Analysis, Matching, and Prediction of Data with Time or Space Characteristics according to Association Rule of Data Mining

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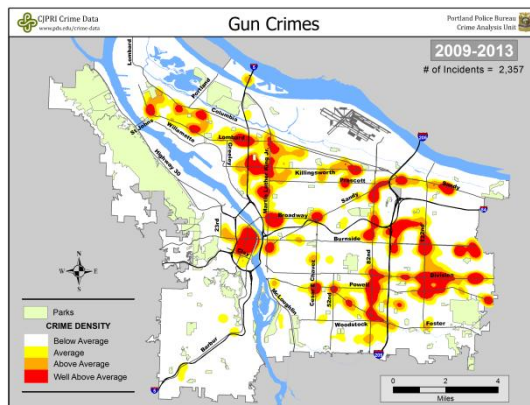Fan Gongxiu Hornors College, Beijing University of Technology

Mentor: Chen Juncheng

Spatiotemporal = Spatial + Temporal
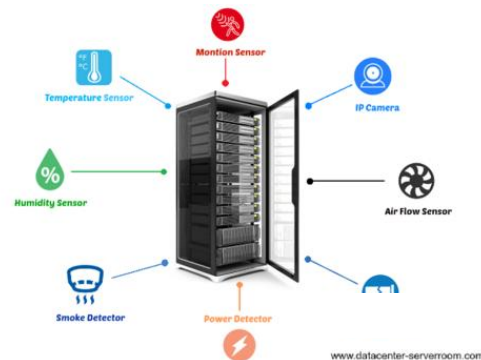
Mobile Application

