**PROBLEM**

- **Time Series Anomaly Detection**
  - Anomalies are patterns that do not conform to expected behavior.
  - Time series anomalies are range based, i.e., they occur over a period of time.
  - Detecting and mitigating anomalies can be safety critical.

**Application Diversity**

- Applications of anomaly detection are numerous and diverse.

**Six levels of autonomy:**
- L0: No automation
- L1: Driver assistance
- L2: Partial automation
- L3: Conditional automation
- L4: High automation
- L5: Full automation

**RESULTS**

- **Comparison to Classical Model**
  - Our model: subsumes the classical point-based model.
  - Our model is more effective in:
    - Subsuming the classical model.
    - Is sensitive to positional bias.
    - Results are similar for Precision and F-Score.

- **Multiple Anomaly Detectors**
  - New training strategies for range-based anomaly detection.
  - Capturing subtleties in data.
  - Results are similar for other datasets.

**Future Directions**

- New training strategies for range-based anomaly detection.
- Exploring use in other time series classification tasks and applications.

**More Information**

Watch: https://www.youtube.com/watch?v=K5f-dUBiQP4
Read: https://arxiv.org/abs/1803.03639
Use: https://github.com/IntelLabs/TSAD-Evaluator/

**How to Measure Accuracy?**

- Prior work: Classical model, Numenta model, Activity recognition metrics
- Lack of support for partial detection and flexible time bias

**Customizable Precision and Recall**

- Our model:
  - Subsumes the classical point-based model.
  - Capture additional intricacies.
  - Results are similar for all Numenta app profiles.

**Expressive, Flexible, Extensible**

- Our model is more effective in:
  - Capturing subtleties in data.
  - Results are similar for other datasets.