M2SMART LAB AT IITH (JAN 2020)

# M2Smart NewsLetter

Vol.7

March 2020

JST MID TERM REVIEW AT IITH

## JST Mid-Term Review at IITH

by Haruka Katarao, M2Smart Resident Coordinator

### Showcasing M2Smart Project in Hyderabad and Ahmedabad!

Japan Science and Technology Agency (JST) conducted the Mid-term review for the M2Smart Porjcet at the Indian Institute of Technology Hyderabad (IITH) on 27 January and in Ahmedabad on 29 January 2020.

At the IITH, JST also conducted the on-sight visit of the IITH Test-bed and M2Smart Lab.

In Ahmedbad, M2Smart project conducted Workshop and received the Ahmedabad smart-city related authorities and relevant institutions members for showcasing the current M2Smart Project in Hyderabad and Ahmedabad.

*JST Mid-Term Review*

*IITH Test-bed on sight visit*

*Ahmedabad Workshop*

# Deep Learning-Based SmartParking Solution using Channel State Information inLTE-based Cellular Networks

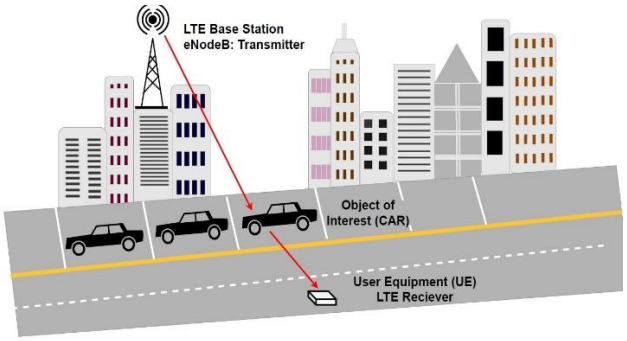
by Abhinav Kumar (Group 2) and Amala Sonny and Prabhat Kumar Rai

Amala Sonny is working on Development of a wireless signal based Smart Parking system in M2SMART project along with Mr. Prabhat Kumar Rai. We are working with Dr. Abhinav Kumar. I presented a poster based on our work related at COMSNETS 2020, held at Bangalore from 6th to 12th of January 2020. The title of the paper is "Deep Learning-Based Smart Parking Solution using Channel State Information in LTE-based Cellular Networks". In this work, we proposed a novel approach to detect and localize cars in a parking area with the help of deep learning. The wireless data collected from the parking area is used to train the DL model and the system will provide the real time location of cars and the vacant parking spaces available in the parking slot. The system is more reliable and less complex as it does not need a transmitter. The data collection set up and the flow chart of the proposed system is given below.

Objectives:

- To find out the total number of cars present in the parking space.
- To localize the position of the cars in the parking space.

Data Collection Set up:




• The LTE downlink signal acquired using USRP B210 and VERT2450 antenna SDR platform.
• Operates on LTE passband frequency range of 2300MHz to 2400MHz.
• The data captured for different number of cars located at various positions in the parking space.
• All the processing is done using srsLTE software with C language.

System Flow Chart:

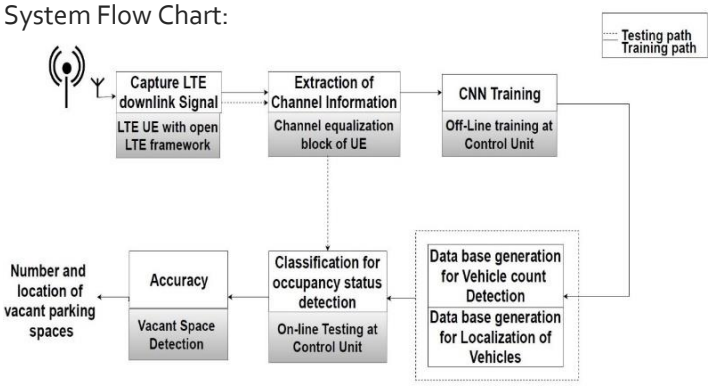



Table 1: Classification Performance Analysis for finding the Number of vehicles in a parking space.

| | Test Analysis | | | | |
|---|---|---|---|---|---|
| Methods | Training samples | Testing samples | Accuracy | FRR | FAR |
| LTE with PCA | 600 | 300 | 53.8 % | .4612 | 0.1537 |
| LTE with SVM | 600 | 300 | 52.12 % | .4788 | .1596 |
| LTE with CNN | 600 | 300 | 95 % | .0500 | 0.0167 |

Table 2: Classification Performance Analysis for finding the location of vehicles in a parking space.

| | Test Analysis | | | | |
|---|---|---|---|---|---|
| Methods | Training samples | Testing samples | Accuracy | FRR | FAR |
| LTE with PCA | 600 | 300 | 13.75 % | 0.8625 | 0.2875 |
| LTE with SVM | 600 | 300 | 49.375 % | .5062 | .1688 |
| LTE with CNN | 600 | 300 | 90 % | .1000 | .0333 |

Numerical results are given in terms of accuracy.