Crime Analysis

Environmental Monitoring

Dynamic Model

Static Model

[1] https://phys.org/news/2017-11-uber-ipo-ceo.html
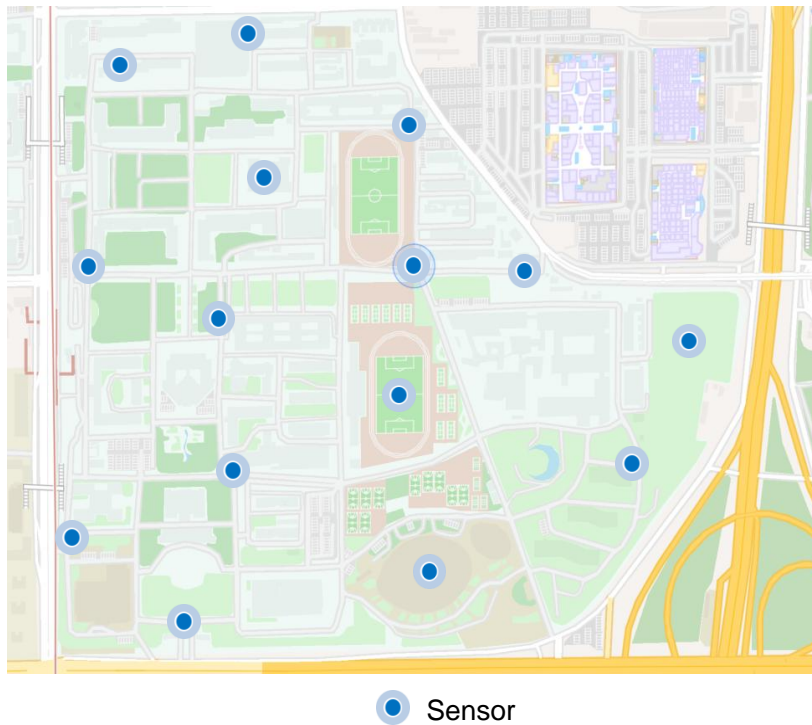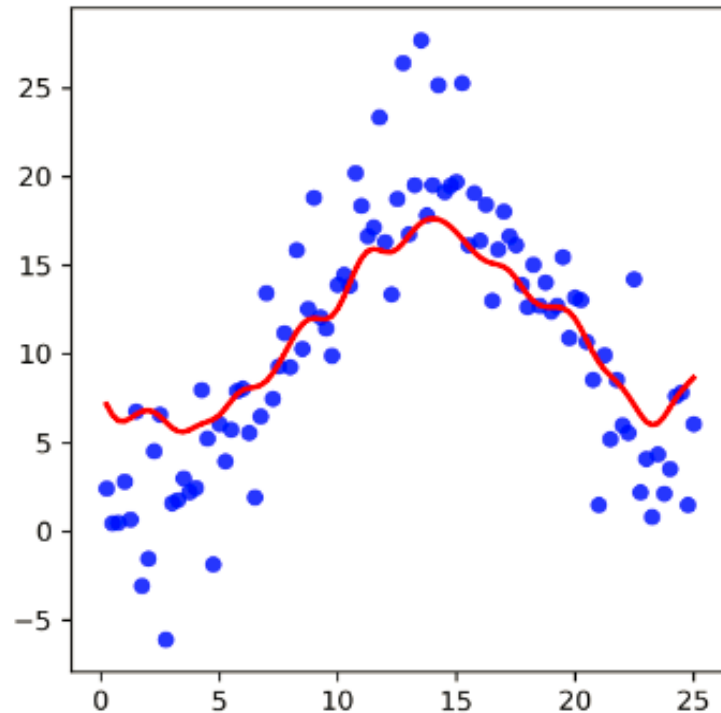[2] https://www.pdx.edu/crime-data/hotspot-past-5-years-11
[3] http://banbenpu.com/picture/server-room-environmental-monitoring-systems-home-design-great-unique-on-server-room-environmental-monitoring-systems-house-decorating/
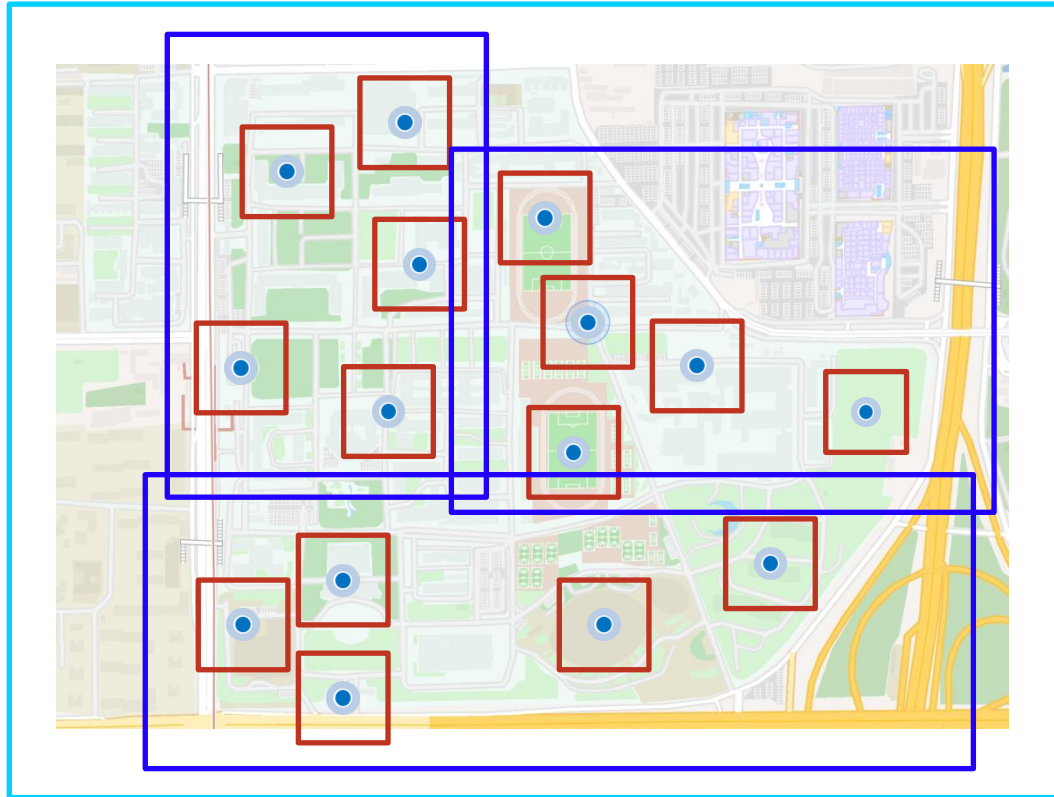
Application Scene

