

IMLAB 결과 발표

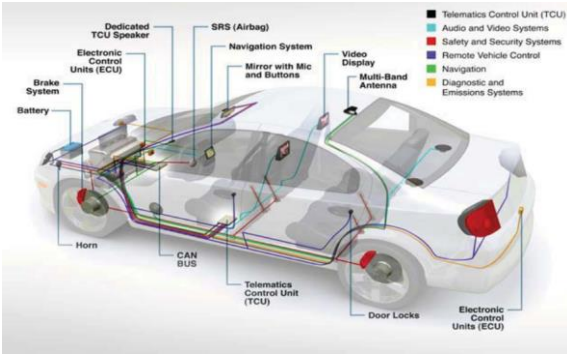
IMLAB (국민대학교)
김민석 정다운
18.11.30

목차

- Model
- Preprocessing
- Convolution Neural Network
- Post-processing
- Conclusion

Model

1) Data preprocessing



Preprocessed data

2) Training(CNN)

Preprocessed data

Our CNN
Algorithm

Learned
CNN

3) Identification

Who is unknown driver?

Learned
CNN

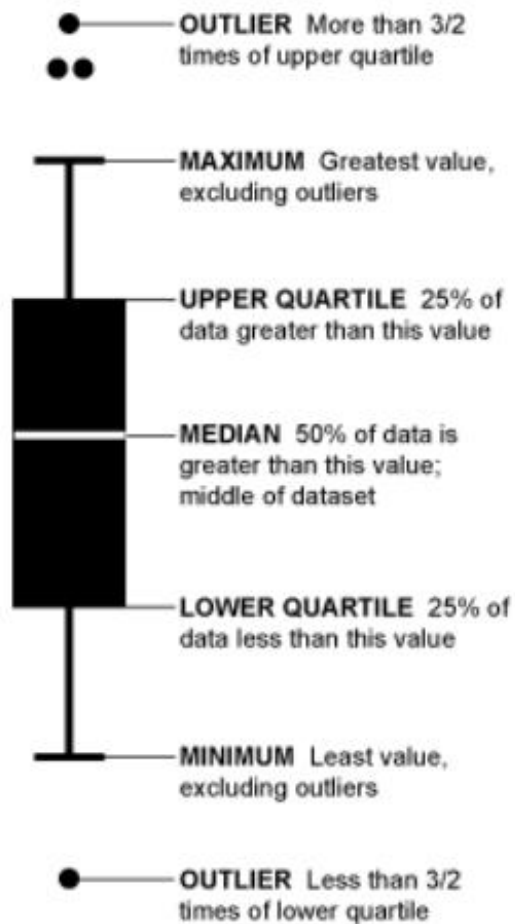
Driver ID

Preprocessing

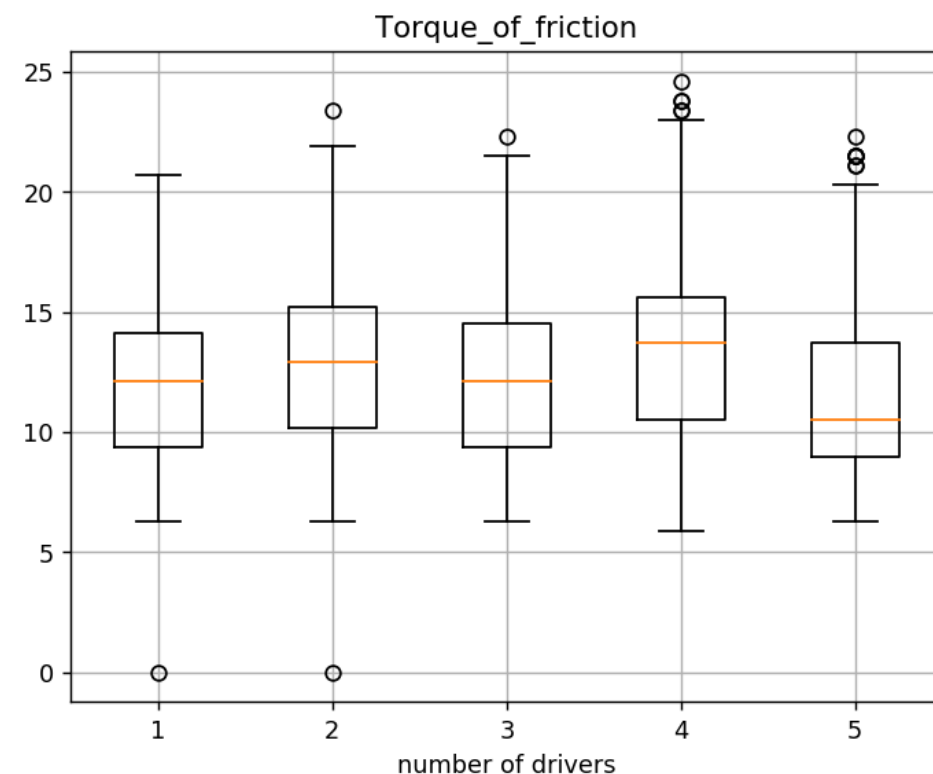
데이터 전처리 과정

1. 각 운전자별로 나눈다.
2. 운전자마다 가지고 있는 특징을 추출하기 위해 P_value, Boxplot을 이용하여 센서를 선택한다.
3. 해당 센서들만 가지고 데이터를 재추출하여 센서들의 값을 각각의 범위에서 정규화 하여 데이터셋을 만든다.

Preprocessing



센서로 선정되지 못한 데이터

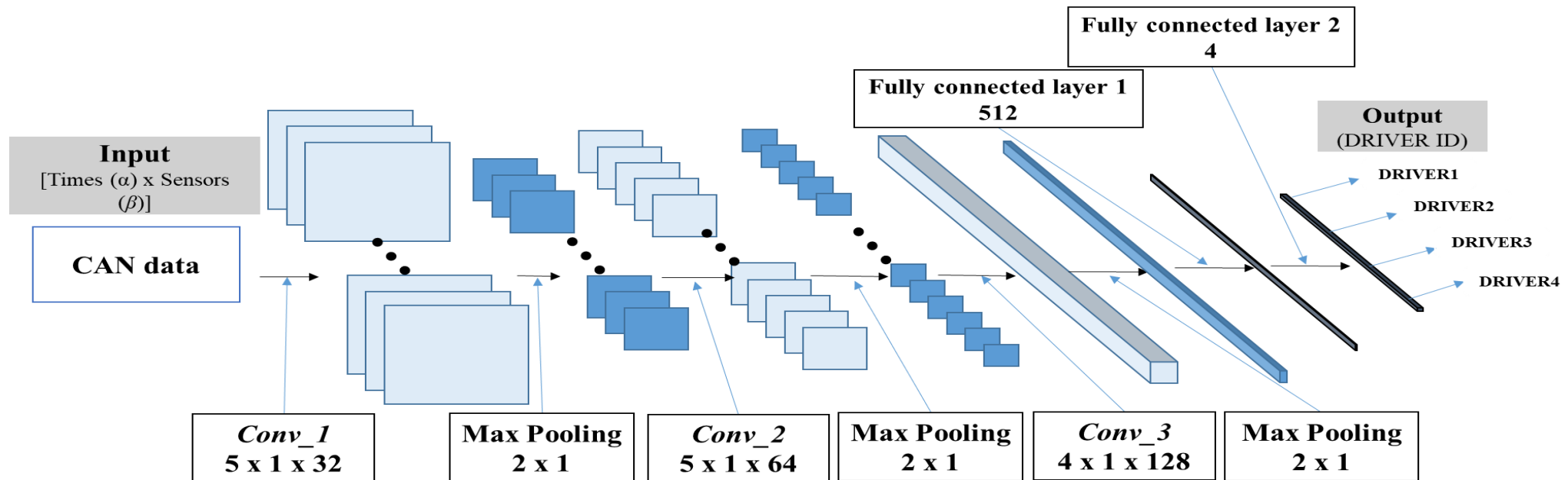


센서로 선정된 데이터

Boxplot 의미

Convolution Neural Network(CNN)

