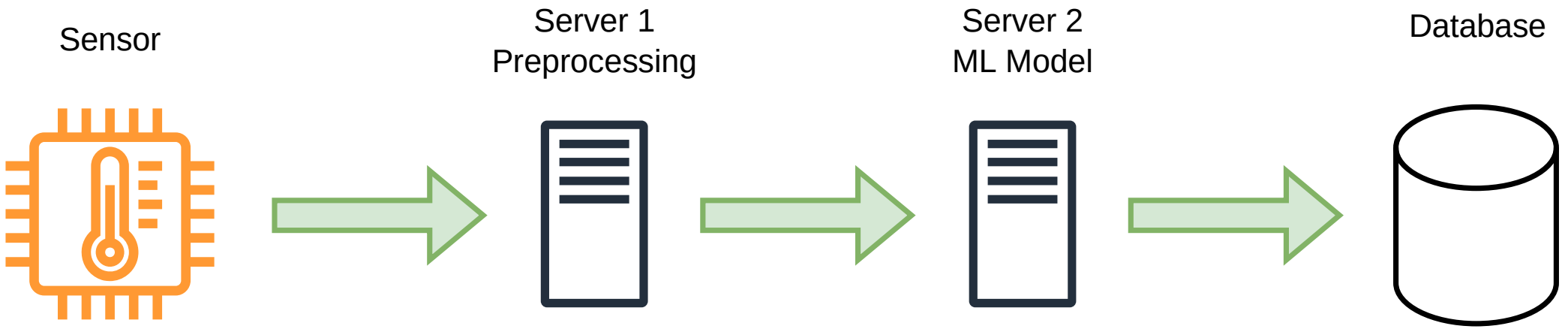

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