Sensor

Static Model

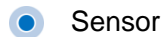Continuous Temperature

Key Problem

How to build up **index**
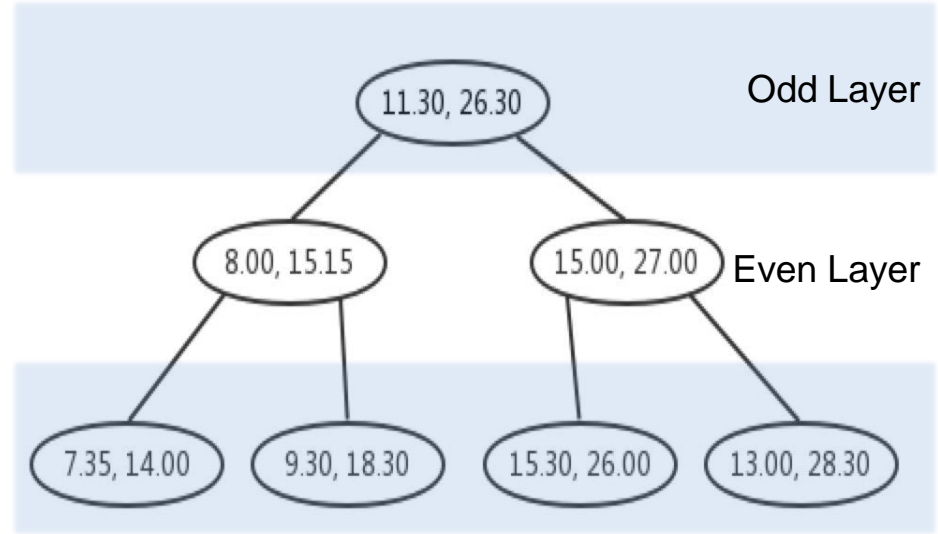
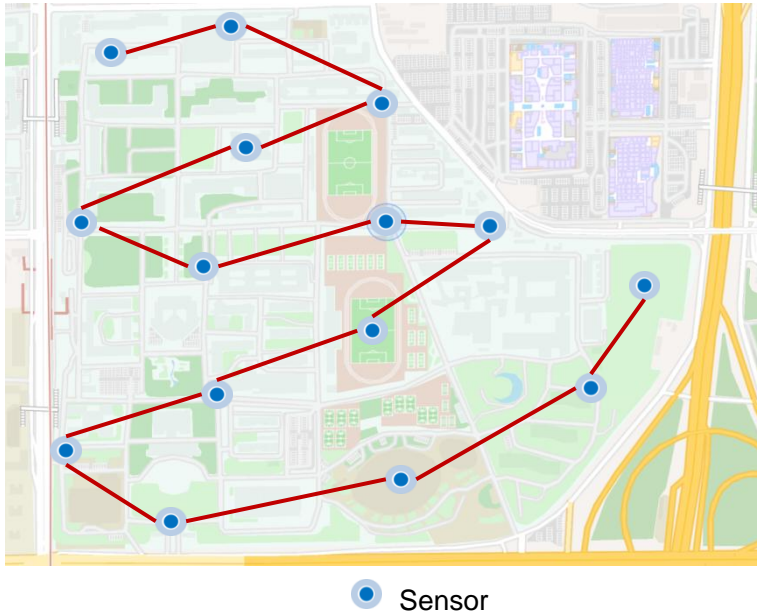for **static** model?

How to realize

continuous query?

Existing INDEX – Rectangle Tree (R Tree)