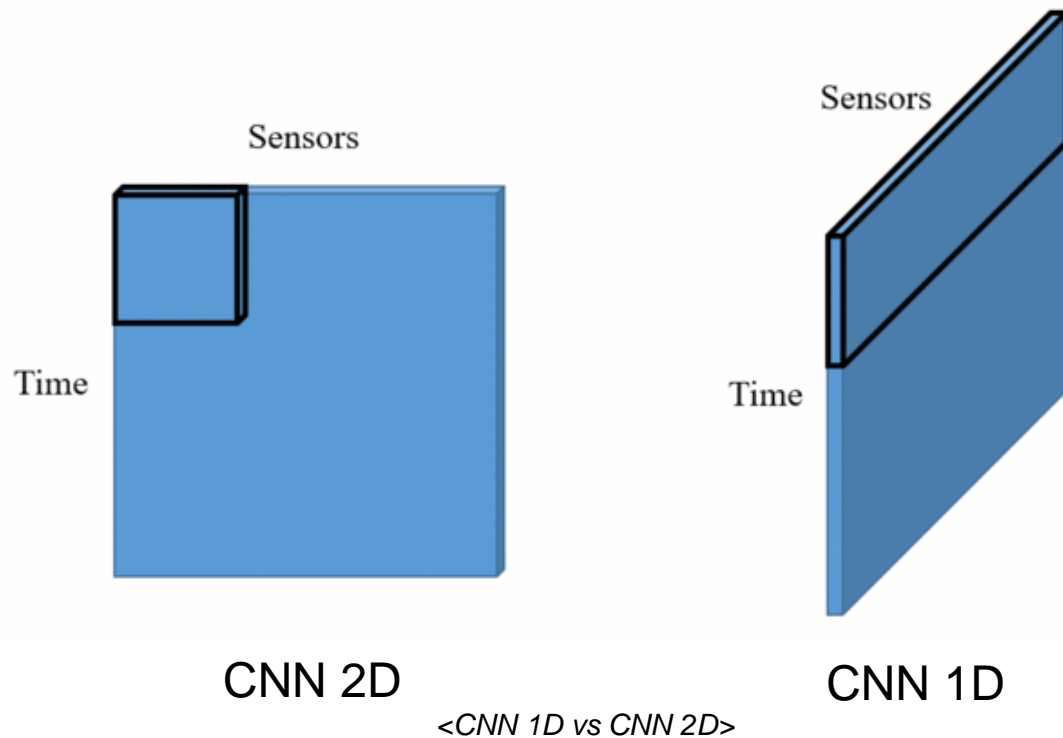
- tensorflow + Python 사용
- Using **1D CNN**(Specialized in data discrimination)
- Input : **Preprocessed CAN Sensor data** for "T" seconds
- Output : **Driver ID**
- CNN architecture: **3** convolutional layers, **2** fully connected layers, and **2** max pooling layers



<CNN architecture>

Convolution Neural Network(CNN)

- CNN 2D 대비 CNN 1D는 시간 감소 및 하나의 장면을 볼 수 있다.
- 실제 구동시 정확도 14% 증가.



Post-Processing

- 딥러닝의 낮은 정확도를 개선하기 위해 Post-Processing 진행하였다.
- 다수결 원칙을 이용한다.
- 가장 많이 나온 운전자를 현재 운전자라고 인식한다.

Driver1	Driver1	Driver2	Driver1	Driver3	Driver4	Driver1	...
Driver1 : 1 Driver2 : 0 Driver3 : 0 Driver4 : 0	Driver1 : 2 Driver2 : 0 Driver3 : 0 Driver4 : 0	Driver1 : 2 Driver2 : 1 Driver3 : 0 Driver4 : 0	Driver1 : 3 Driver2 : 1 Driver3 : 0 Driver4 : 0	Driver1 : 3 Driver2 : 1 Driver3 : 1 Driver4 : 0	Driver1 : 3 Driver2 : 1 Driver3 : 1 Driver4 : 1	Driver1 : 4 Driver2 : 1 Driver3 : 1 Driver4 : 2	
↓	↓	↓	↓	↓	↓	↓	
Driver1	Driver1	Driver1	Driver1	Driver1	Driver1	Driver1	