# Study on Cyber-Security for IoT Edge Utilizing Pattern Match Accelerator

by Hiroyuki Hosono (Group 1)

A malware detection algorithm that can be embedded in IoT edge computing is proposed in this study and validated using an emulator. This algorithm, with a pattern match accelerator, reduces the computing cost while maintaining a relatively high detection accuracy. For autonomous driving, complicated IoT edge computing must have a huge amount of embedded program codes. In such a situation, the invasion of malware can lead to compromised cybersecurity. In this study, a pattern match accelerator is implemented for such issues, thereby offering IoT edge computing that detects malware automatically. Edge computing is designed to apply simply structural level analysis algorithms using HLAC mask pattern (Fig.1). We developed a pseudo-emulator system environment (Fig.2) and conducted performance confirmation of the proposed technique using 641 chosen samples from six types of malware families. The algorithm's efficiencies demonstrated an identification performance of approximately 80%. In comparison to characteristic extraction using AI, the computing cost was reduced and these processes enable edge computing with high cybersecurity features.

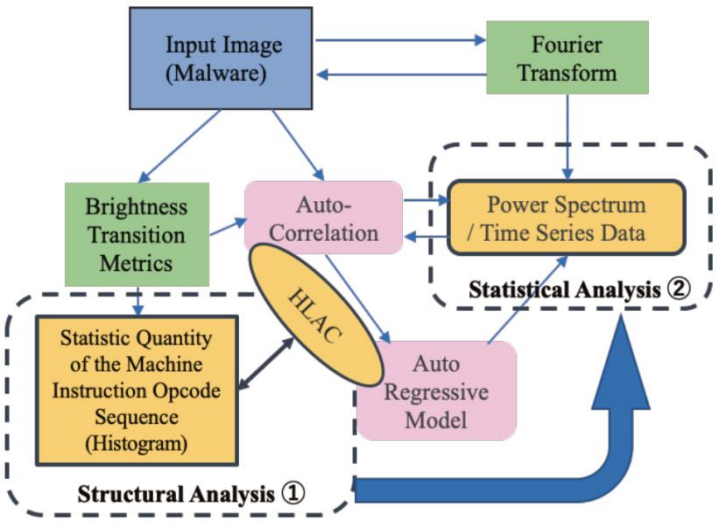



*Fig.1 Relationship of Statistics applied to Malware Analysis.*

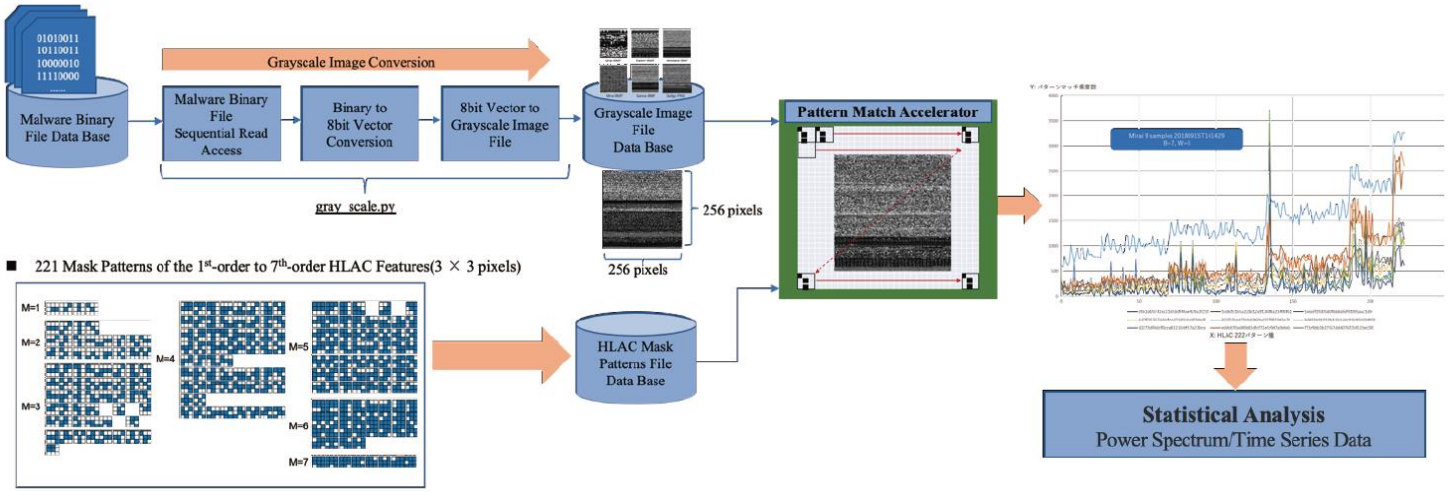


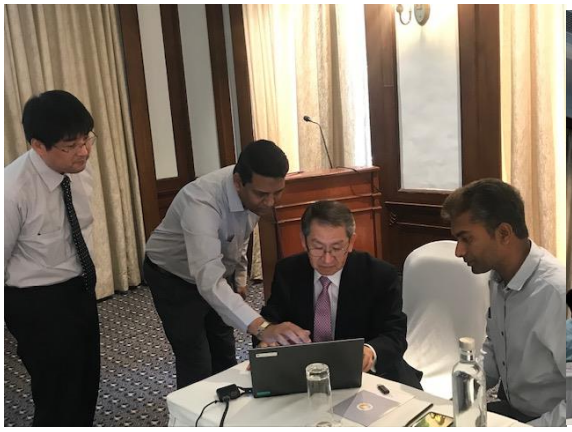

*Fig.2 a Pseudo-Emulator System*

# Publications

### Conference poster presentation

- Amala Sonny, Prabhat Kumar Rai, Abhinav Kumar, Mohammed Zafar Ali Khan, "Deep Learning-Based Smart Parking Solution using Channel State Information in LTE-based Cellular Network",09 March 2020.

# JST Mid-Term Review in Ahmedabad Photo Gallery





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