

IESTI01 - TinyML

Anomaly Detection with TinyML

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Industrial Embedded Machine Learning Demo

Daniel Situnayake, founding engineer of Edge Impulse

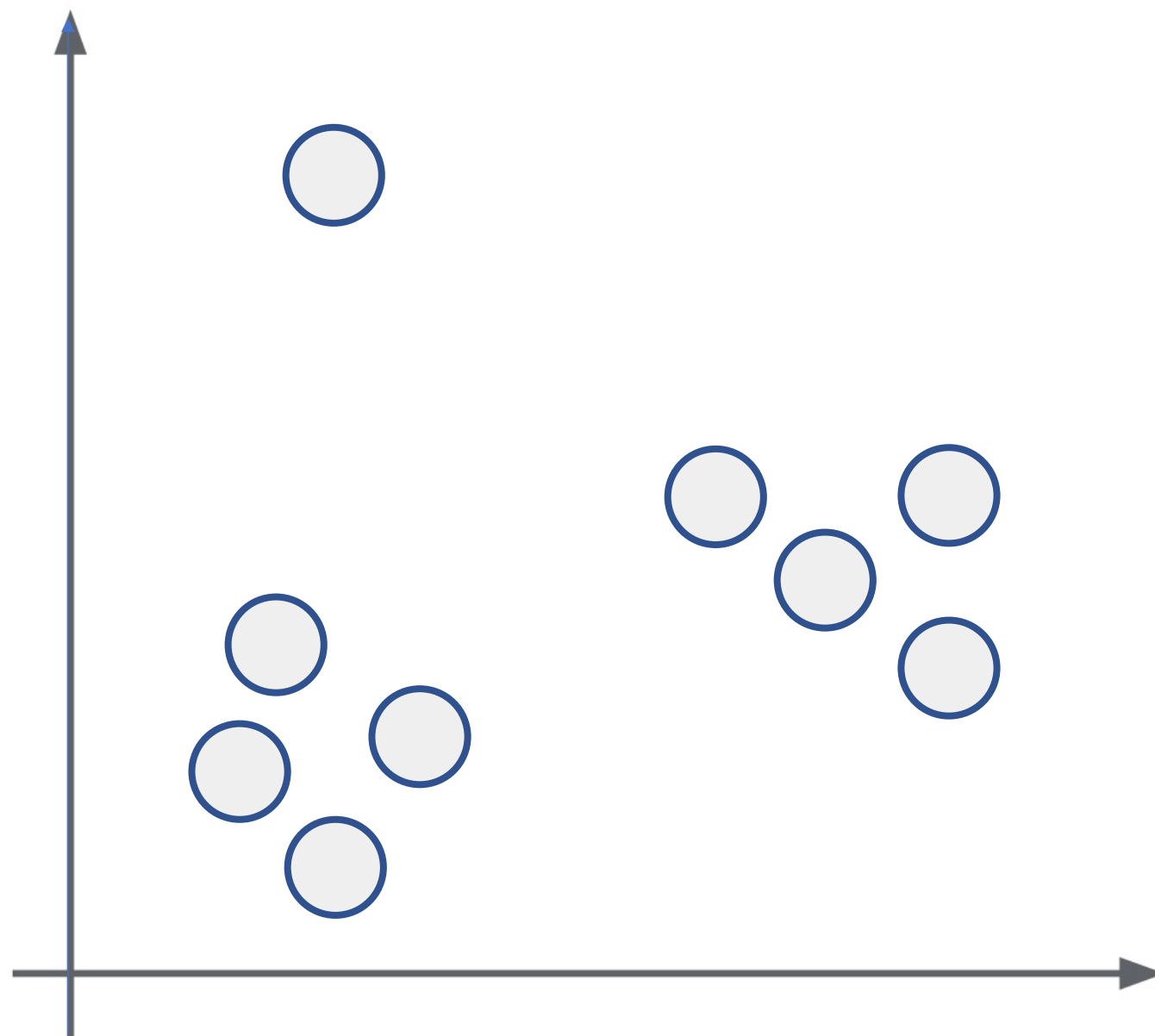
[Introduction to Embedded ML course](#)