- Identifier = Time
- Divide Space = Index
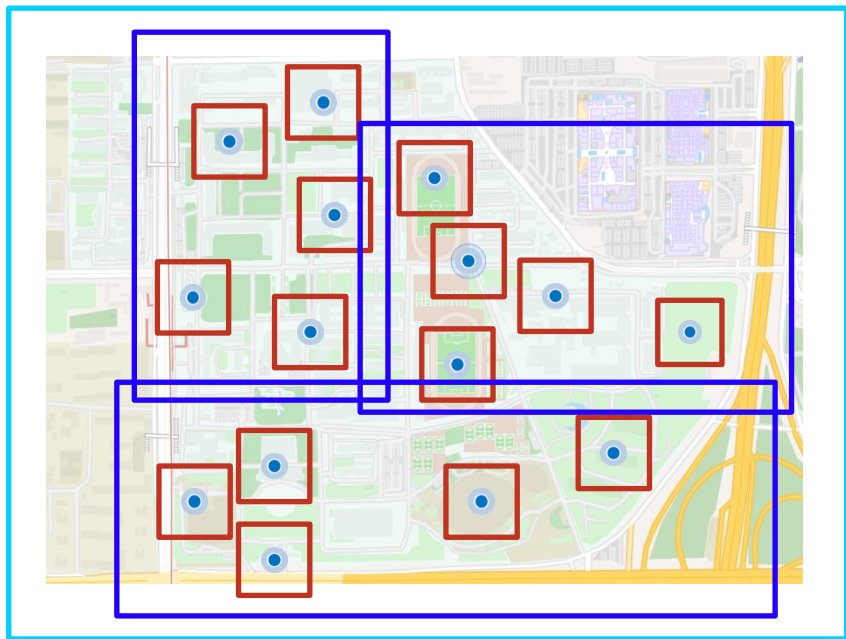
- Low query efficiency in static model

● Sensor

Our Solution -- K-Dimensional Tree (KD Tree)

Sensor

Odd Layer

11.30, 26.30

8.00, 15.15   15.00, 27.00   Even Layer

7.35, 14.00   9.30, 18.30   15.30, 26.00   13.00, 28.30
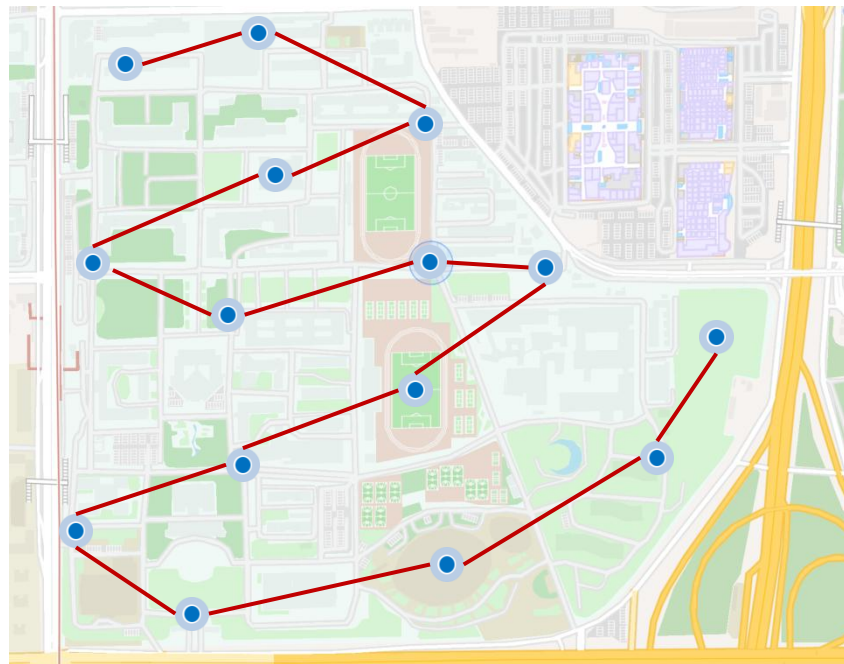
- Identifier = SensorID (space)