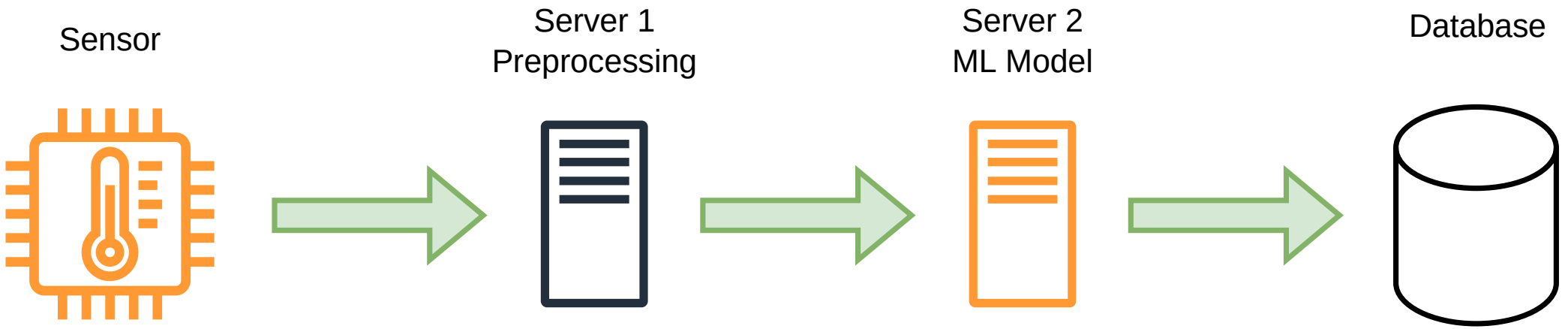
