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University of Applied Sciences

Network

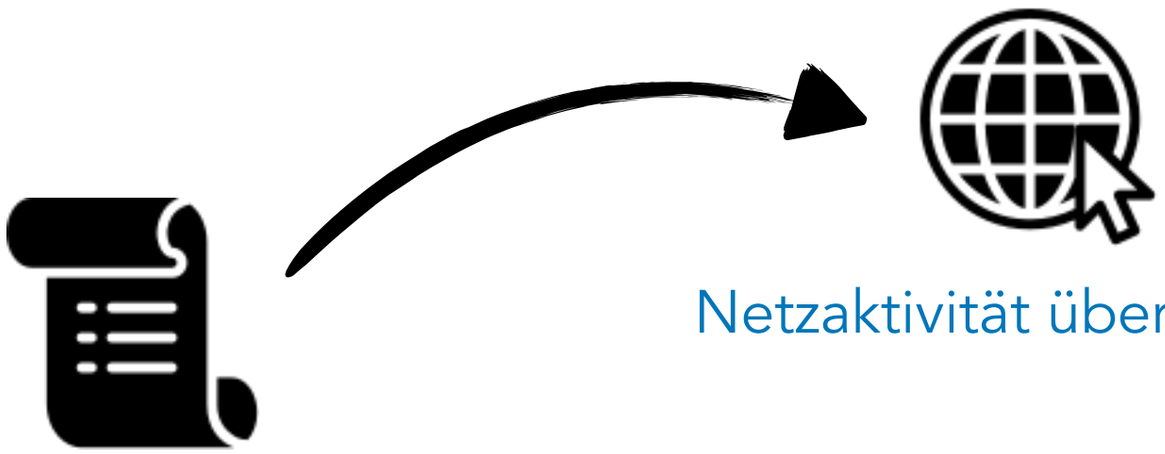
ANOMALY DETECTION

Lucas Elsässer

Signature-based IDS

Rule based

Signature-based IDS



Netzaktivität überwachen

Rule based

Signature-based IDS

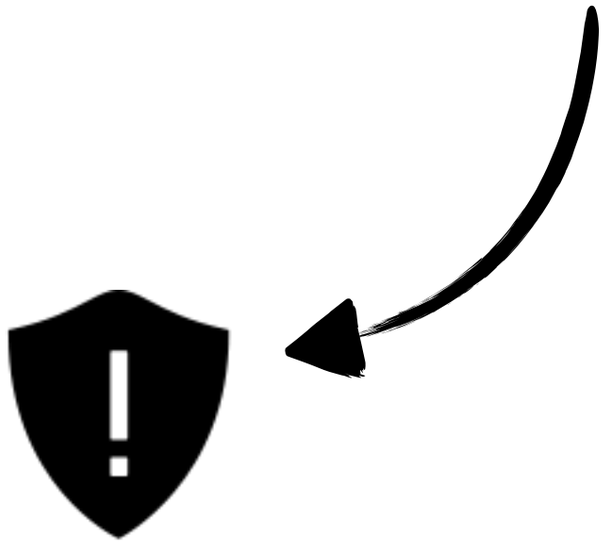
Rule based

Signatur abgleich

