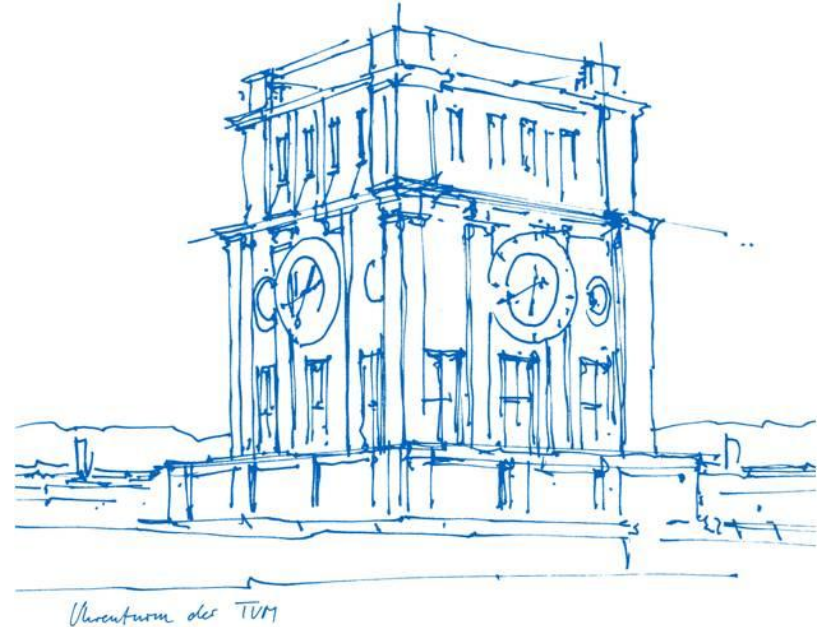


Mobile Solar Panels

Sprint 4

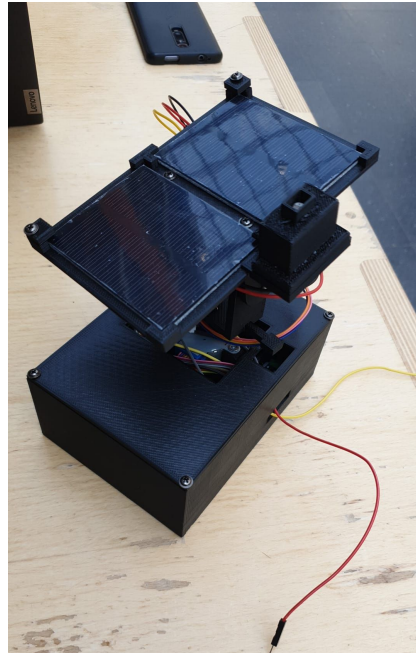
Eric Armbruster, Florian Freund, Sebastian Klinke

Garching, 22.07.2022



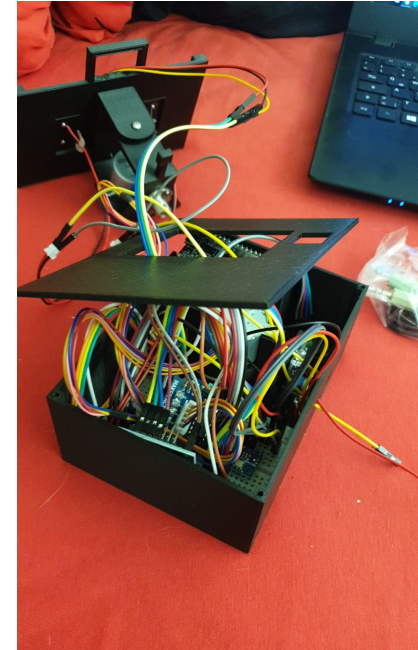
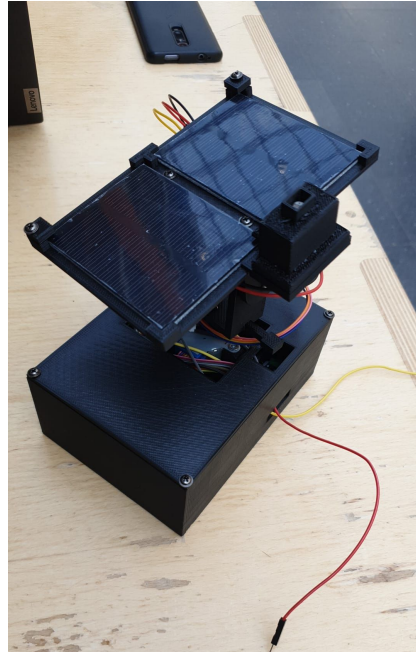
Support Multiple ESPs