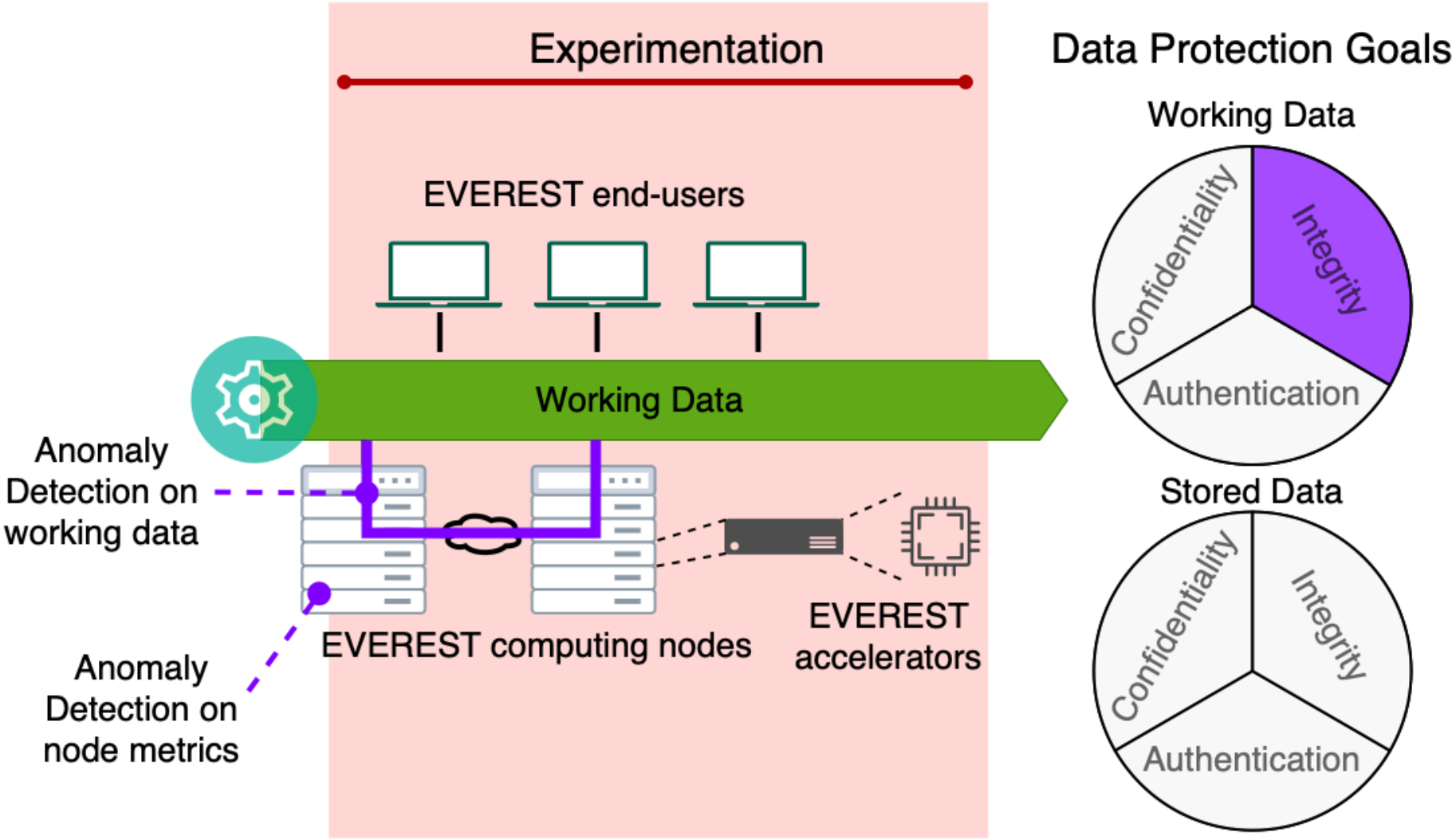
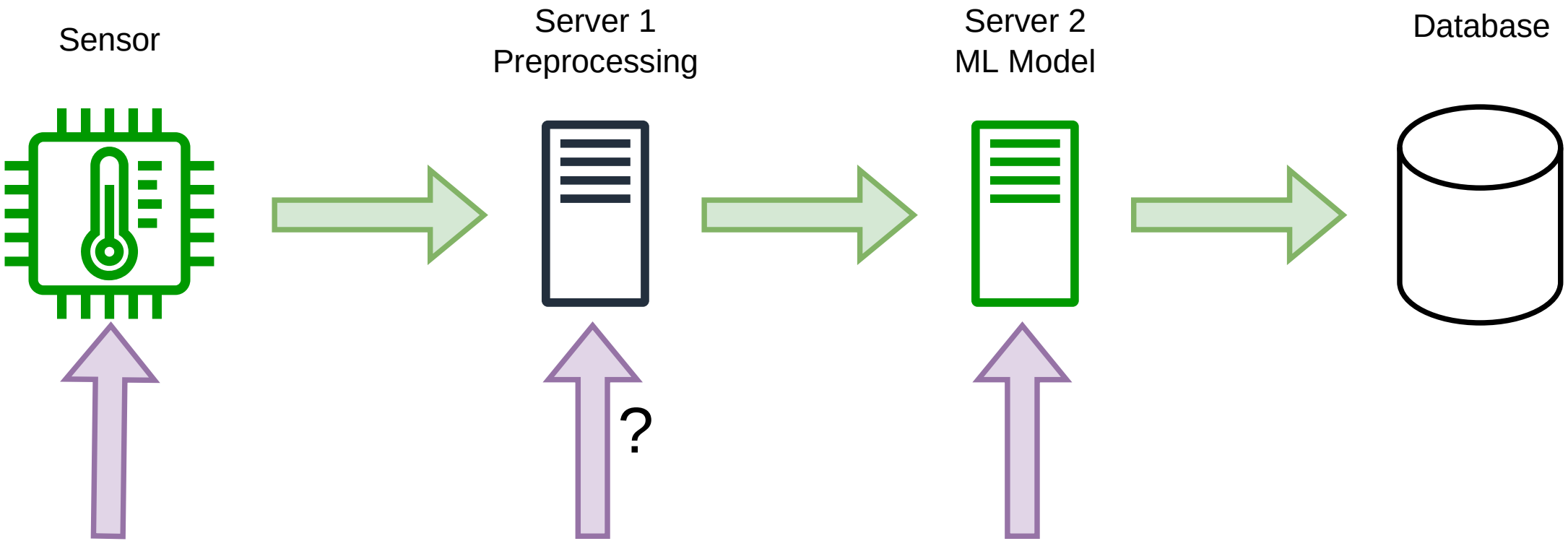