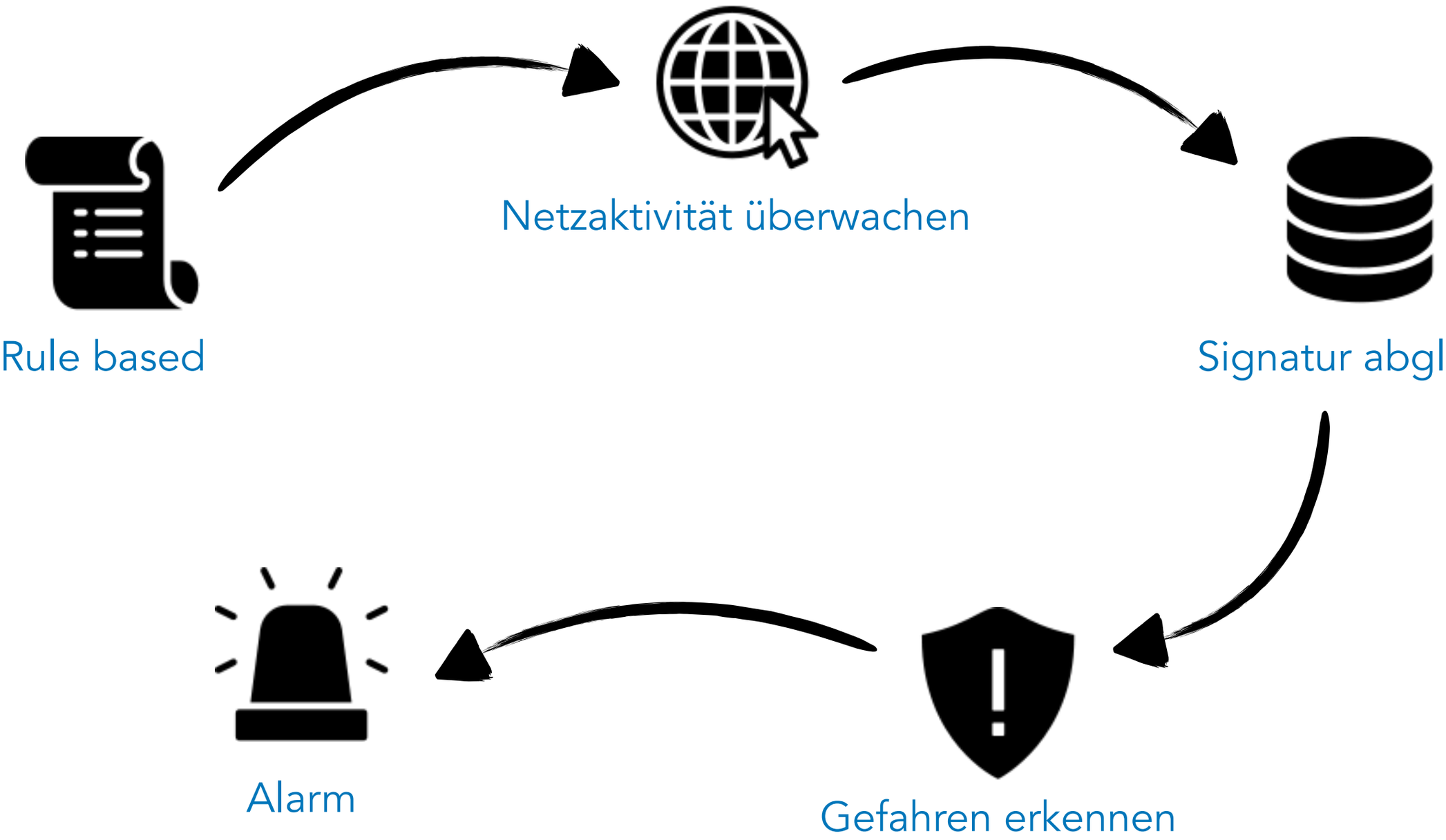
Signature-based IDS

Rule based

Signatur abgleich



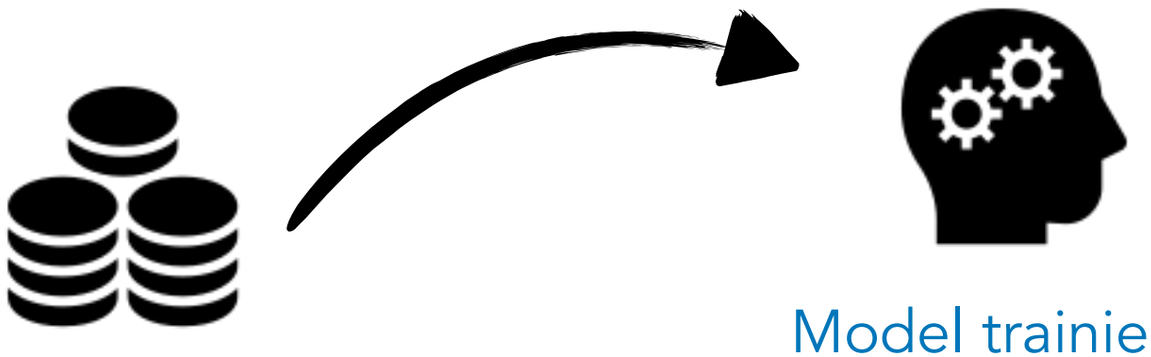
Signature-based IDS



Anomaly-based IDS

Datenmenge

Anomaly-based IDS



Model trainieren

Datenmenge

Anomaly-based IDS

Datenmenge

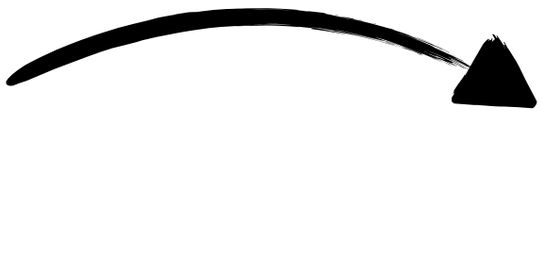
Model trainieren

Netzaktivität überwachen