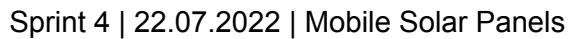
- Second Platform:
 - 3D Printing
 - Assembly



Support Multiple ESPs

- Second Platform:
 - 3D Printing
 - Assembly





Smartphone Control

Click one of the buttons to start the Mobile Solar Panels with or without your current coordinates or stop it for now. The currently active command is:

LightTracking

Start using current location

Start without location

Stop

Click one of the buttons to start the Mobile Solar Panels with or without your current coordinates or stop it for now. The currently active command is:

LightTracking

Start using current location

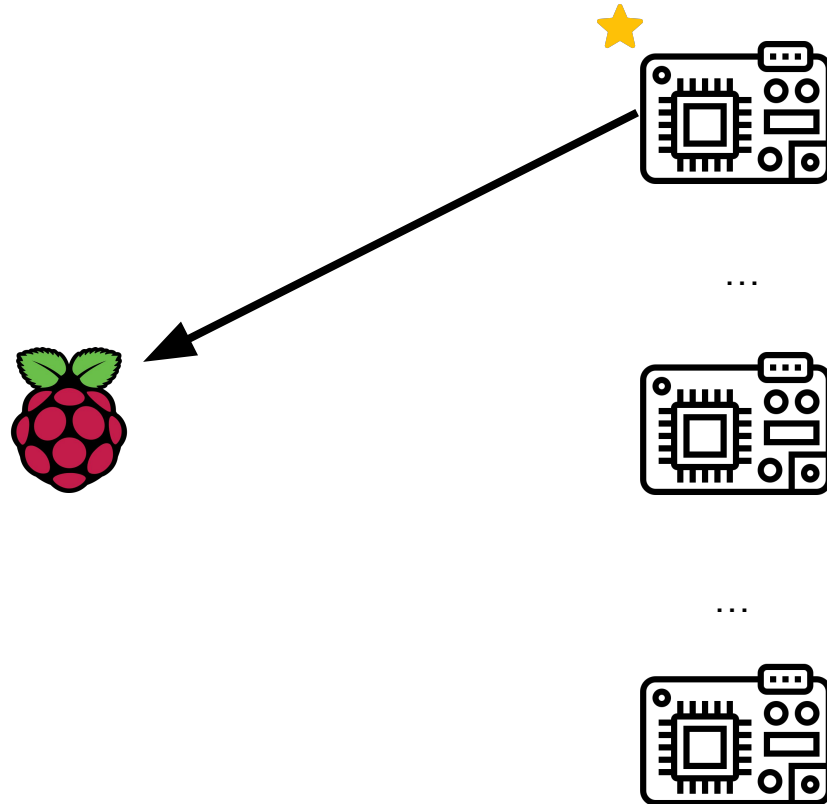
Start without location

Stop

Stop was unsuccessful