Security Properties



Where to deploy AD



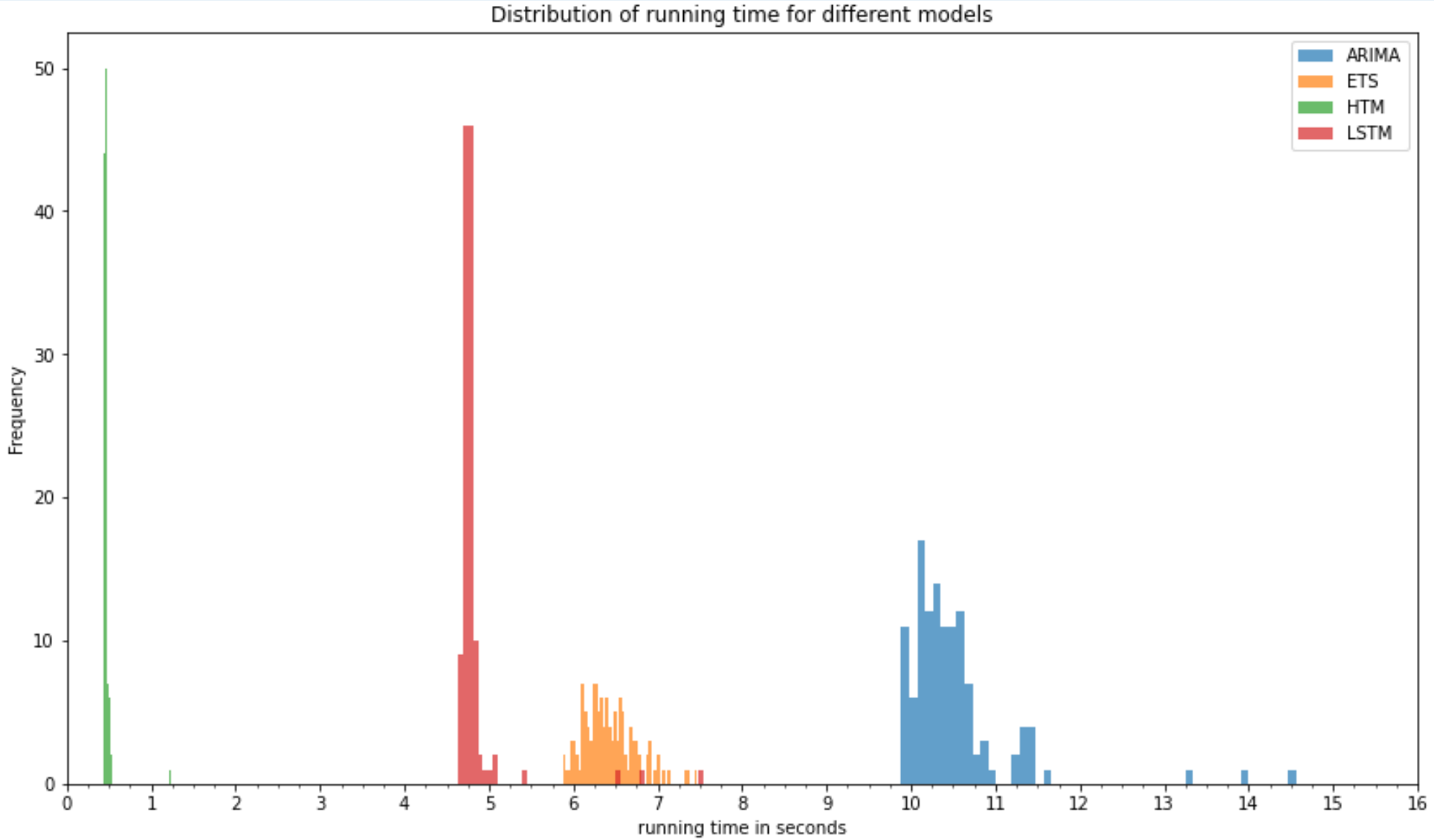
How

- Challenges for anomaly detection in EVEREST
  - Univariate and Multivariate data
  - Streaming and Batched data
  - Unsupervised
  - Real-time
  - Heterogeneous hardware
  - Training?

How

- Starting technique: Hierarchical Temporal Memory
  - Unsupervised
  - Insensitive in hyperparameters
  - Robust
  - Online, continuous learning
  - Handles concept drift
  - Encoders -> broadly deployable

