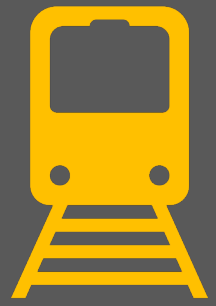

Introducing Maintenance and Damage Occurrence Prediction of Trains and Trails of Public Transport Victoria using Big Data

FIT5145- Introduction to Data Science

Prepared by :

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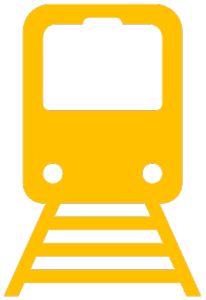
Introduction and Benefits



Introduction:

PTV(Metro):

220 six carriage trains

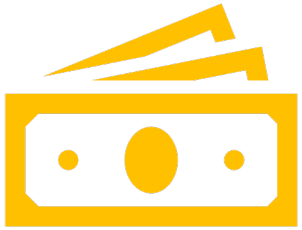
965 KM of tracks

Around 90% Punctuality

Proposed System(for trains and tracks):

Predict Damage Occurrences

Predict/Find Need of Maintenance



Benefits:

-> Reduced maintenance cost, inspection timing and workload for engineers

->Predicted maintenance -timing, cost and need.

->Analyse data to reduce emergency repairs

-> Reduced service disruptions

Overall Process

(Train Axle fault and Wheel Crack Detection)

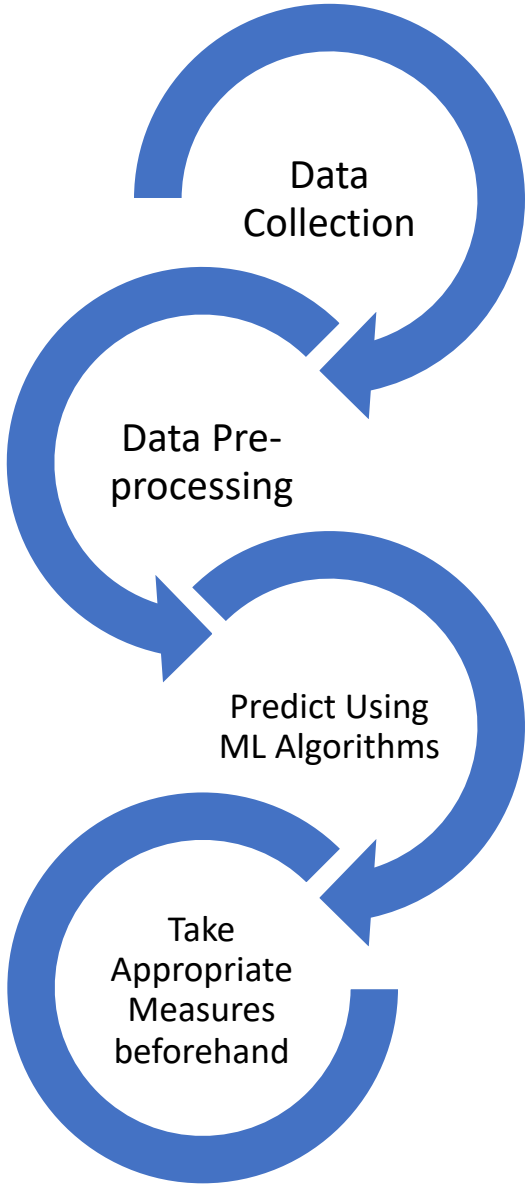
Data Collection

Data Pre-processing

Predict Using ML Algorithms

Take Appropriate Measures Beforehand

Overall Process (cont.)