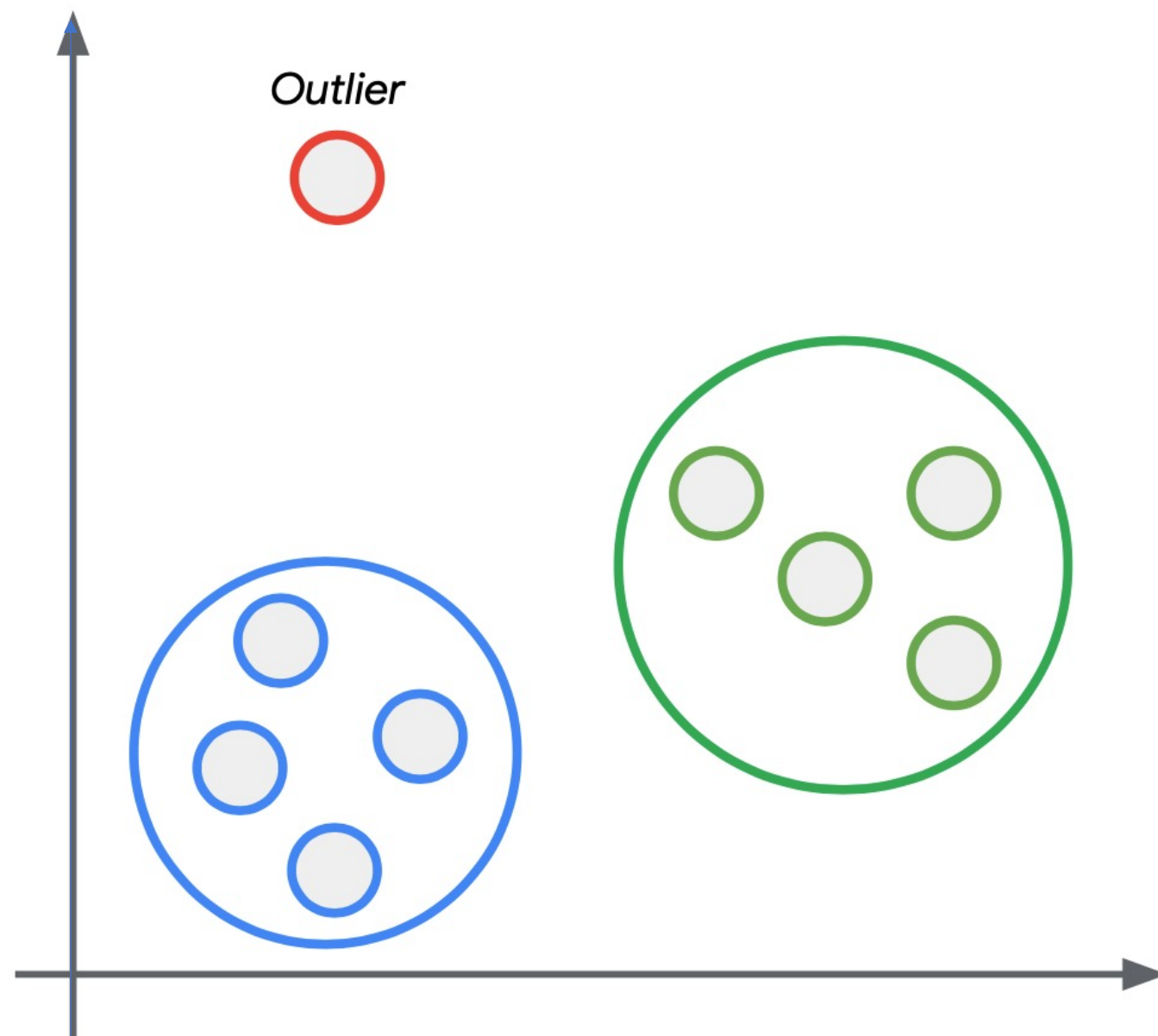


What is Anomaly Detection?

What is **Anomaly Detection**?

In **data analysis**, **anomaly detection** is the **identification of rare** items, events or observations which **raise suspicions** because they **differing significantly** from the **majority of the data**.