Preliminary Results: Running Time



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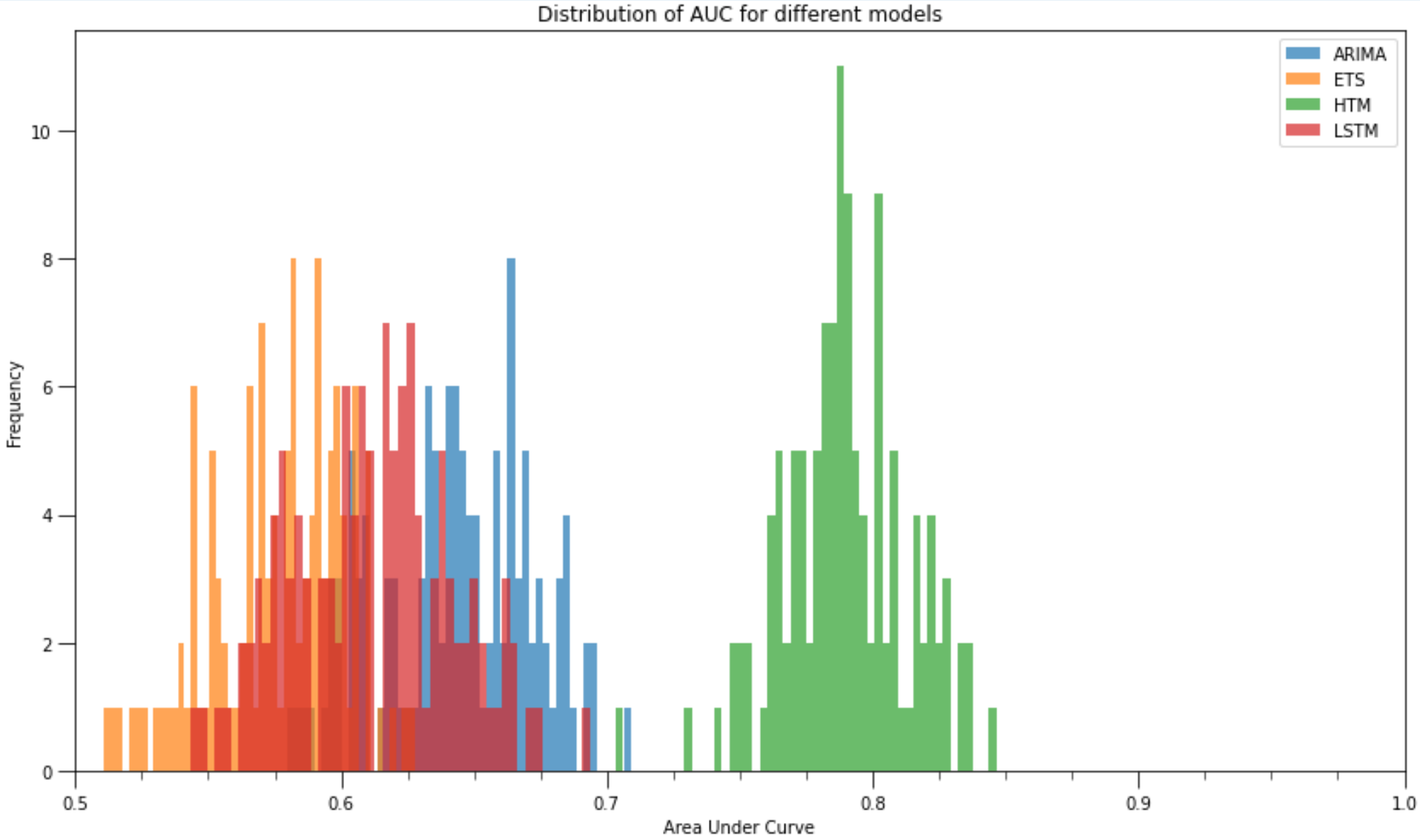
Preliminary Results: Detection Performance