- Divide Time & Temperature = Index

Tree Comparison

- Lower dimensionality of space characteristic
- Higher query efficiency

Sensor

Sensor

Query

A. Moment & Spot

B. Period & Spot

C. Moment & Area

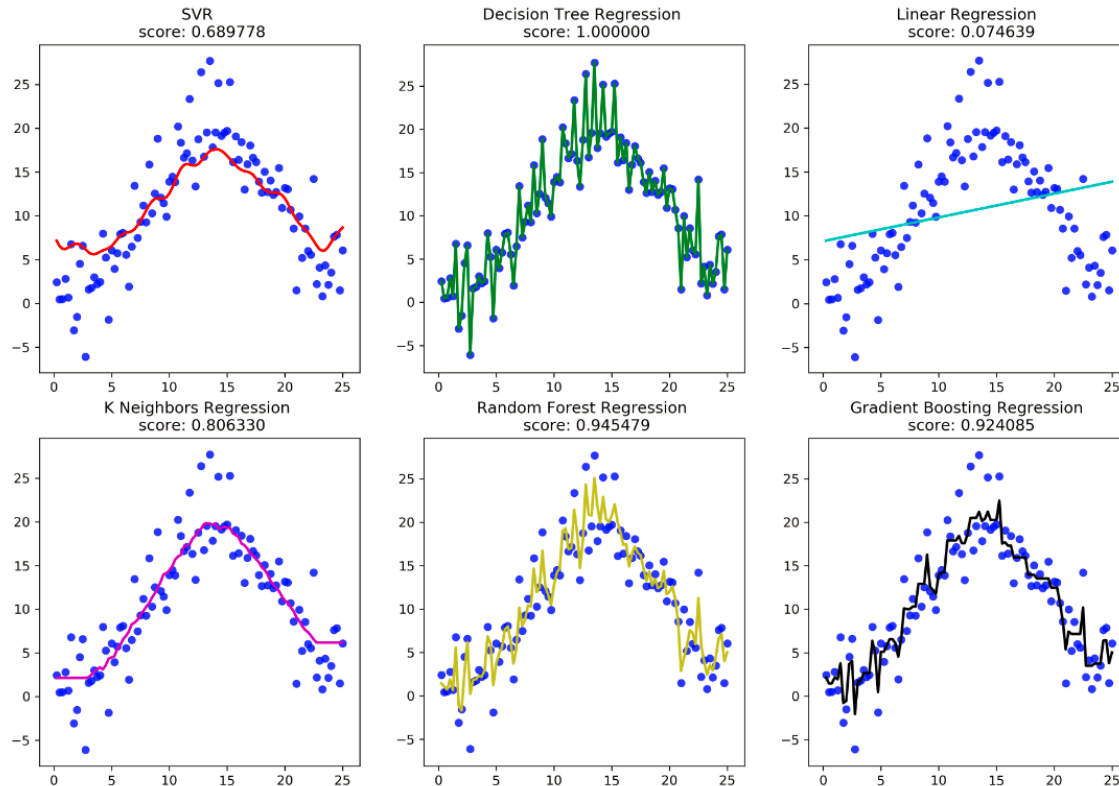D. Period & Area

Can't realize continuous query

Our Solution -- Machine Learning

Figure 1 Temperature in a spell at particular location

- Fitting discrete points with 6 machine learning methods.

- Using the evaluation score to choose the most suitable method.

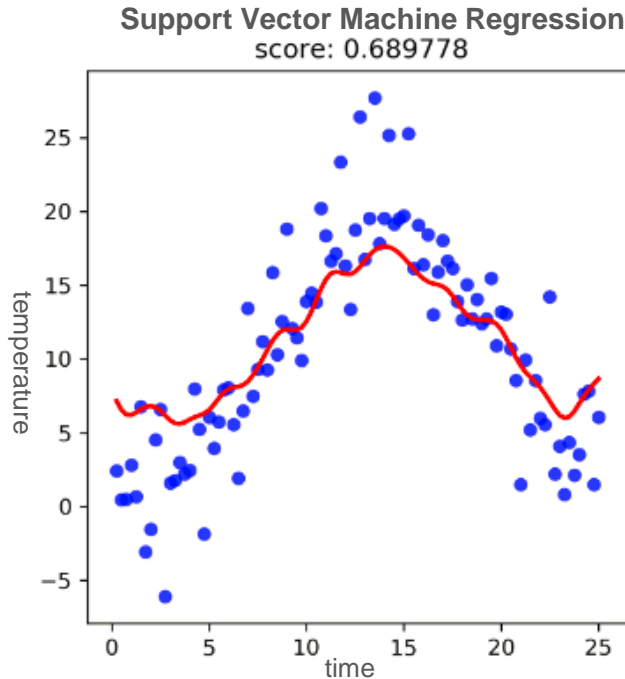# Query B -- Temperature in a Period at a Spot

Continuous query result :