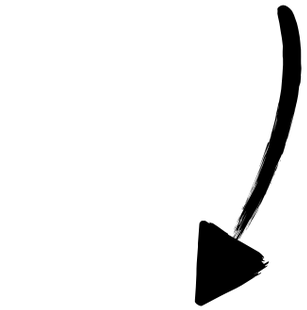
Anomaly-based IDS

Datenmenge

Model trainieren

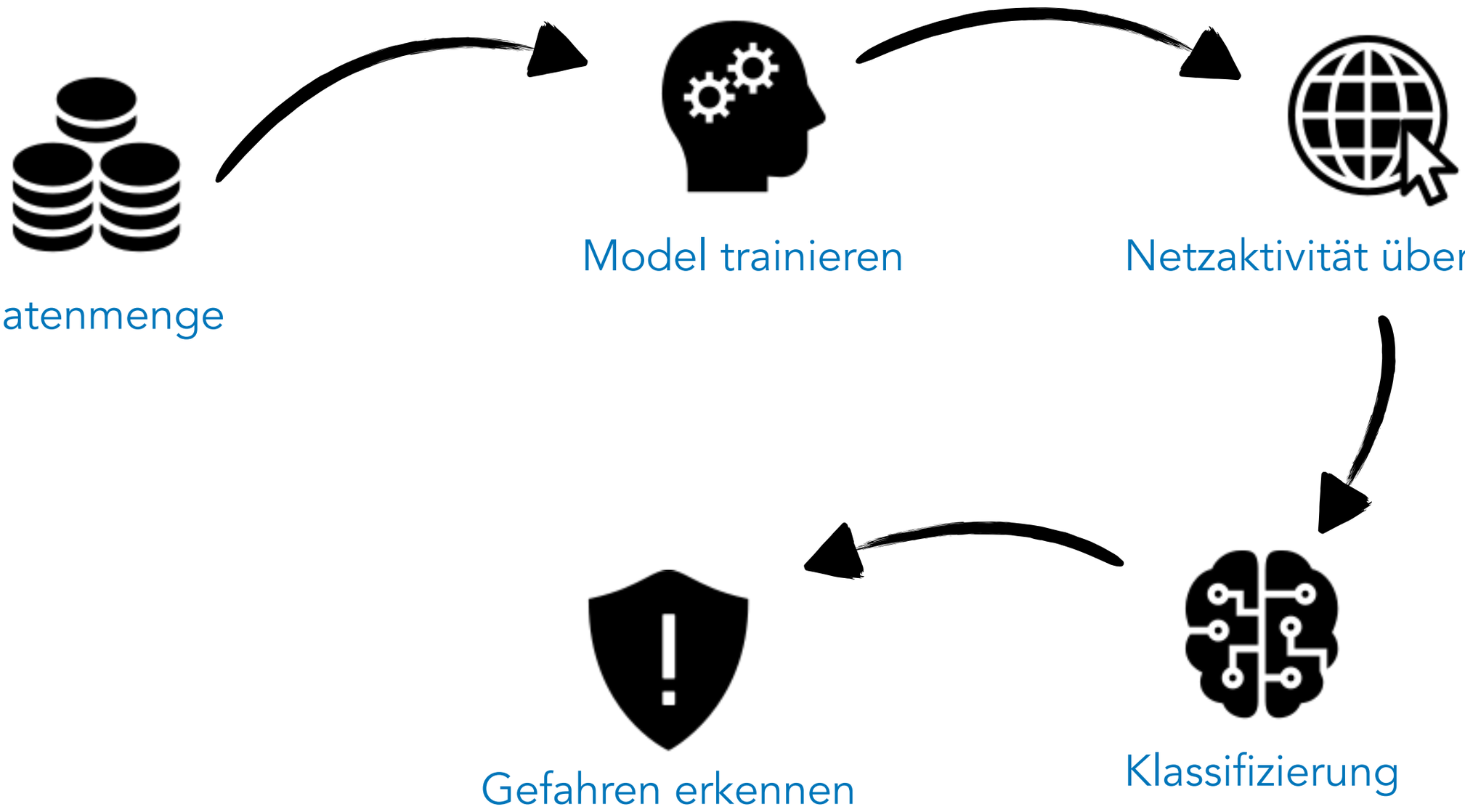


Netzaktivität überwachen

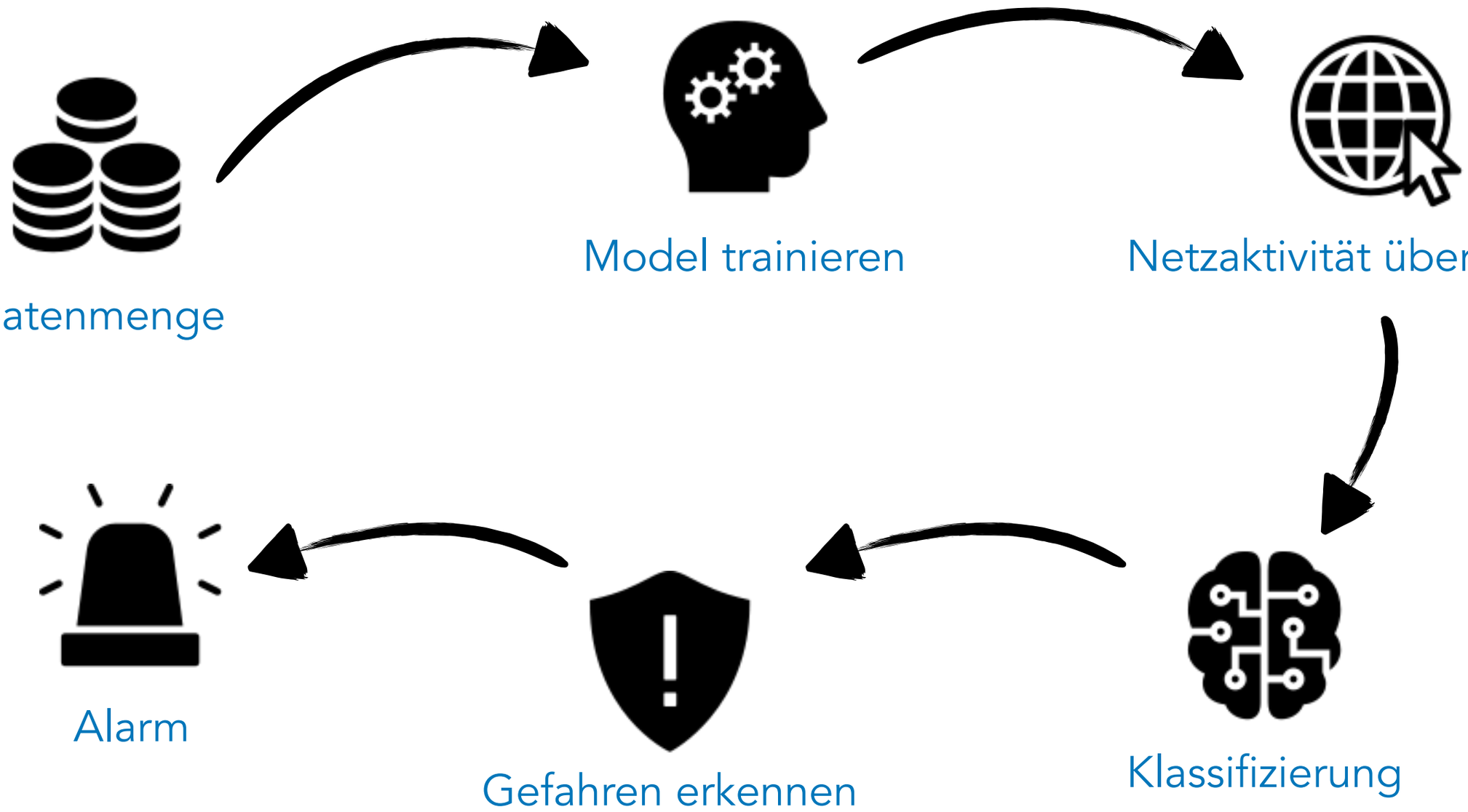


Klassifizierung

Anomaly-based IDS



Anomaly-based IDS



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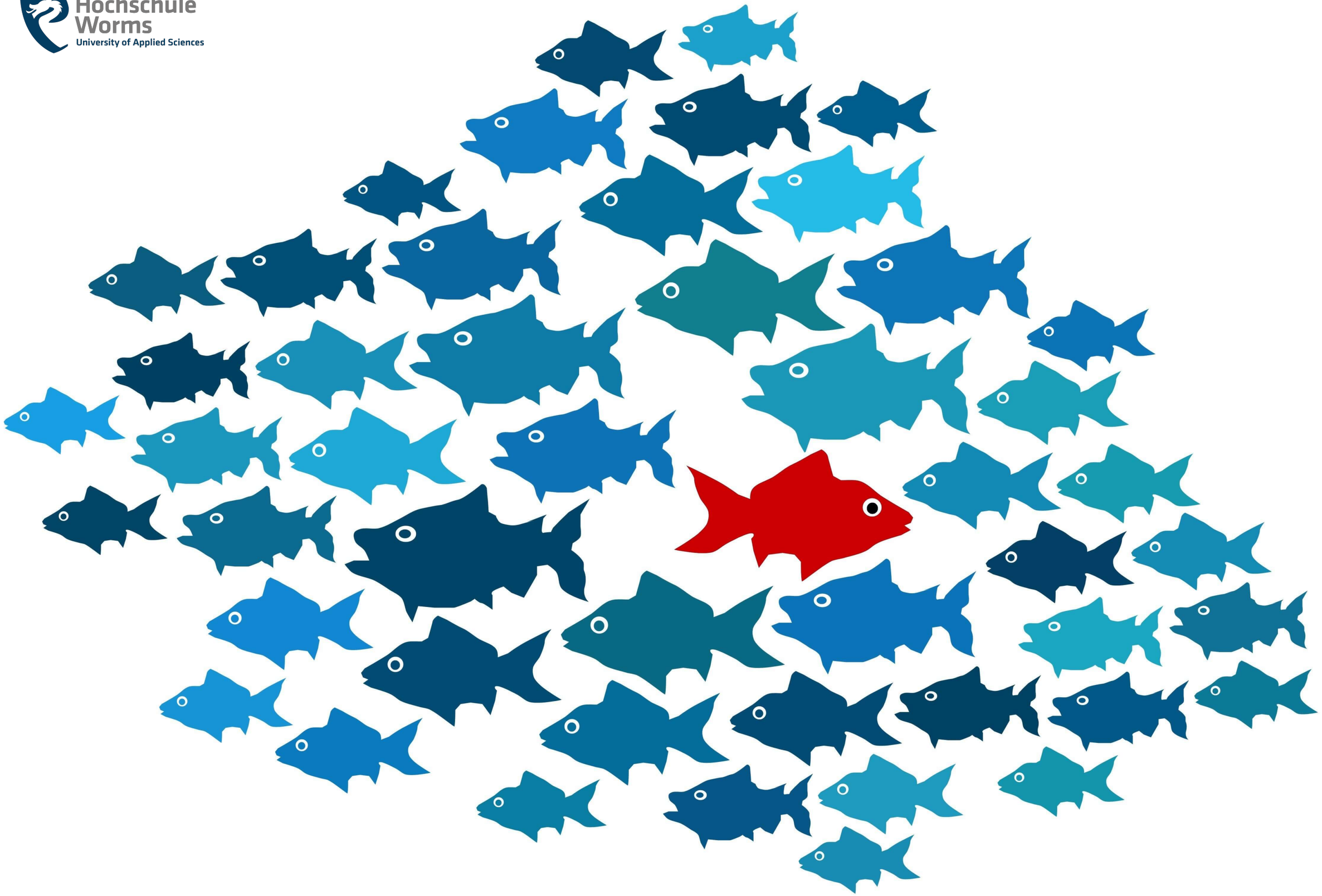

