Machine Learning Sensor Data
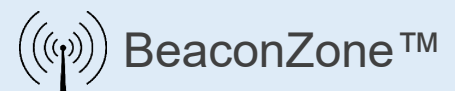
Benefits of machine learning with sensor data, project risks and the development process

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What does it do?
Uses patterns found in old data that can be applied to new data to DETECT (something has happened), CLASSIFY (between types) and PREDICT (the next value or status).

How is it unique?
Finds and uses insights in data that are difficult or impossible to identify by humans. Solves problems that are difficult or impossible to solve using conventional algorithmic programming.

Who is it for?
Any organisation that either creates software-driven products or uses software to drive processes.

Machine learning (ML) differs from conventional algorithmic coding in that it's based on analysing data to extract patterns that are expressed at **models**.

The stages are usually:

1. Collect data.
2. Clean the data.
3. Do machine **learning** to create a **model** that **detects** a condition, **classifies** a situation or **predicts** a state.
4. For actual use, implement an **inference** mechanism on a server, smartphone or edge device to use the **model** to provide the output in response to new data input.

Stage #2 can be manually time consuming and needs to be done in such a way that it can be automatically repeated during stage #4.

Stage #3 needs to be repeated using different ML methods and parameters to achieve an anticipated **accuracy.** This stage is computationally intensive and in some situations can take weeks or months.

General Benefits of Machine Learning

- Provides a way of solving business problems that might have previously seemed intractable.
- Can be used to improve business operations, create unique products and understand human behaviours.
- Derives insights from existing and new 'big data'.
- Improves on expensive manual preventive and corrective maintenance practices to provide predictive maintenance.
- Eliminates manual checks and implicit human error.
- Diagnoses, predicts health, provides recommendations and identifies risks.
- Creates new processes that are themselves intellectual property that can become a valuable asset in its own right.
- Enhances your organisation's credibility through the use of advanced technologies.

Benefits of Using Machine Learning on Sensor Data

- Allows insights to be obtained from physical measurements such as position, movement (accelerometer), temperature, humidity, air pressure, light, open/closed, proximity, fall detection, smoke, gas and water leak.
- Enables identification of complex patterns that exist over a time series.
- Physical analysis provides for physical anomaly detection and trend forecasting to prevent faults and defects in a proactive manner.
- Allows creating of actionable alerts and decisions from complex data, from multiple sensors, when the means of analysing the data isn't obvious.
- Provides a way of filtering out noise in sensor data.
- Easier to create new sensor data rather than relying on existing data that's (usually) silo'd and over-protected by company stakeholders.

Development Risks

Machine learning projects have different risks than conventional programming and should be thought of more as a type of Research & Development. While past experience defers some of the risk, there's always some degree of experimentation.

Feasibility

The problem you wish to solve might not be solvable using sensor data.

Accuracy

While the problem might be solvable, the resultant accuracy might not be good enough or the development activities might end up taking too long to achieve a required accuracy. You will never get 100% accuracy and if you need this, ML isn't the solution. Before you discard ML, remember that many non-ML and manual safety critical processes usually have some possibility of failing.

Performance

If the input data is very large, it might not be possible to derive a model in a reasonable elapsed time. If a model can be created, it might not be fast enough during inference (real use).

Cost & Pricing

The experimental nature of ML is such that projects can't be fixed price. Instead, we can price for sub-tasks at fixed rates to manage costs.

To Learn More

Contact us via our help desk to set up a free initial chat to determine if a machine learning based solution might benefit your organisation.

http://bzone.click/support

Project Stages

Scoping and High Level Architecture

- Identifying and understanding your problem(s).
- Deriving the requirements, the required accuracy and performance.
- Determining feasibility of solving using machine learning or indeed using a simpler solution.

Data Collection

- Implementing mechanism(s) to collect data.
- Exploratory analysis to find obvious features, patterns and correlations in the data.
- Data cleaning and shaping.

Machine Learning to Create Models

- Running of many experiments to develop the machine learning model(s).
- Trying different variants of the data, different ML techniques and different parameters.

Production

- Implementing a server, smartphone app or edge device to collect new data, clean and shape it and use the model for inference.
- Where required, implementing an API so the model can be used from other systems.

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