Figure 2 Support Vector Machine Regression
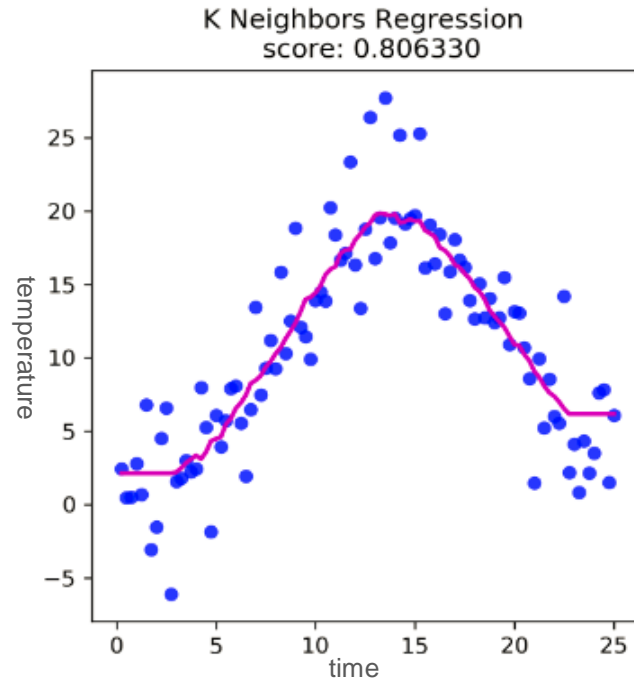for temperature in a spell at particular location

Figure 3 K Neighbors Regression
for temperature in a spell at particular location

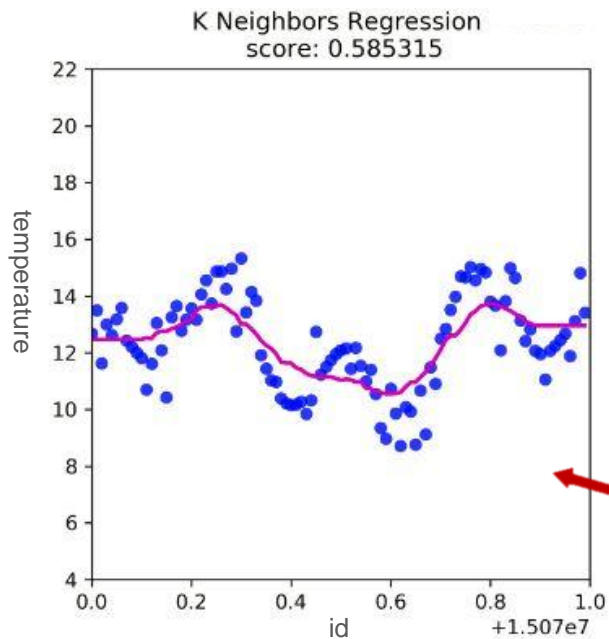# Query C -- Temperature of an Area in a Moment

Continuous query result :