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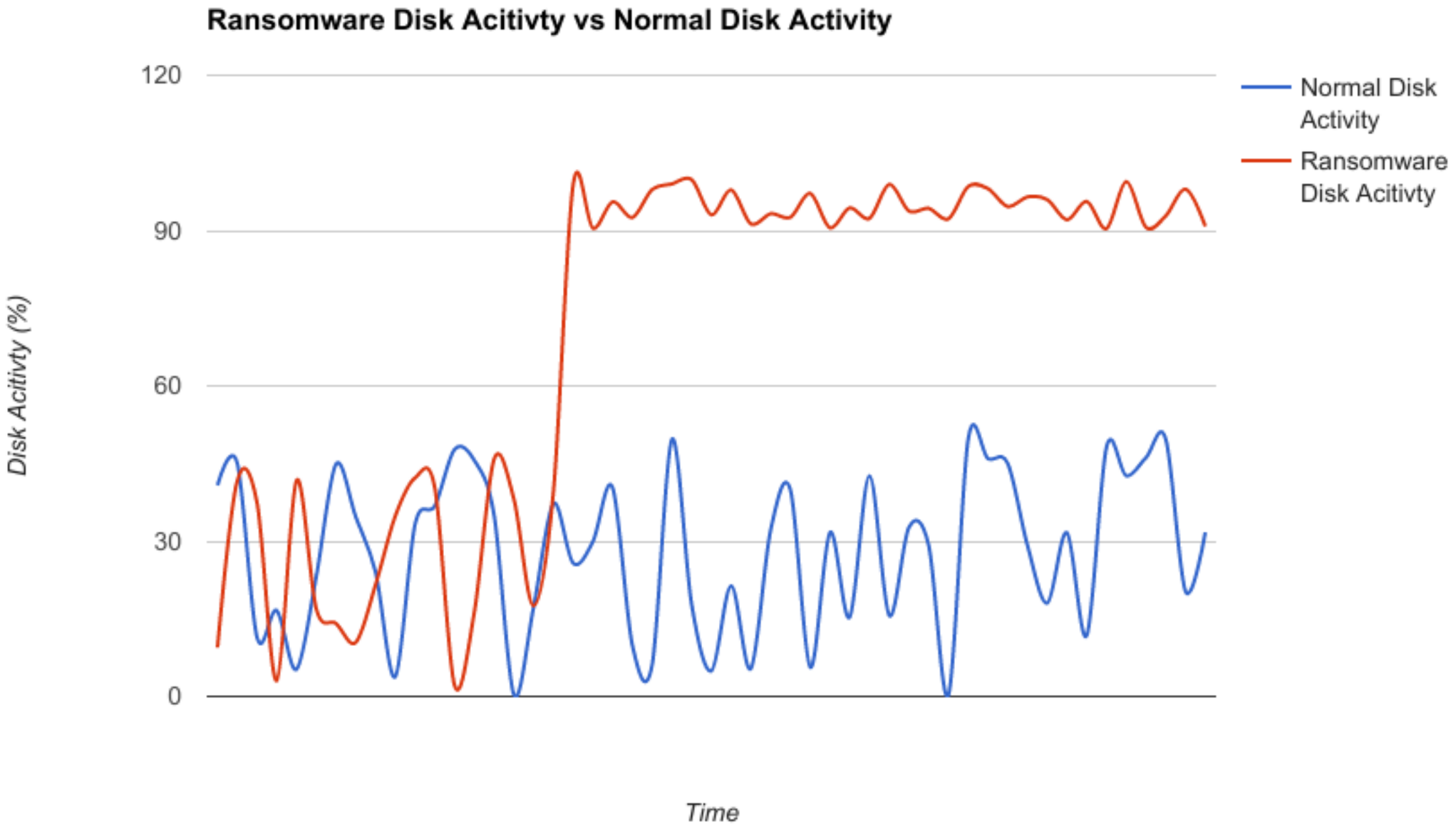
Ransomware Disk Acitivty vs Normal Disk Activity
120
90
60
30
0
Disk Acitivty (%)
Time
Normal Disk Activity
Ransomware Disk Acitivty