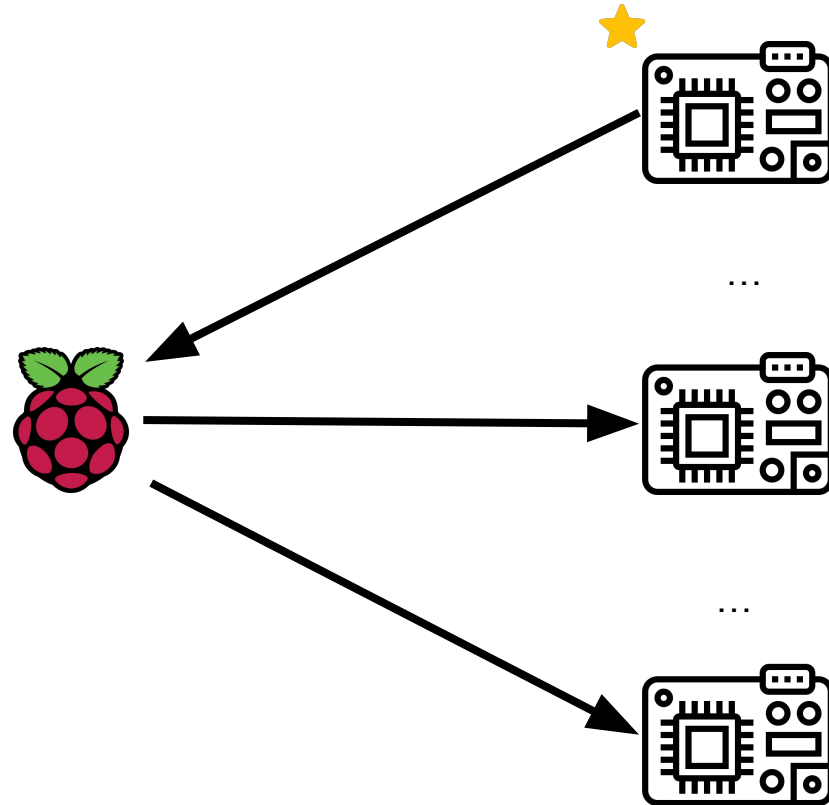
Leader Follower Reuse

1. Every IoT device
 - is assigned a role
 - initializes its rotation
2. Leader
 - Probes next rotation offset
 - Leader forwards rotation offset to edge



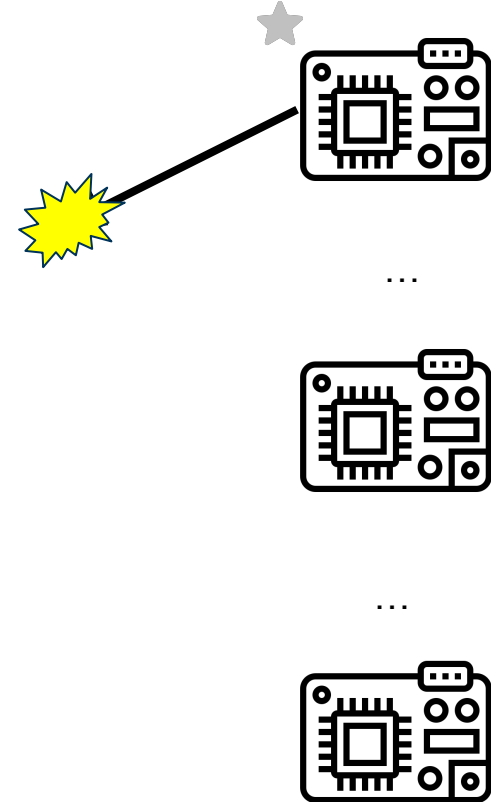
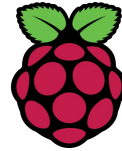
Leader Follower Reuse

1. Every IoT device
 - is assigned a role
 - initializes its rotation
2. Leader
 - Probes next rotation offset
 - Leader forwards rotation offset to edge
3. Edge device forwards to followers



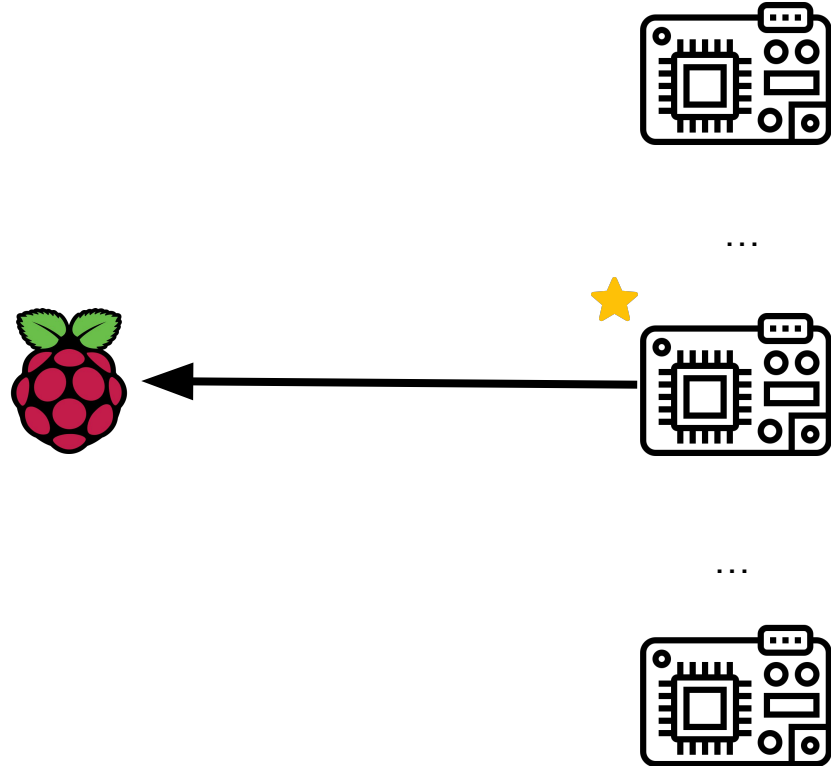
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4. Leader role can be reassigned when current leader is unresponsive