- ✓Data captured as Vertical and Horizontal vibration from train axle
- ✓Data Captured using multiple sensors attached in train axle
- ✓Data Transferred using Wireless Sensor Network(WSN)

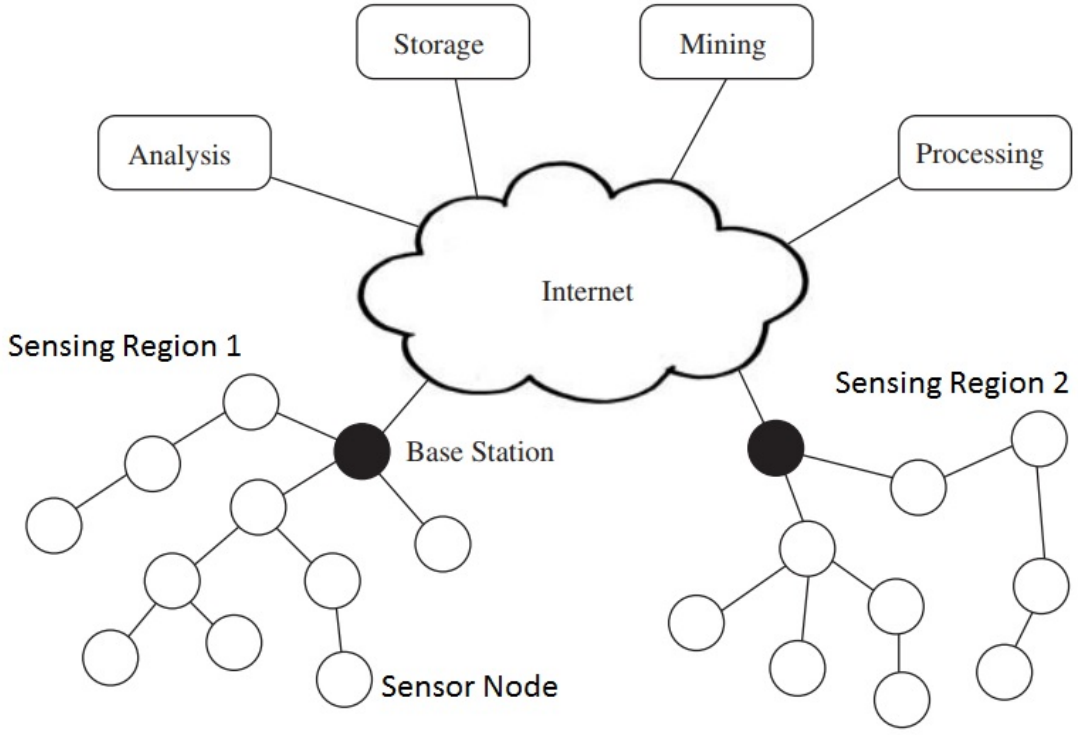
- ✓Dealing with missing value- Numeric and Categorical column
- ✓Changing current data type to appropriate data type for ML algorithms
- ✓Appropriate features are transformed to vector using vector assembler

- ✓Decision Tree algorithm is used to predict chances of maintenance requirement, before any unavoidable circumstances