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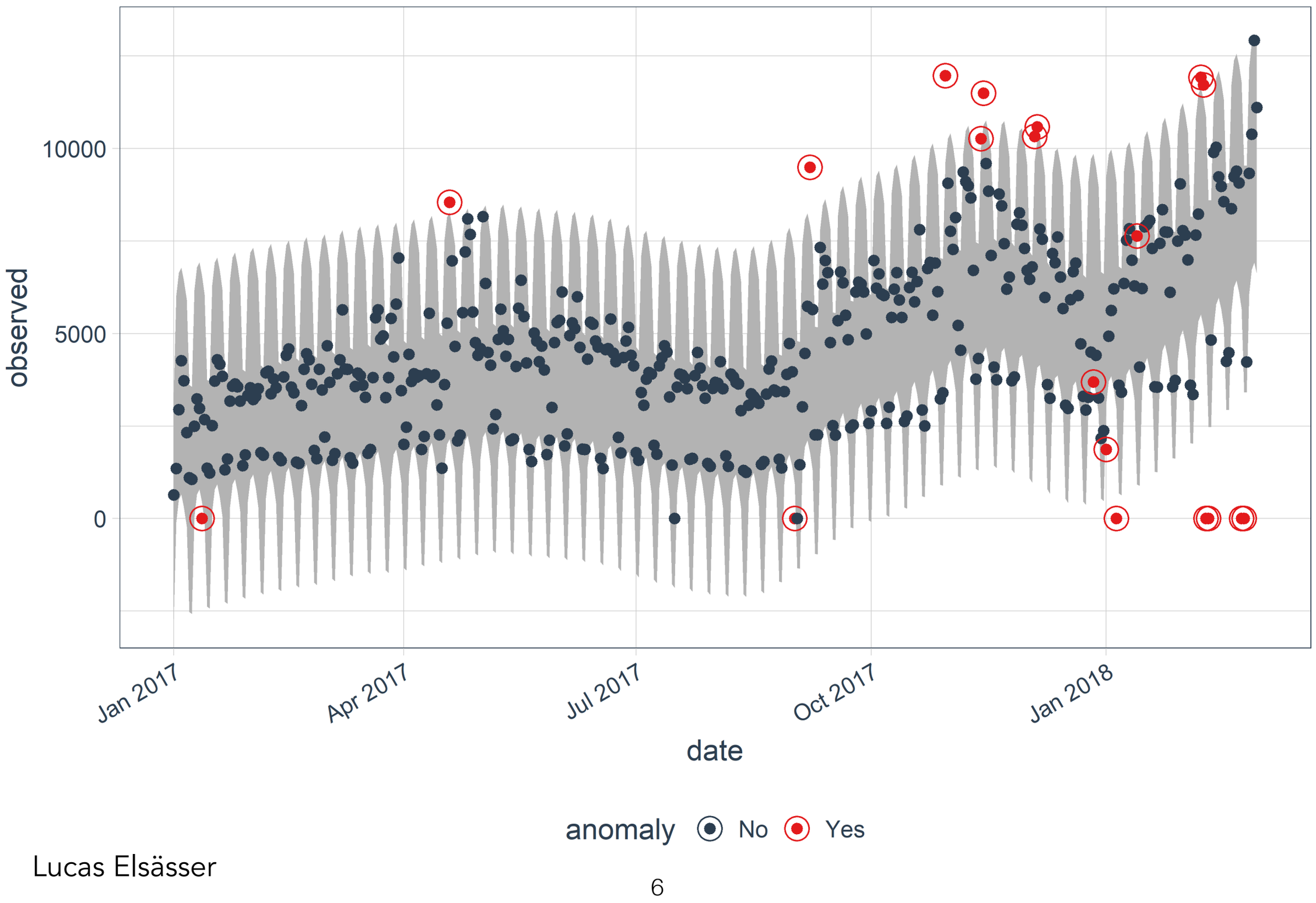
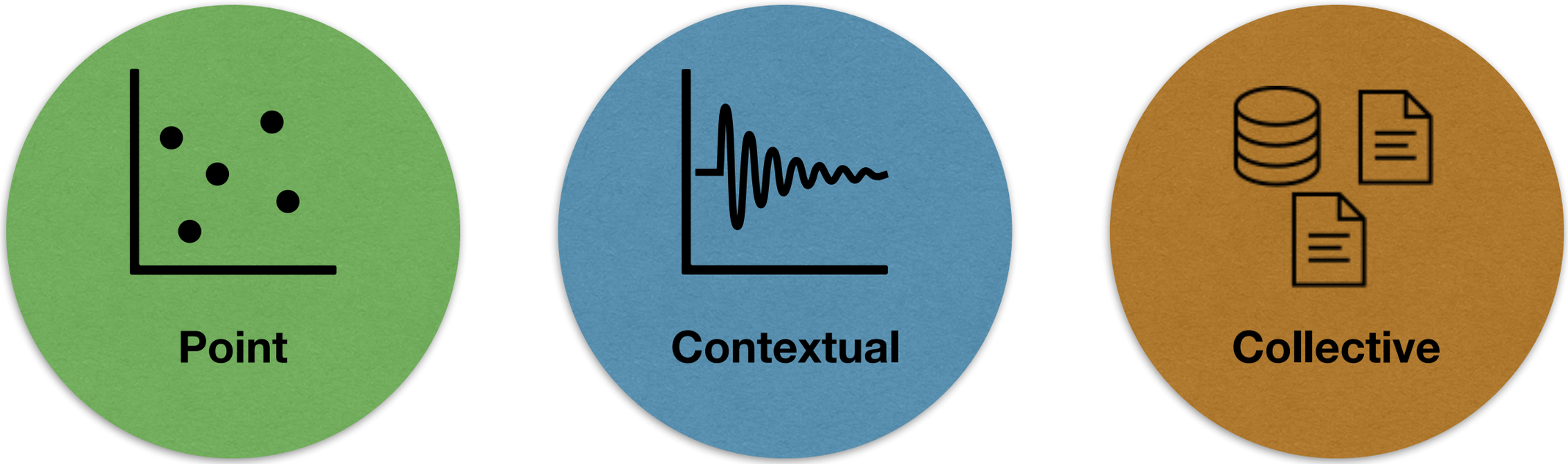
Lubridate Anomalies