Application: Factory machinery



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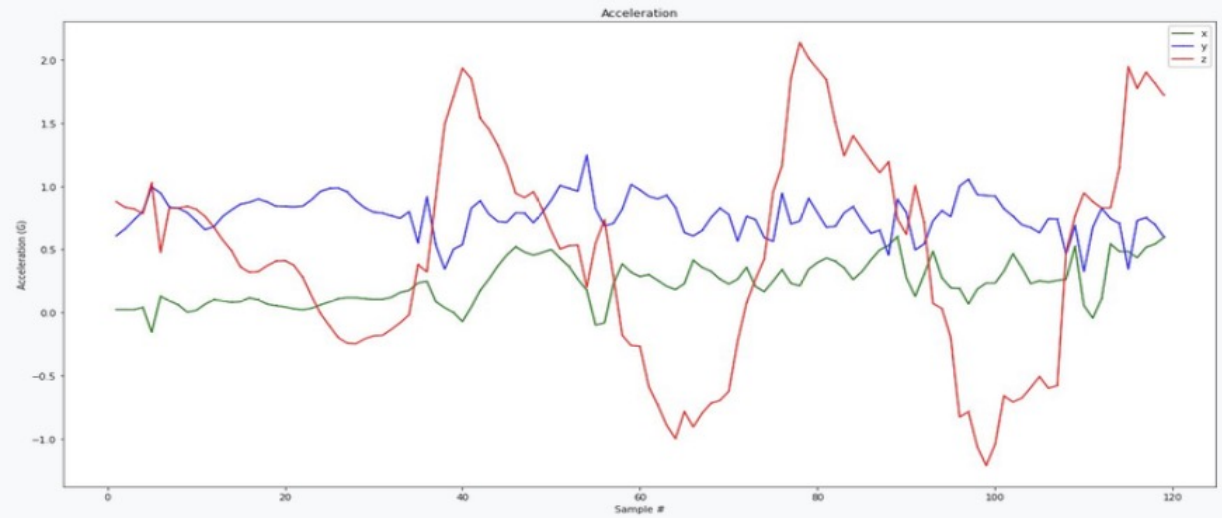
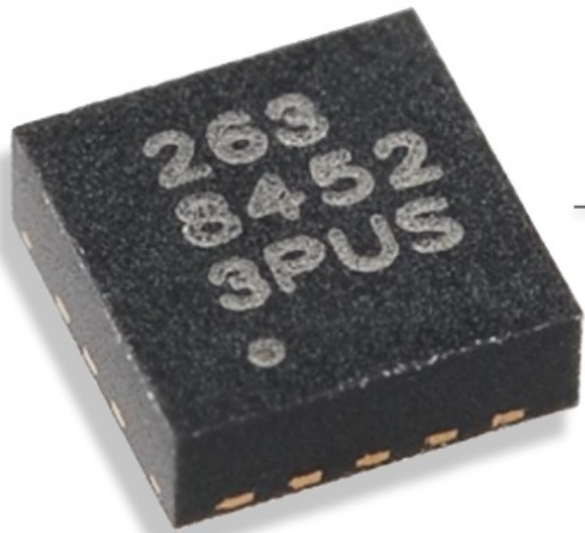


Ball Bearings



Accelerometer

Sensor: Accelerometer



Sensor: Accelerometer



$$2 \text{ bytes} \times 8 \times 20\text{kHz} = \mathbf{320} \text{ KB / sec}$$

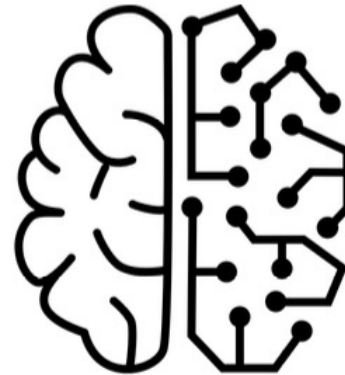
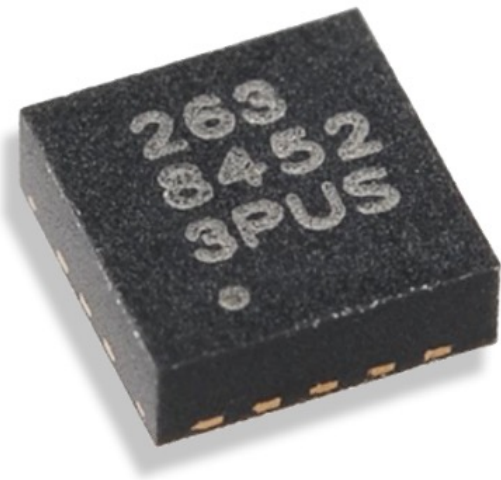
Measurement