Figure 4 K Neighbors Regression
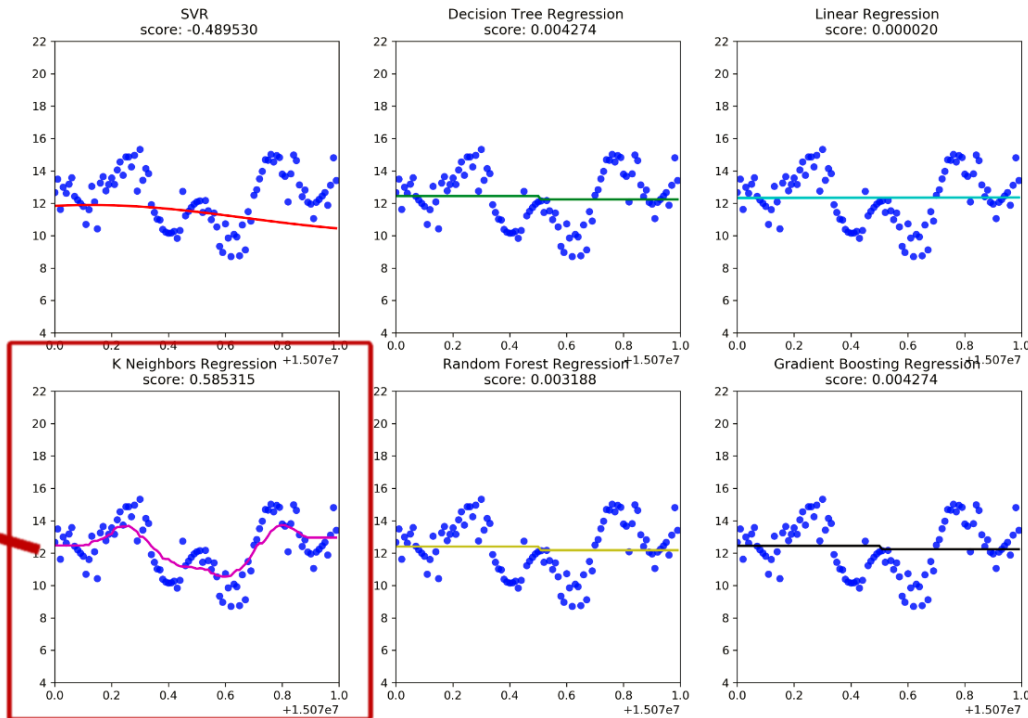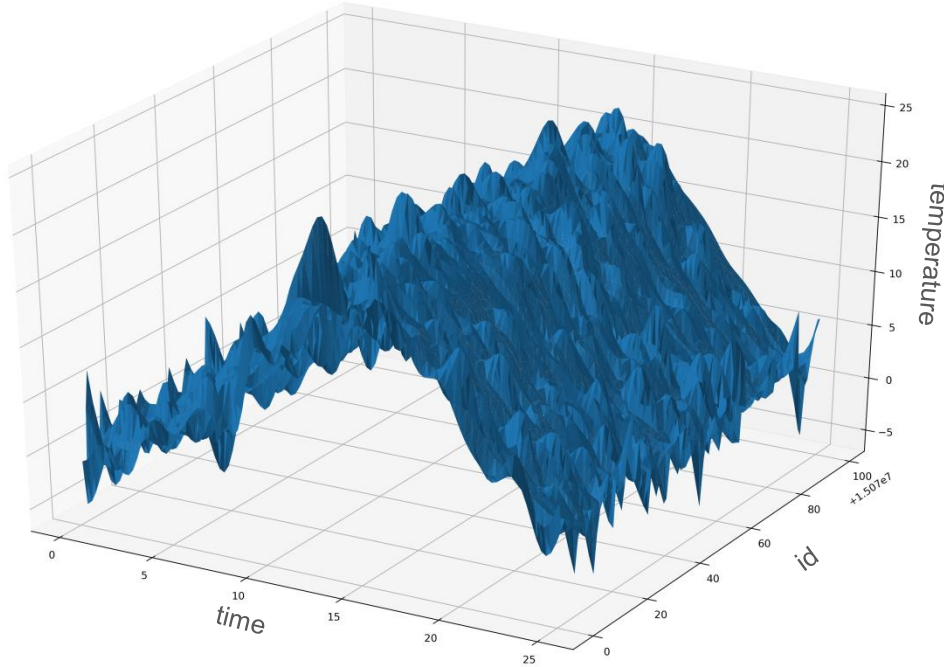for temperature in a particular time in areas