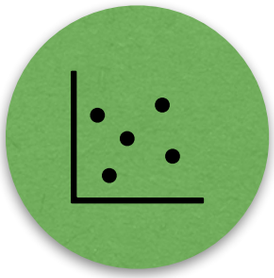
STL + IQR Methods

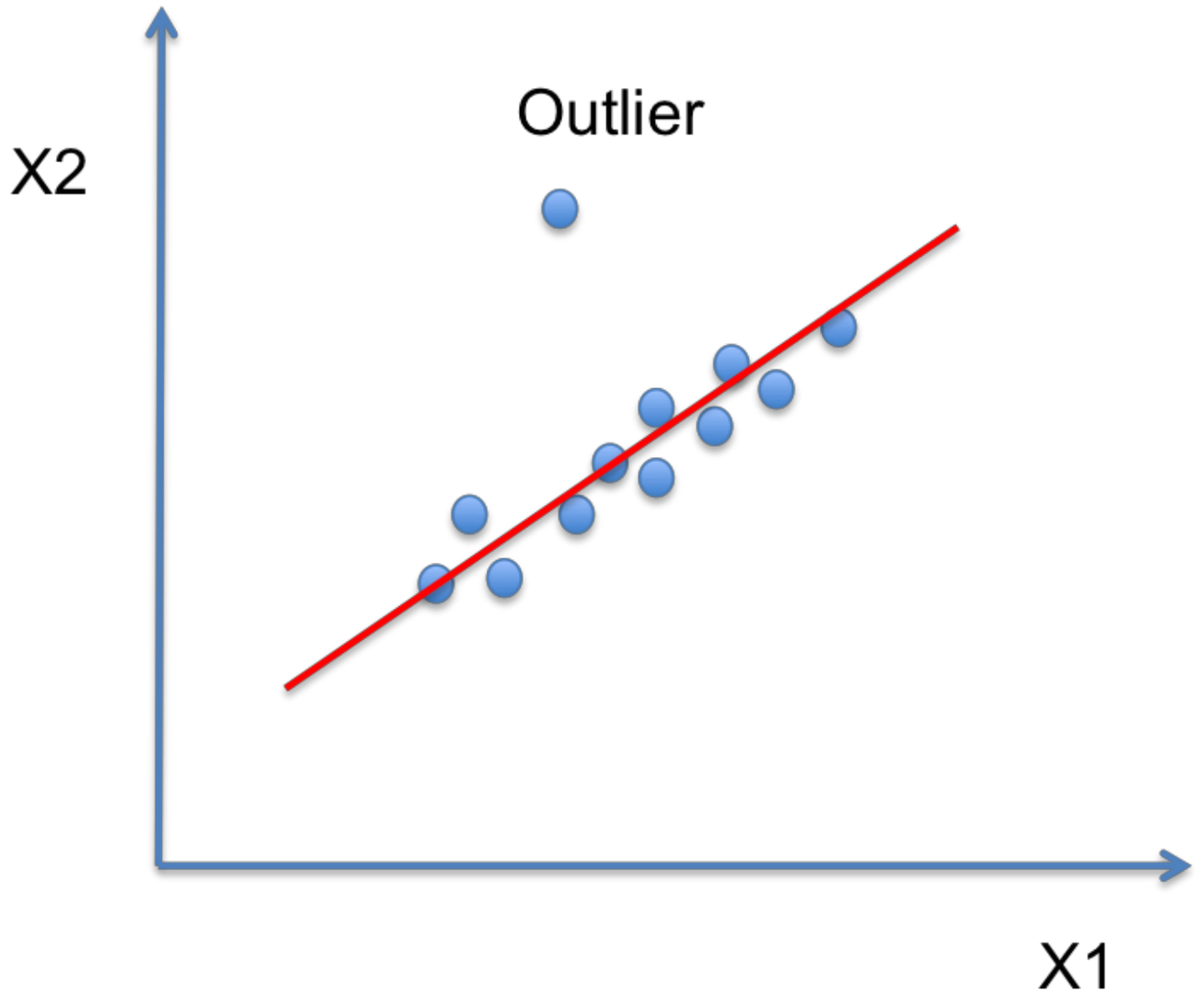


Anomalien

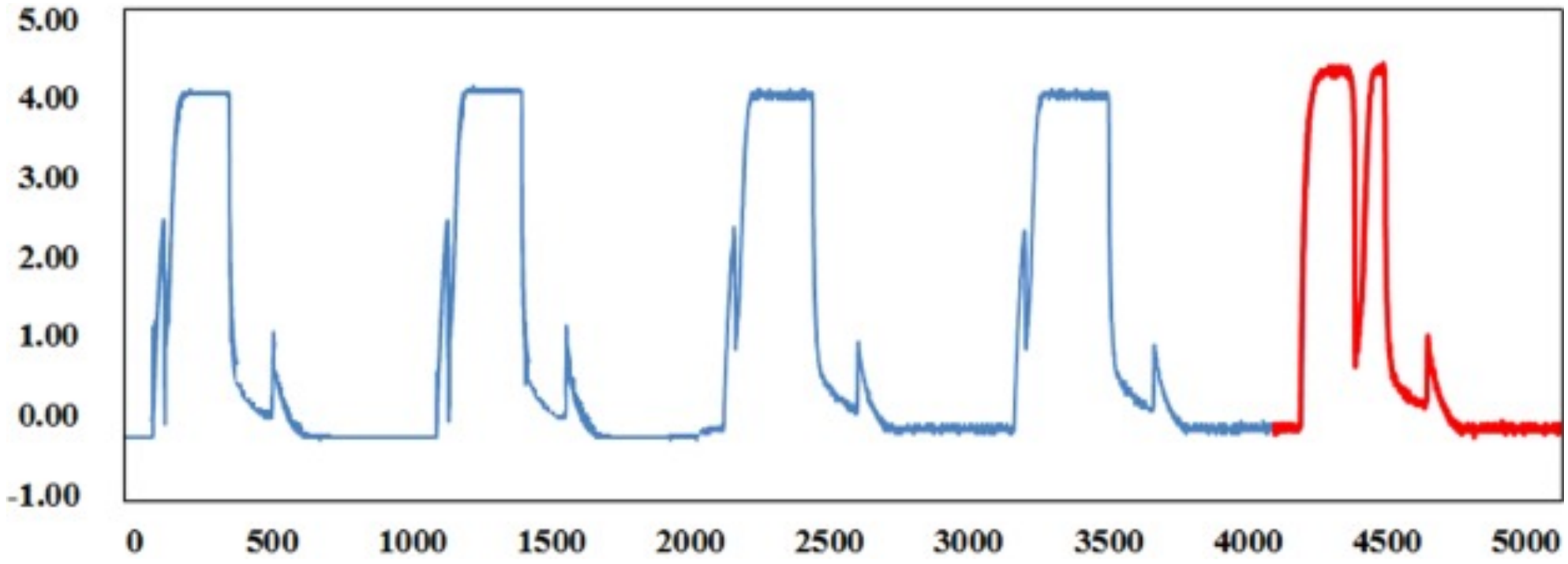


Point anomaly





Contextual anomaly



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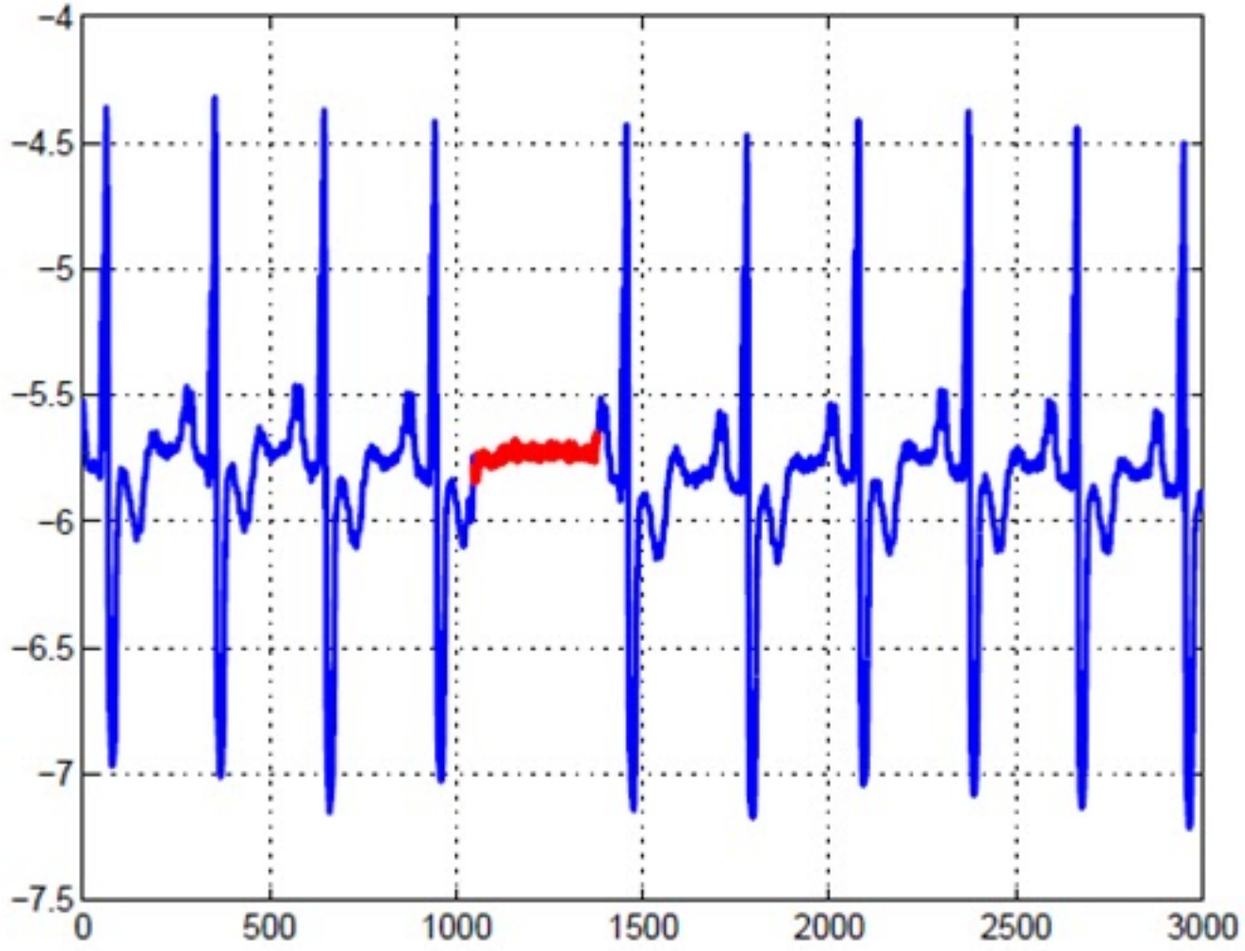
Collective anomaly