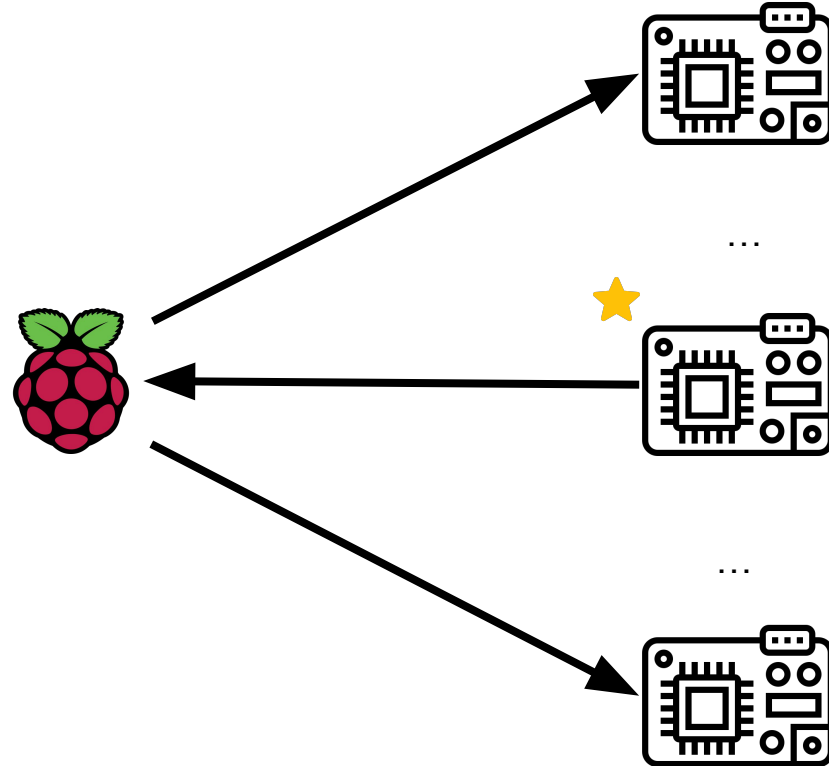
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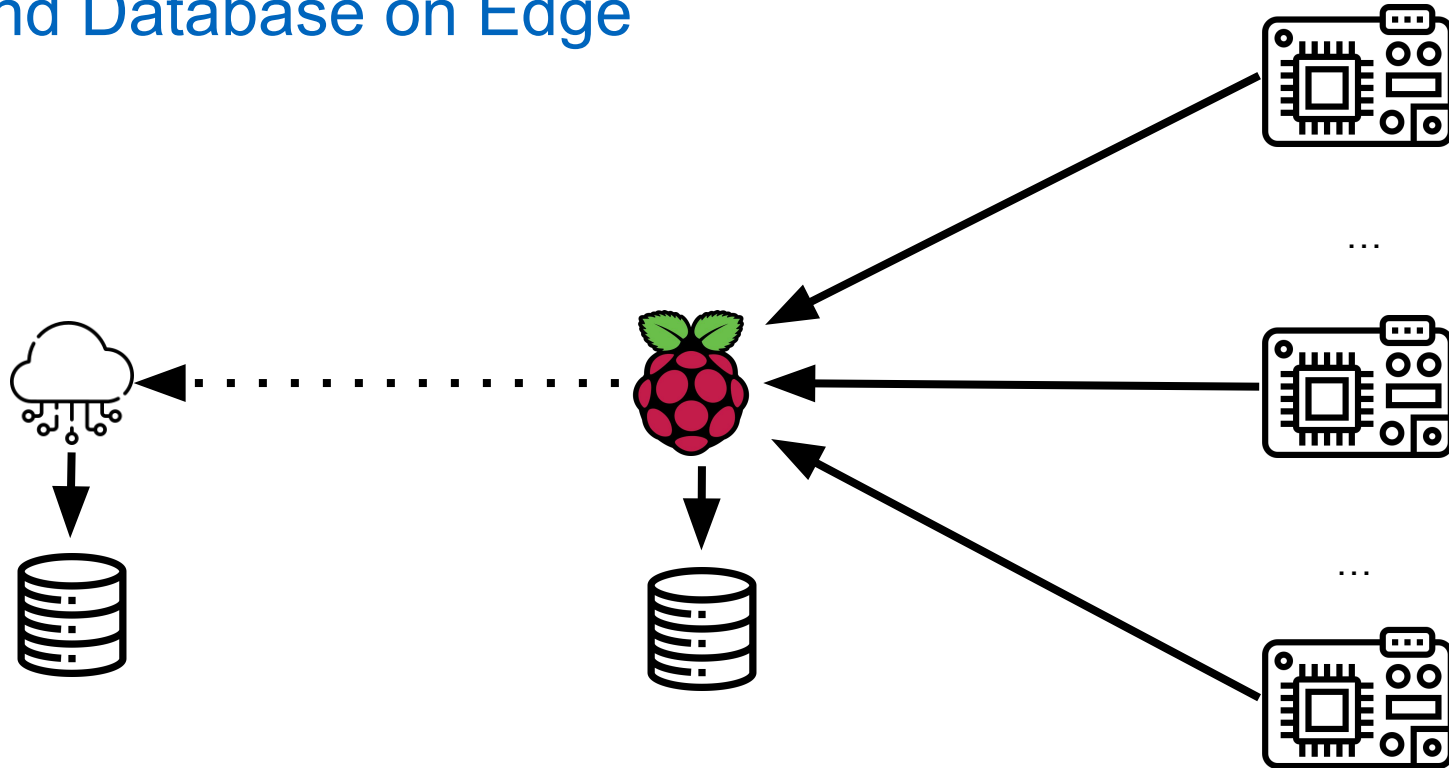