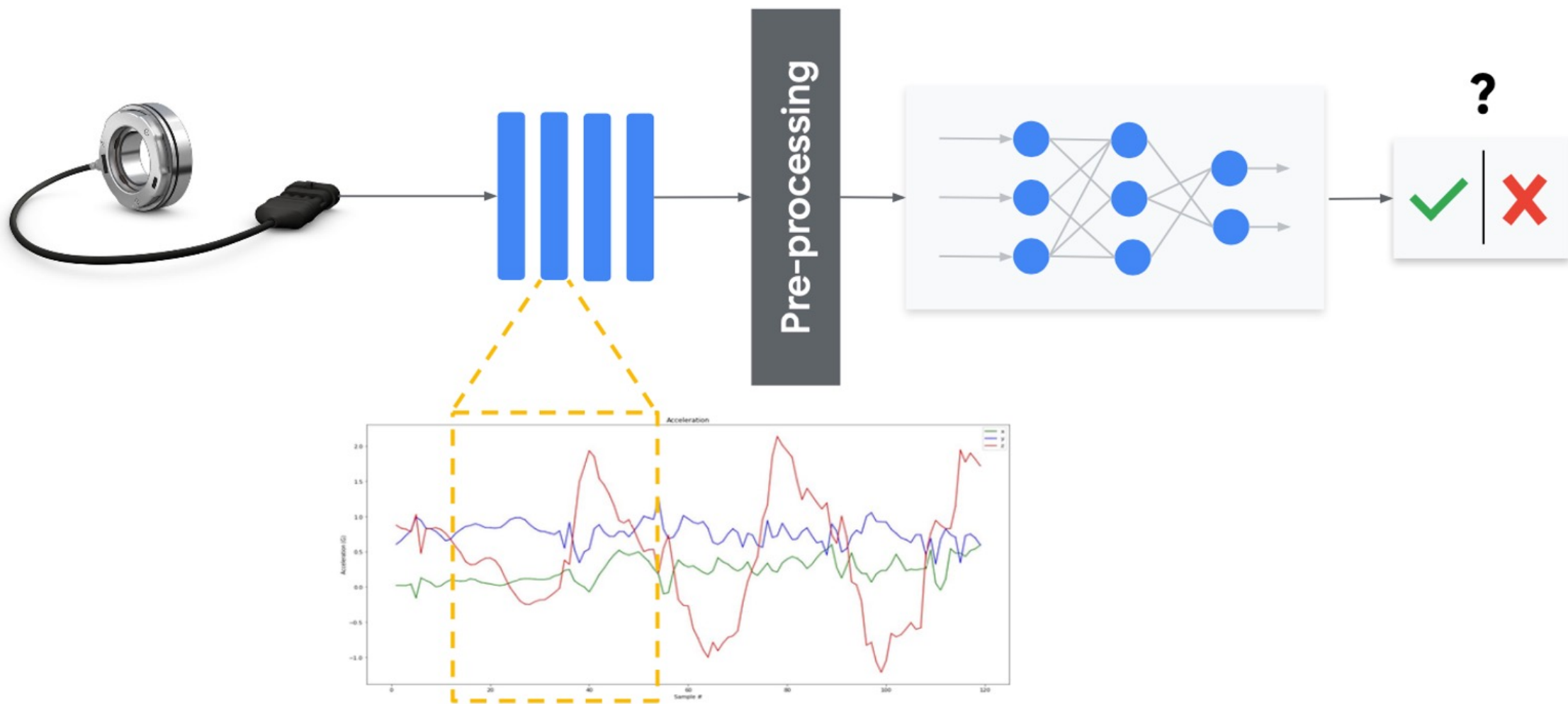
Sample Rate

Sensors