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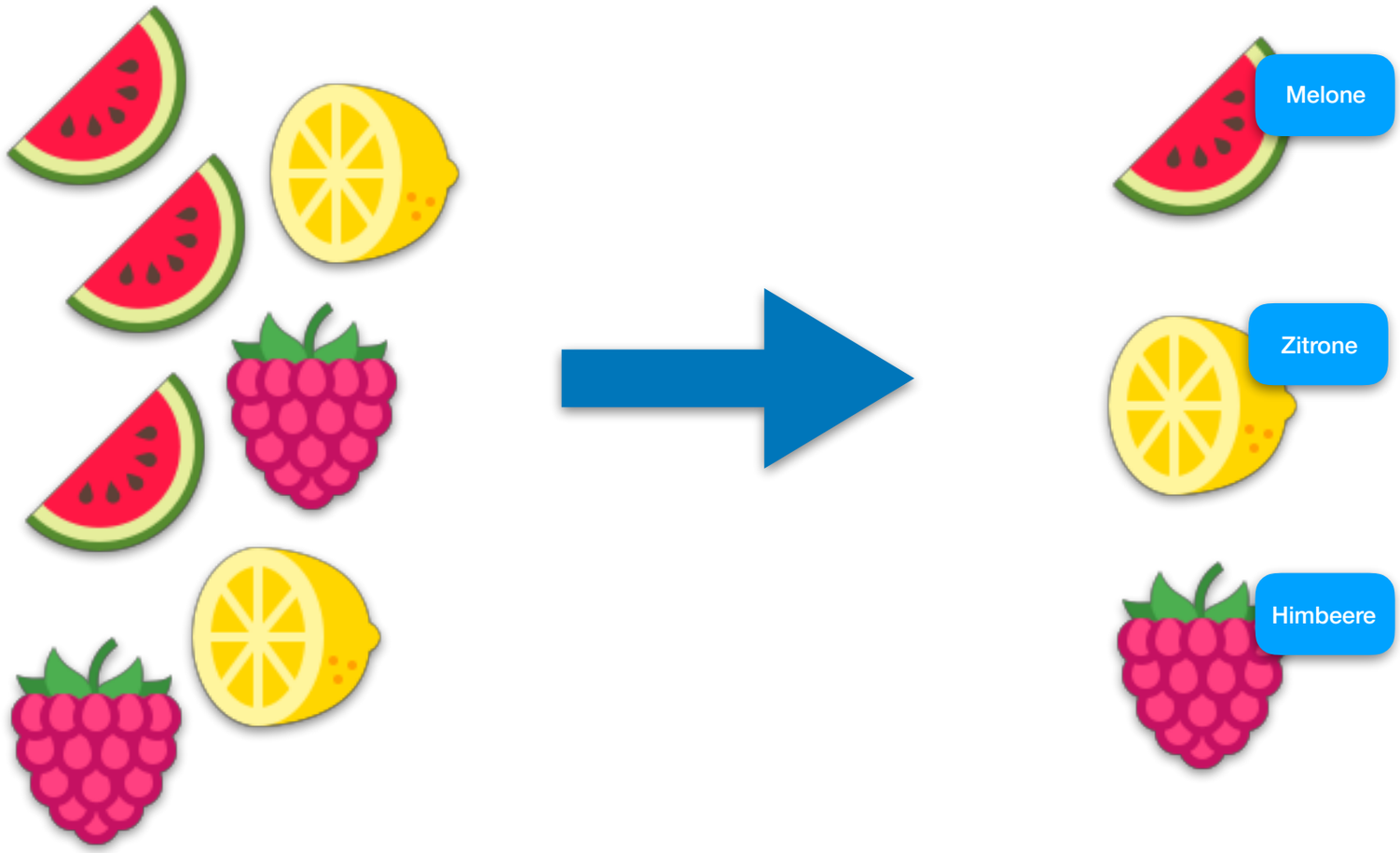
Machine Learning