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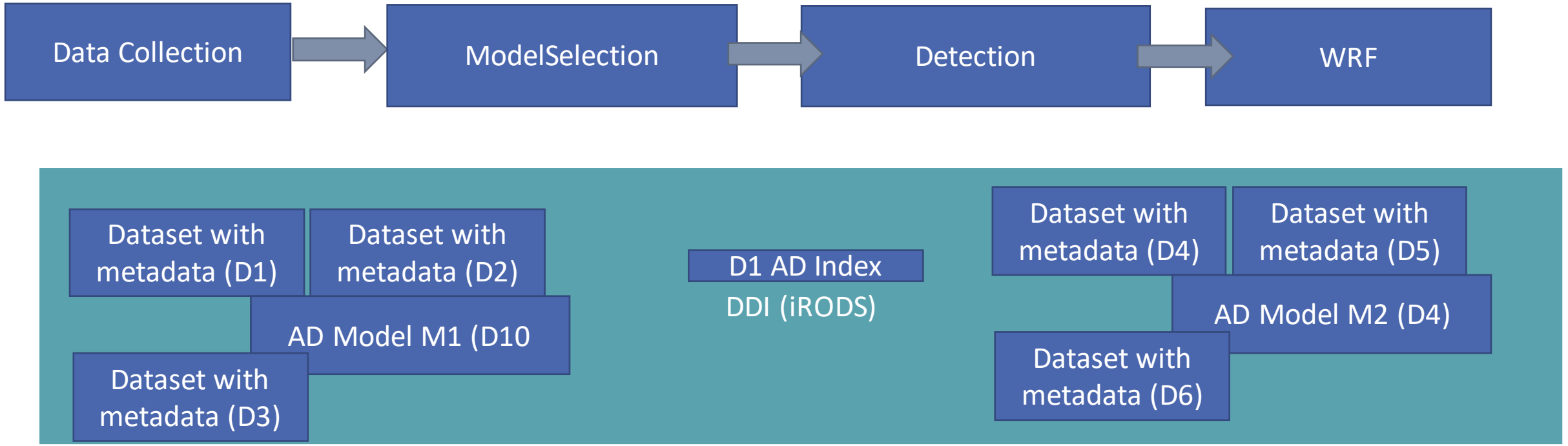
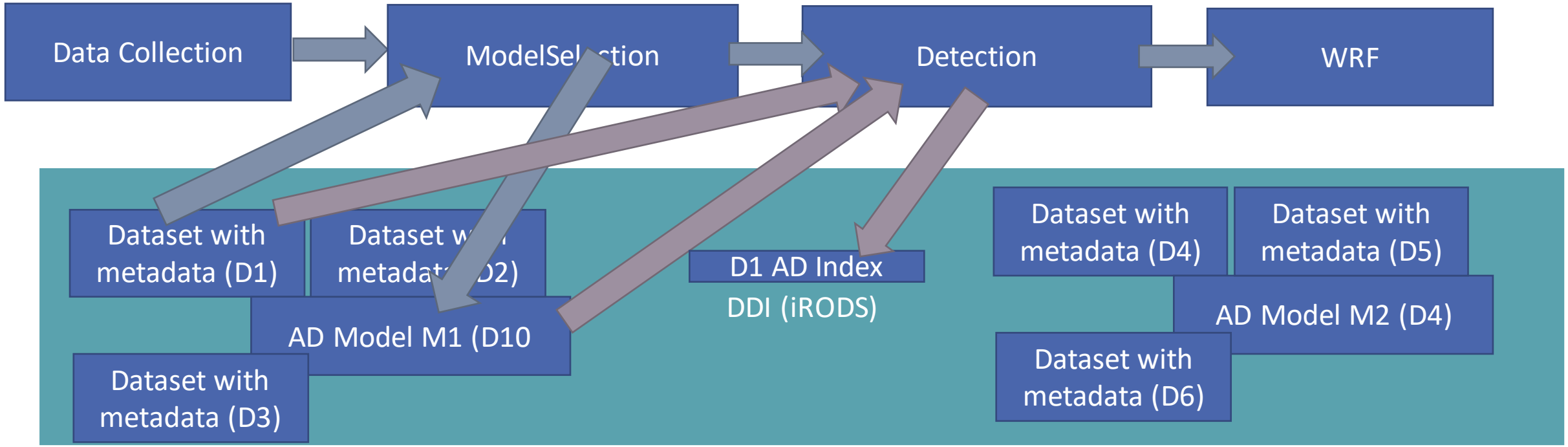
interface


Data Collection
ModelSelection
Detection
WRF
Dataset with metadata (D1)
Dataset with metadata (D2)
AD Model M1 (D10
Dataset with metadata (D3)
D1 AD Index
DDI (iRODS)
Dataset with metadata (D4)
Dataset with metadata (D5)
AD Model M2 (D4)
Dataset with metadata (D6)