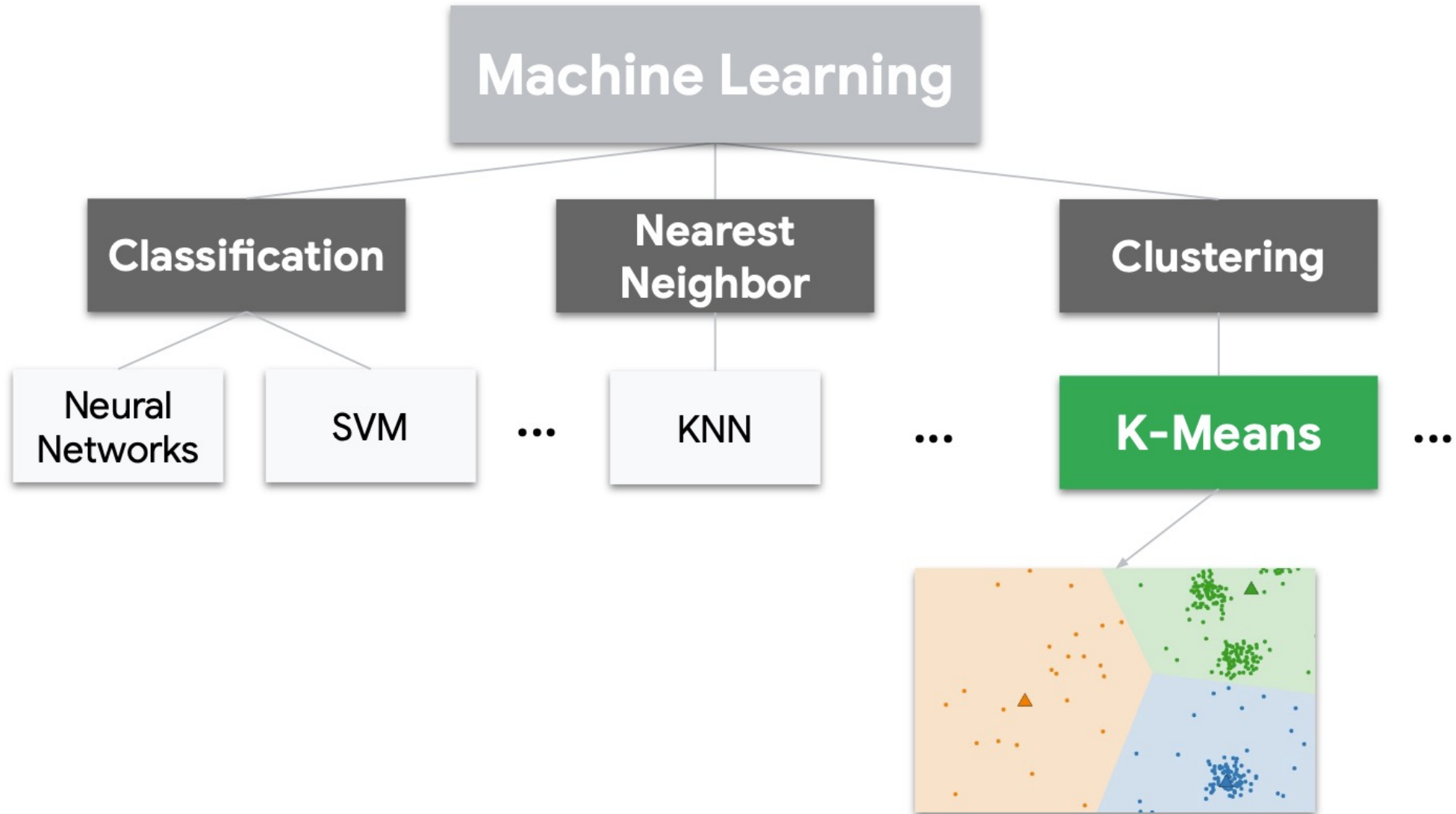
It's too expensive to stream to the cloud