Leader Follower Reuse

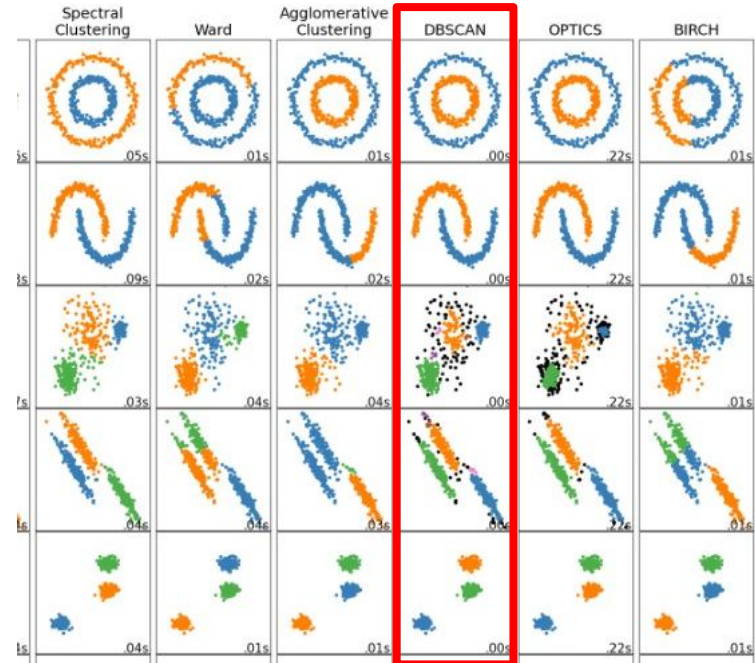
1. Every IoT device
 - is assigned a role
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 - Probes next rotation offset
 - Leader forwards rotation offset to edge
3. Edge device forwards to followers
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Second Database on Edge