- ✓Decide whether the issue is in Train Axle or in the Wheel

Technical Specification Details

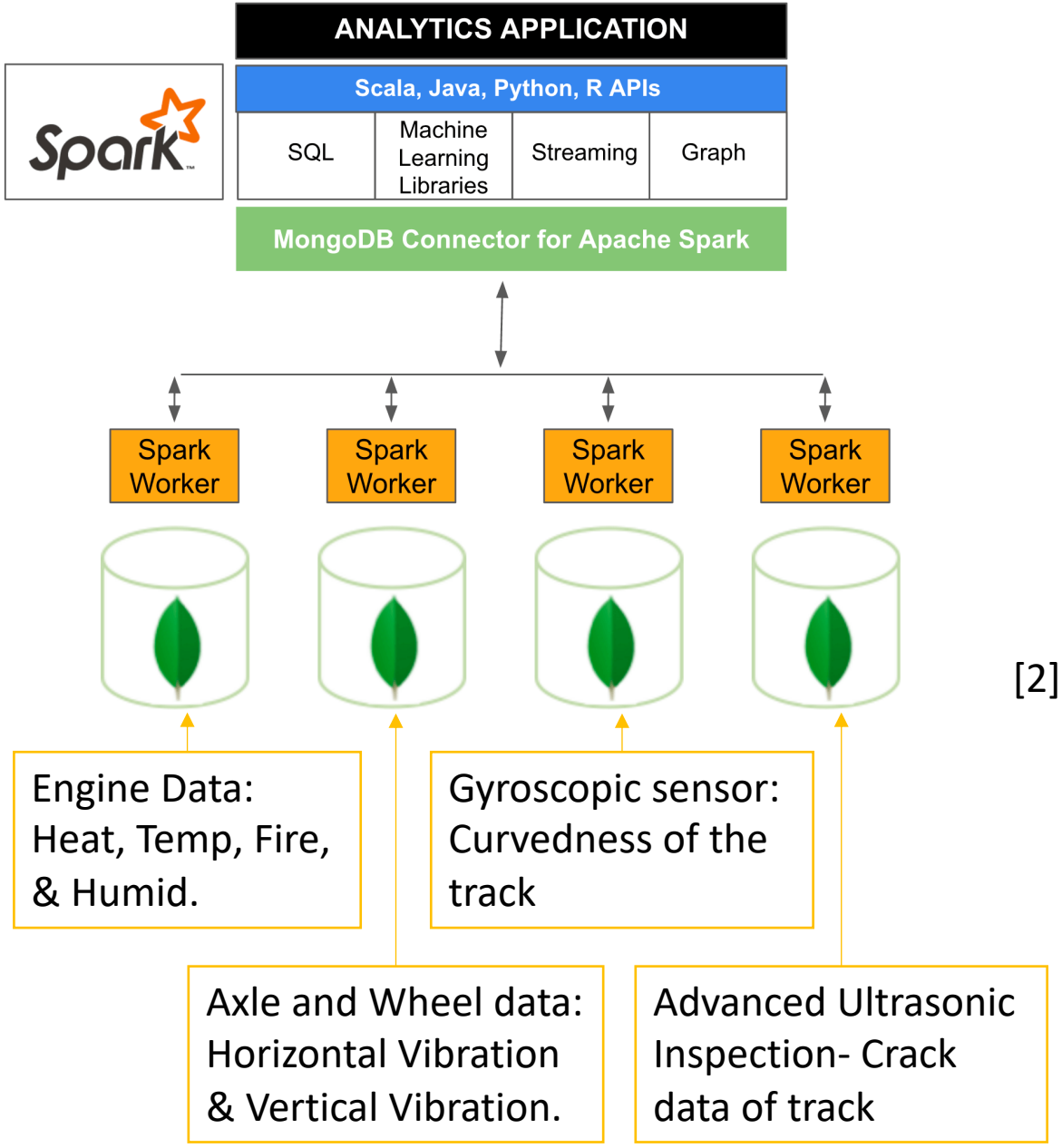
- Data From Sensors
  - Engine Data:
    - Heat/Temperature Sensor
    - Fire Sensor
    - Humidity Sensor
  - Axle and Wheel Data
    - Sensor to catch Vibrations(Horizontal and Vertical)
  - Track/Trail Data:
    - Gyroscopic sensor – Whether the trail Is curved from the original position?
    - Advanced Ultrasonic Inspection – is there any crack in the trail?
- Communication Medium:
  - Wireless Sensor Network(WSN)



[1]

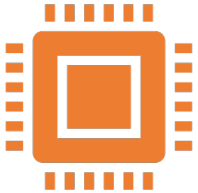
Technical Specification Details (cont.)

- Big Data processing and Analysis
  - Apache Spark and MongoDB
  - Apache Spark and ML Libraries
  - Apache Spark and Streaming



[2]

Challenges



Cost of Sensors

Network devices expenses

Network Devices with adequate Signal strength in Remote Areas

High performing Distributed and Cluster Computing Setting

Conclusion

Improved Maintenance System of Trains and the Tracks

Reduced Emergency Repairs

Reduced Service Disruptions

References

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2 MongoDB. MongoDB Connector for Apache Spark [Image on internet]. [cited 2019 Oct 20]. Available from: https://www.mongodb.com/products/spark-connector