Figure 5 Six regression methods for temperature in a particular time in areas

Query D -- Temperature of an Area in a Period
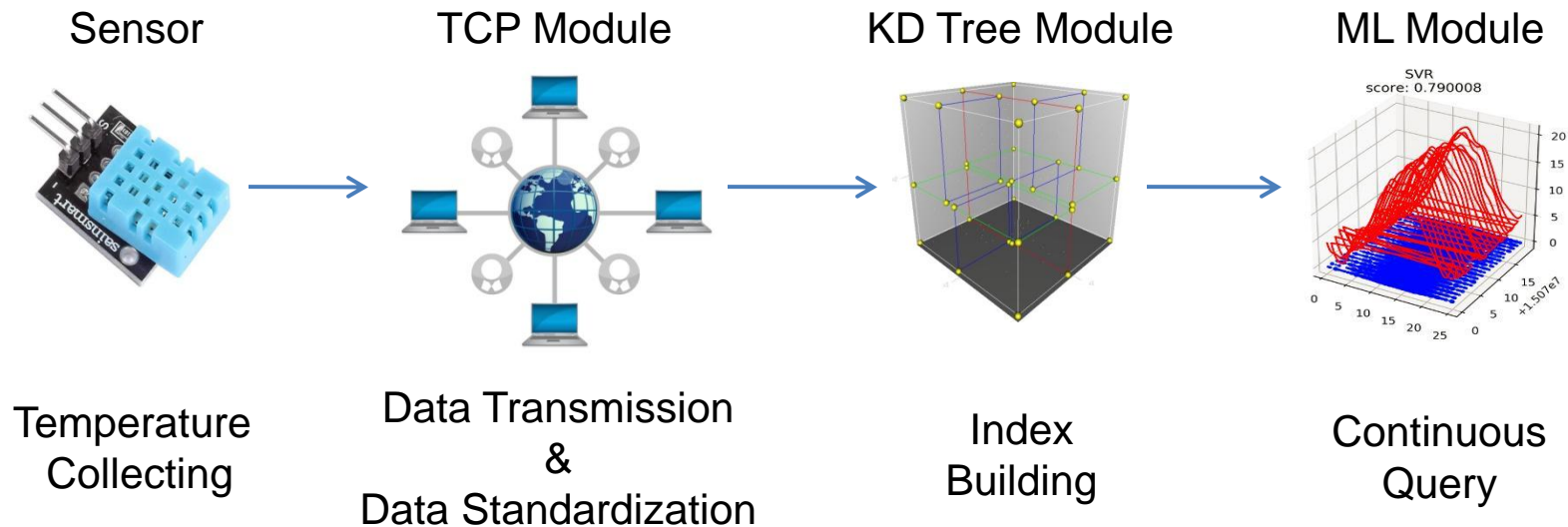
Continuous query result :

Figure 5 Support Vector Machine Regression for temperature in a spell in areas
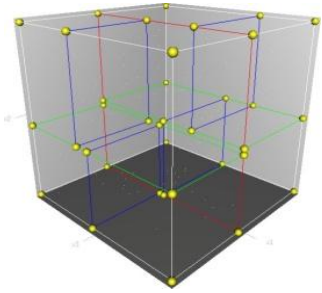
- Fitting the 3D data set into hyper plane

- Innovation

IoT Data Analysis Platform

Live Demonstration

Conclusion
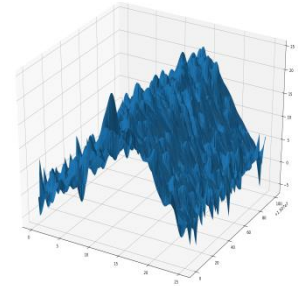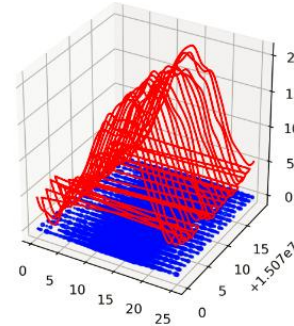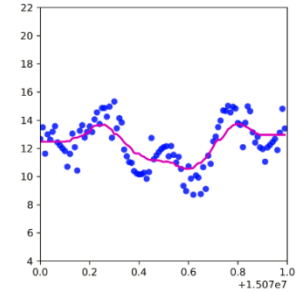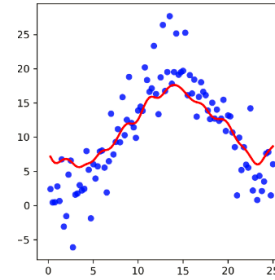
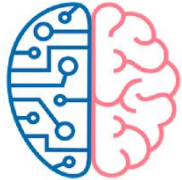- Index for Static Model – KD Tree
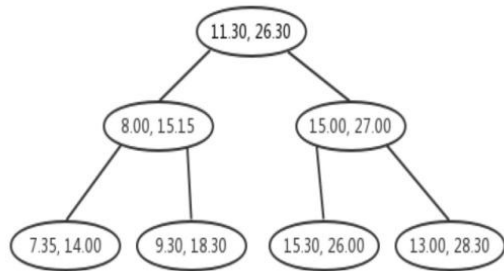
- Continuous Query – Machine Learning

Sensor

Conclusion

Intelligent Logistics

Intelligent Agriculture

Smart Tourism

Smart City

Intelligent
Medical Treatment

Smart Transportation

Thanks for Listening