interface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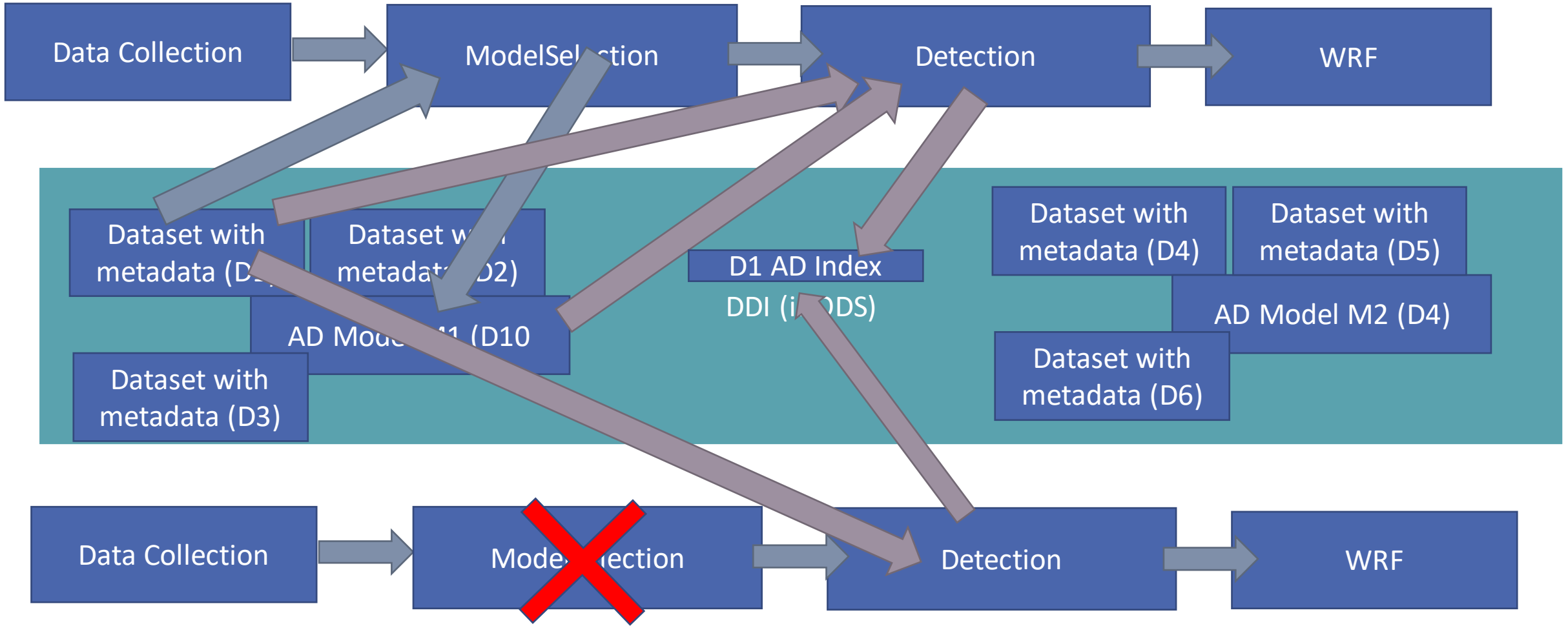

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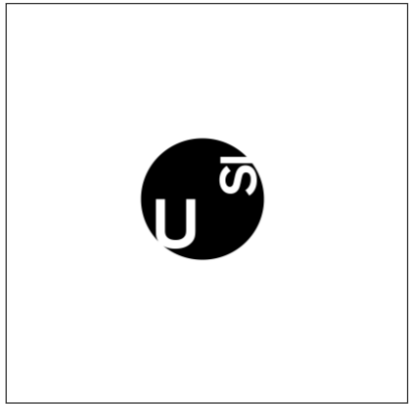
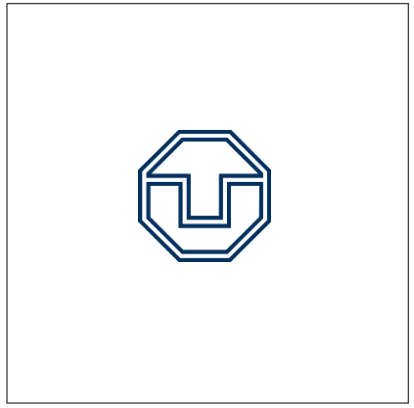
Conclusion

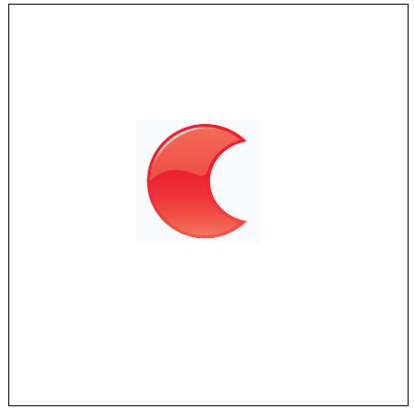
- Anomaly Detection can be used to improve security
- Making anomaly detection generally deployable comes with several challenges
- With a simple interface we have the opportunity to expand in the future

Future Work

- Accelerating hierarchical temporal memory
- Extending the library with more models







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Thank You!