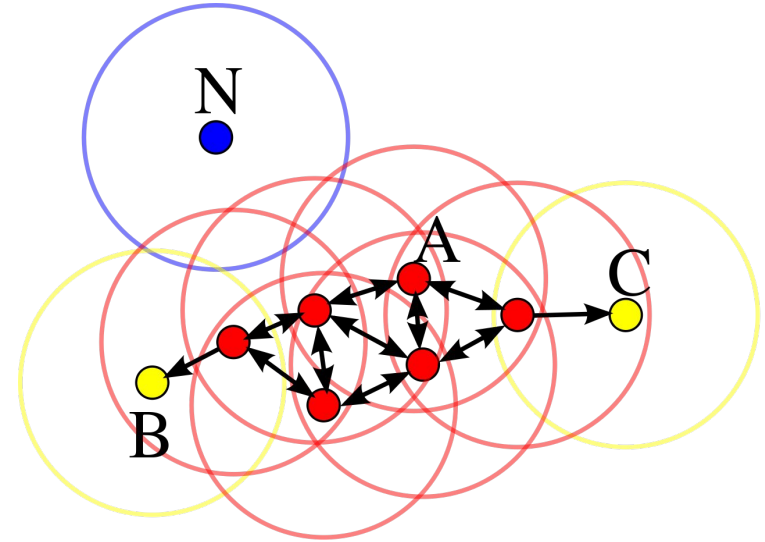


Anomaly Detection



Density-Based Spatial Clustering of Applications with Noise (DBSCAN)

- unsupervised
- can find arbitrarily shaped clusters with noise (outliers)
- no hyperparameter for number of clusters required!!
- euclidean distance \leftrightarrow curse of dimensionality

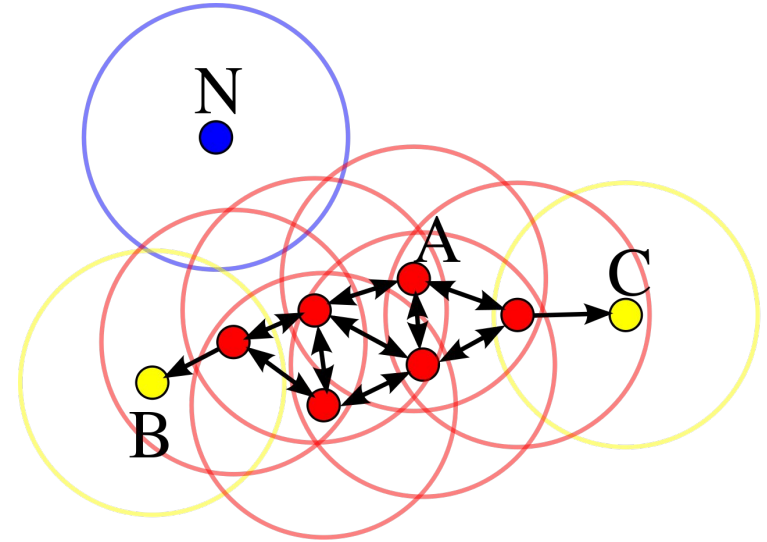


<https://en.wikipedia.org/wiki/DBSCAN#/media/File:DBSCAN-Illustration.svg>

Density-Based Spatial Clustering of Applications with Noise (DBSCAN)

- **Core point:** \geq minPoints (including self) in its surrounding area with radius epsilon.
- **Border point:** Point reachable from core point, but $<$ minPoints surrounding points
- **Outlier:** Not a core point and not reachable from any core point

