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Paper 1: *"A Practical Evaluation of Information Processing and Abstraction Techniques for the Internet of Things"*

DOI – *"10.1109/JIOT.2015.2411227"* **|** (Published in: *"IEEE Internet of Things Journal"*)

Conclusions and Findings

- Surveyed distinct IOT data abstraction techniques and research, and explained the challenges in current frameworks and applications
- Introduced a generic workflow for analysing data from IOT devices as an attempt to reduce domain dependency existing in most frameworks
- Created a tool KAT, to visualise and analyse any small scale static IOT data with options for Pre-Processing, Dimension Reduction, Feature extraction and representation options
- IOT devices suffer from energy, communication and processing efficiencies.

Technological Insights

- The tools present for IOT data visualization and analysis such as rapid miner and Orange lack big data handling and real time processing
- Feature abstraction is user/network centric. eg. current state of the door or patterns in door movements to gage higher context data such as office end time, meetings etc.
- Feature abstraction in form of sequential occurrences can be done through Hidden Markov Model which is a combination of clustering and time series analysis of data
- IOT devices scaled over vast geographies such as geosensors suffer communication issues leading to scalability problems

Insights on Processing Scalability

- For IOT devices, scalability faces the constraint of lack of more domain generic approaches to extract and analyse data
- IOT devices' data face high dimensionality, communication bottlenecks and complexity due to temporal element in the data
- The reduction of dimensions is different from lossless data compression techniques in that it can lead to loss of important features such as outliers
- Cost of communication can be reduced using band pass filters or mathematical and statistical techniques, eg. moving averages, correlation etc.

Paper 2: *"Edge Computing: Vision and Challenges"*

DOI – *"10.1109/JIOT.2016.2579198"* **|** (Published in: *"IEEE Internet of Things Journal"*)

Conclusions and Findings

- Defined edge computing and explained with case studies and examples. Introduced the idea of an edgeOS to manage and analyse IOT data easily at the edge to make the devices smarter
- Explained the trade offs between two extremities of data handling – Total Cloud Computing Vs Edge Computing
- Highlighted challenges such as collaborative edge computing, flexible programming streams and data abstraction to inspire research
- Explained workload parameters that need to be tuned for balance b/w edge computing and cloud

Technological Insights

- Edge can help in processing, storage and cashing of data. Eg. cart page of e-com apps, navigation and gaming apps
- Service management of IOT devices face challenges of differentiation, flexibility and reliability of devices
- The application of collaborative edge computing will make it possible to make real time decisions easily and plan much better for future such as in healthcare combining symptoms data with prescriptions and pharmacy billing data
- Development of novel costing strategies for dynamic process streams between devices and cloud

Insights on Processing Scalability

- The increase in computational power of clouds cannot be efficiently utilized without improvement of communication networks' latency issues
- The scalability is also challenged here because of device specific architectures in contrast to single source architecture of cloud
- Scaling of IOT must optimise for data privacy, energy requirement and naming strategies
- Cloud offloading can increase scalability by extracting features from low level IOT data thereby reducing both cloud computation cost and increasing response time