Need “intelligence”
close to sensors





It's **not** all deep learning



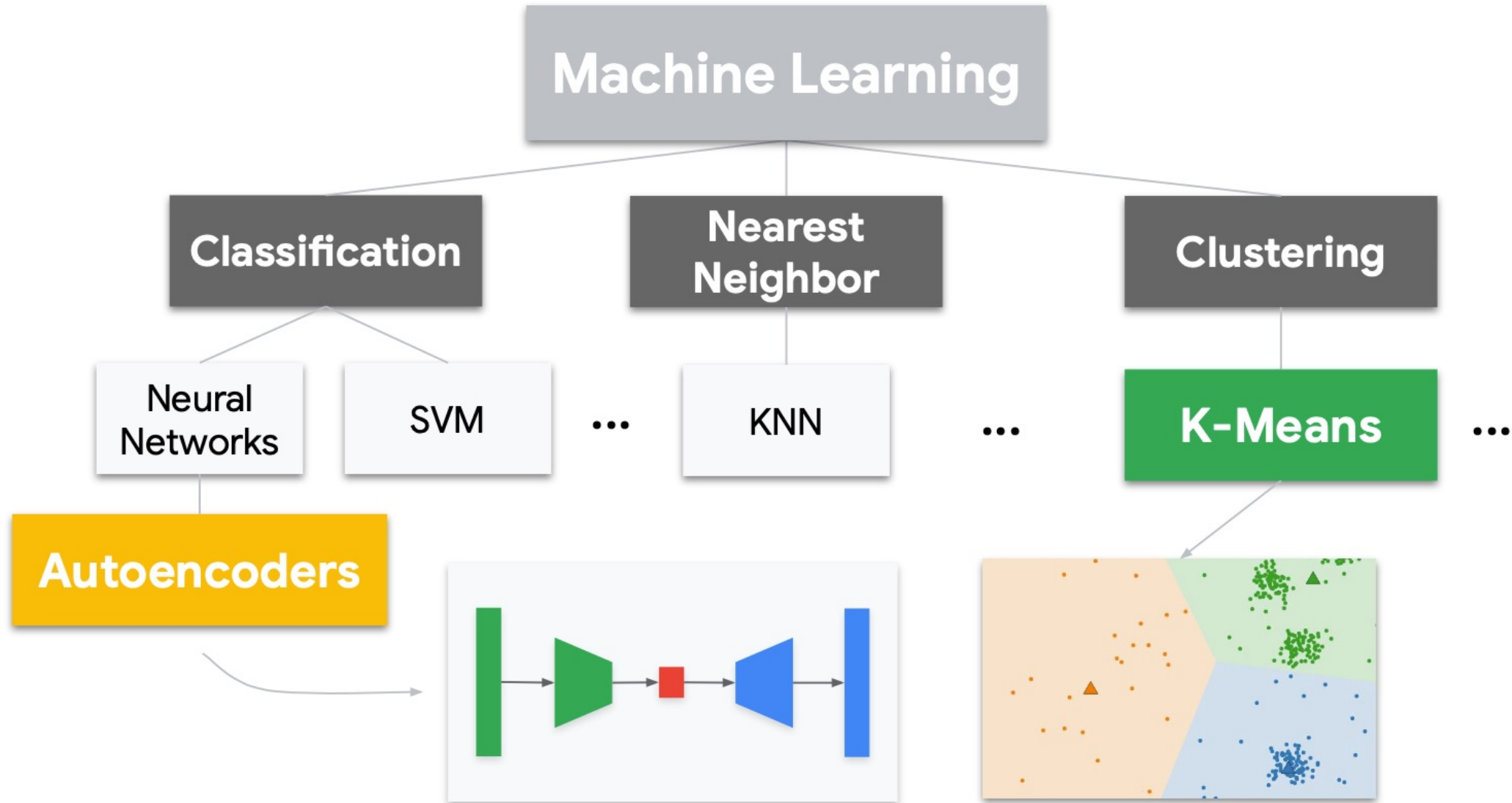
K-means Clustering for Anomaly Detection

Code Time!

Anomaly_Detection_K_means.ipynb



It's not all deep learning



Gesture Classification – Anomaly Detection

Project Time!



Reading Material

Main references

- [Harvard School of Engineering and Applied Sciences - CS249r: Tiny Machine Learning](#)
- [Professional Certificate in Tiny Machine Learning \(TinyML\) – edX/Harvard](#)
- [Introduction to Embedded Machine Learning \(Coursera\)](#)
- [Text Book: "TinyML" by Pete Warden, Daniel Situnayake](#)

I want to thank [Shawn Hymel](#) and Edge Impulse, [Laurence Moroney](#) from Google, Harvard professor [Vijay Janapa Reddi](#), Ph.D. student [Brian Plancher](#) and their staff for preparing the excellent material on TinyML that is the basis of this course at UNIFEI.

The IESTI01 course is part of the [TinyML4D](#), an initiative to make TinyML education available to everyone globally.

Thanks
And stay safe!