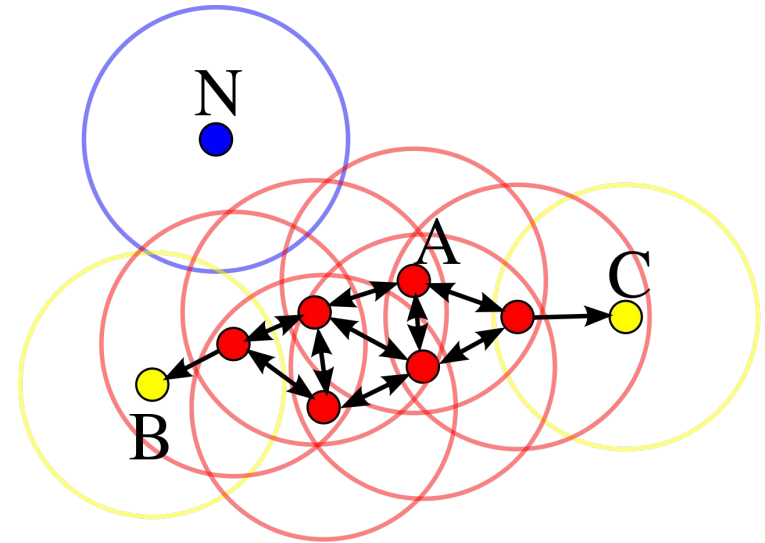
<https://towardsdatascience.com/dbscan-clustering-explained-97556a2ad556>



<https://en.wikipedia.org/wiki/DBSCAN#/media/File:DBSCAN-Illustration.svg>

Our Approach with DBSCAN

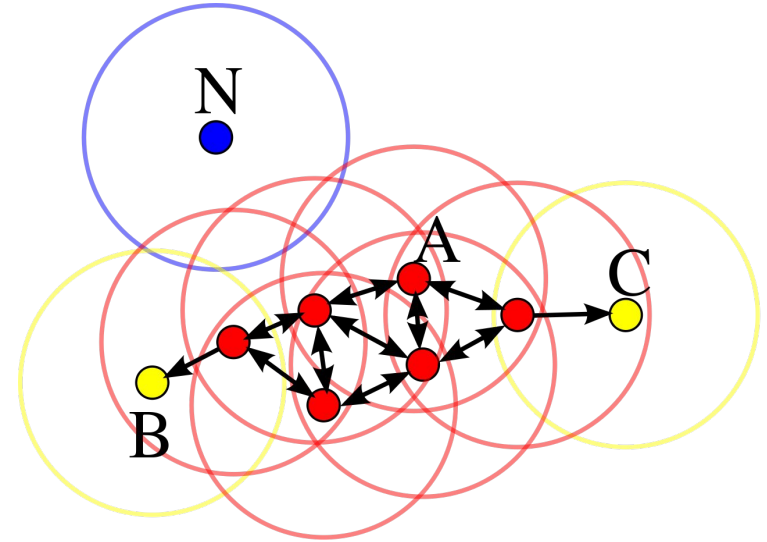
- Use temperature, generated power and photoresistor values
- Idea: different clusters for different weather conditions
- Datapoints from different devices should land in the same cluster at a timestamp
- We collect the anomalies for each device and send them in a report email periodically



<https://en.wikipedia.org/wiki/DBSCAN#/media/File:DBSCAN-Illustration.svg>

Hyperparameters: TBD

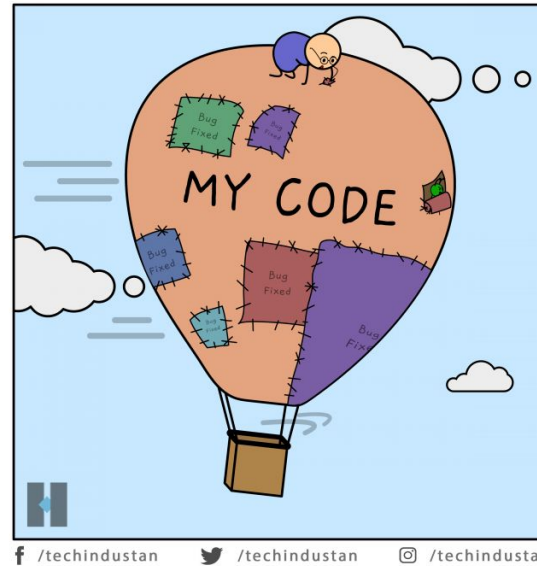
- minPoints: rule of thumb: $\text{dim} * 2$
- epsilon:
 - good: kneplot would be optimal,
 - alternatively through trial and error



<https://en.wikipedia.org/wiki/DBSCAN#/media/File:DBSCAN-Illustration.svg>

Until Demo

- Fix Bugs
- Testing, testing, testing



<https://i.pinimg.com/originals/c9/bc/7c/c9bc7cb6c92630c54f3a6266605cc6cf.png>