<Example of post processing>

Conclusion

P-Value

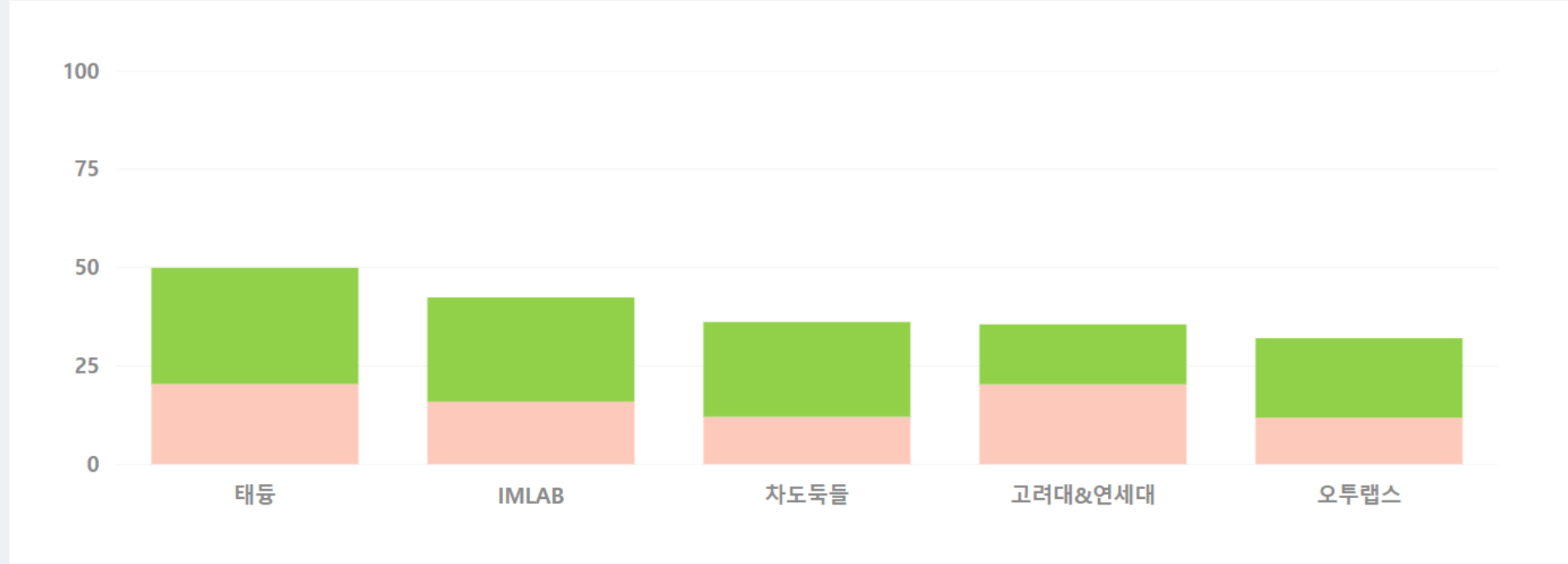
Combination of Sensor (number of sensors)	Sensor name	Accuracy (%)
All Sensor(7)	Calculated_LOAD_value, Accelerator_Pedal_value, Long_Term_Fuel_Trim_Bank1, Torque_of_friction, Intake_air_pressure, Engine_speed, Vehicle_speed	23.3
Combination of sensors related to car status(6)	Calculated_LOAD_value, Accelerator_Pedal_value, Torque_of_friction, Intake_air_pressure, Engine_speed, Vehicle_speed	45.4
Combination of sensors related to car status(5)	Accelerator_Pedal_value, Torque_of_friction, Intake_air_pressure, Engine_speed, Vehicle_speed	48.2
Combination of sensors operated by the driver (3)	Accelerator_Pedal_value, Engine_speed, Vehicle_speed	60.1
Combination of sensors operated by the driver (3)	Accelerator_Pedal_value, Vehicle_speed	56

Layer 및 구조 변경

Techniques	Summary	Accuracy (%)
CNN 2D	Common CNN used for image discrimination	28.3
CNN 2D + Normalization	Normalization is applied to adjust the range of all sensors to 0-1	56.5
CNN 1D + Normalization	CNN 1D specialized for data discrimination	70.2
CNN 1D + Normalization + Post-processing	Post-processing using CNN 1D and majority rule	88.3

Conclusion

태둥	IMLAB	차도독들	고려대&연세대	오투랩스
49.98%	42.45%	36.19%	35.58%	32.06%



차량주행 데이터기반 도난 탐지

팀명	1차 분류정확도	2차 분류정확도
태둥	40.832%	59.117%
IMLAB	31.904%	52.995%
차도독들	24.137%	48.236%
고려대&연세대	40.676%	30.48%
오투랩스	23.698%	40.428%



Thanks you