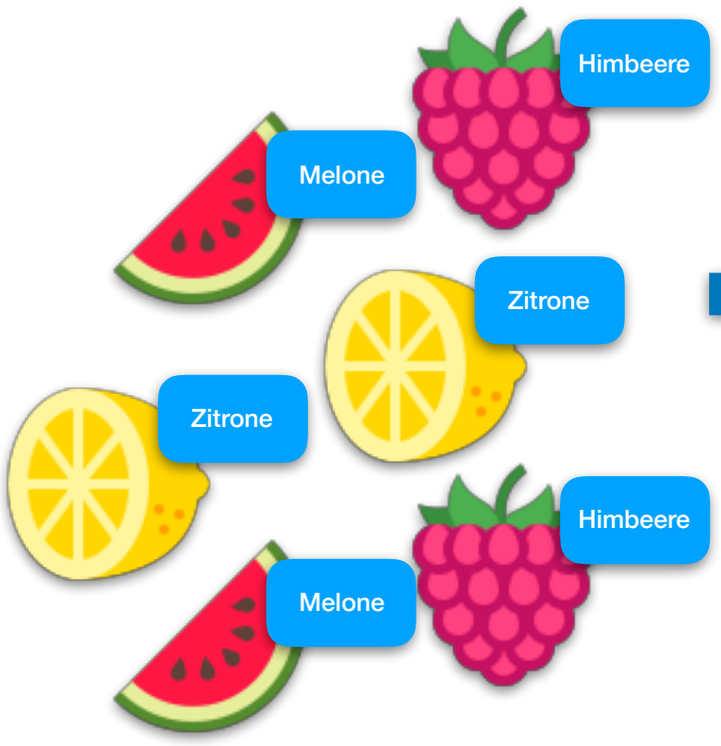
Supervised Learning



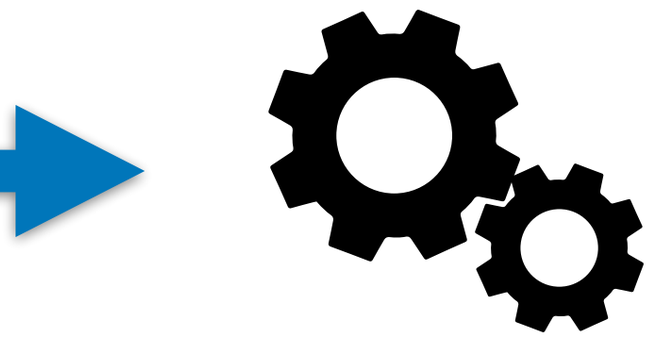
Datenmenge

Label

Supervised Learning



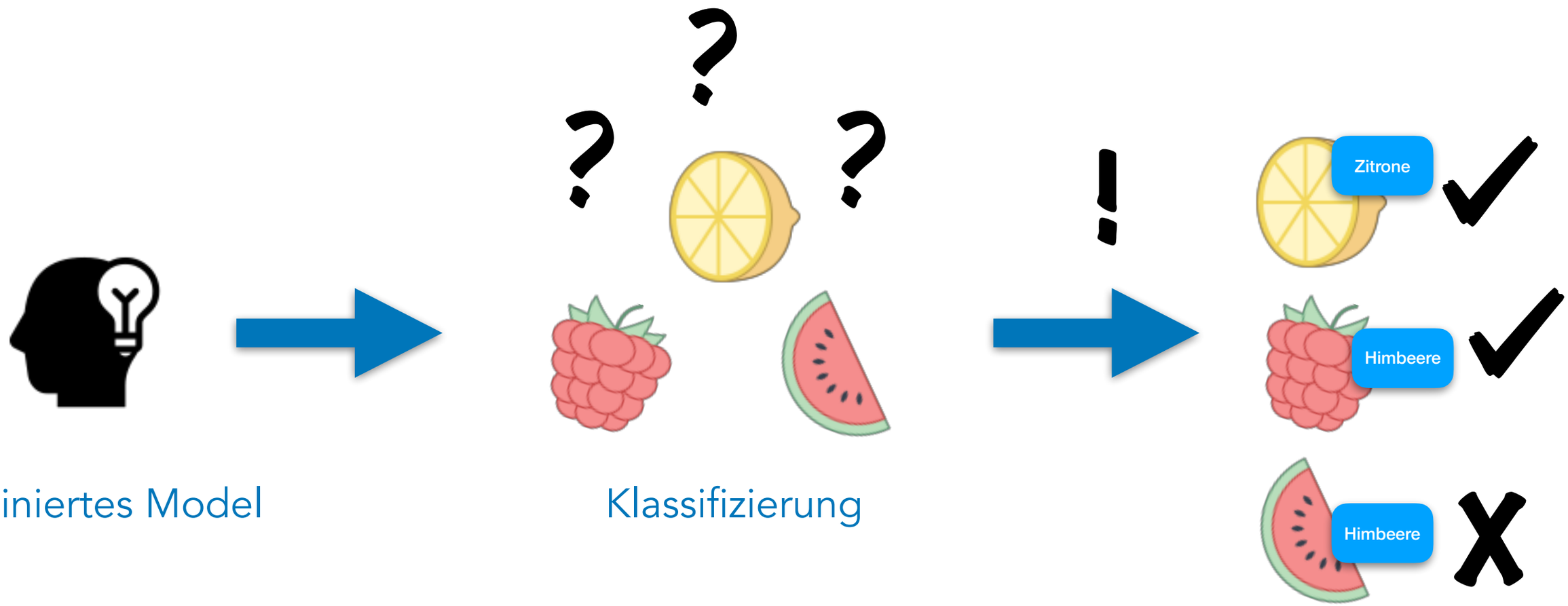
Datenmenge



Training / Lernvorgang

Trainiertes Model

Supervised Learning



Trainiertes Model

Klassifizierung

Evaluierung

Let’s see how this works!

Vergleich

Signature-based IDS	Anomaly-based IDS
nur bekannte Angriffe	soll neue Attacken erkennen
Erfordert Signatur Datenbank	Erfordert Trainingsdaten
Echtzeit-Pattern-Matching	Echtzeit-Klassifikation

Grafiken

- https://medium.com/@alhadpofali_5697/anomaly-and-outlier-detection-concepts-1f82498851a2
- https://www.datascience.com/blog/python-anomaly-detection
- https://stats.stackexchange.com/questions/323553/difference-between-contextual-anomaly-and-collective-anomaly
- https://ars.els-cdn.com/content/image/1-s2.0-S0957417416301191-gr2.jpg
- https://icons8.de/icons
- http://www.dataversity.net/machine-learning-next-decade-promises-pitfalls/

Papers

Rui Zhang, Shaoyan Zhang, Yang Lan, Jianmin Jiang. *Network Anomaly Detection Using One Class Support Vector Machine.* Proceedings of the International MultiConference of Engineers and Computer Scientists 2008 Vol I IMECS 2008, 19-21 March, 2008, Hong Kong. https://bit.ly/2SRKuWG

Prajowal Manandhar, Zeyar Aung. *Towards Practical Anomaly-based Intrusion Detection by Outlier Mining on TCP Packets*. Institute Center for Smart and Sustainable Systems (iSmart) Masdar Institute of Science and Technology, Abu Dhabi, UAE. https://bit.ly/2Ex8Thi

V. Jyothsna, V. V. Rama Prasad. *A Review of Anomaly based IntrusionDetection Systems*. International Journal of Computer Applications (0975 – 8887) Volume 28– No.7, September 2011. https://bit.ly/2S1UVac

Varun Chandola, Arindam Banerjee, Vipin Kumar. Anomaly Detection : A Survey. ACM Computing Surveys, September 2009. https://bit.ly/2SRQoXY

Robin Sommer, Vern Paxson. *Outside the Closed World: On Using Machine Learning For Network Intrusion Detection*. https://bit.ly/2NsYgxi

Stefan Axelsson. *The Base-Rate Fallacy and its Implications for the Difficulty of Intrusion Detection*. https://bit.ly/1r27yTU

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VIELEN DANK!

Lucas Elsässer

Diskussion

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- Muss der Trainingsvorgang an ein Unternehmen angepasst werden?

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- Hauptschwierigkeiten beim Training? Klassenverteilung?

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- Hauptschwierigkeiten beim Training? Klassenverteilung?
- Aktuelles Einsatzgebiet? Kombination mit Signature-based IDS?