

주차장  
얼만큼 차 있나요

2017270934 배유진

# 목차

1. 소개
2. Data
3. Model
4. test

# 1. 소개

주차 전에 주차장에 얼마나 주차되어 있는 지, 남은 자리가 얼마가 있을 지 미리 알면 좋겠다는 생각으로 시작

Input

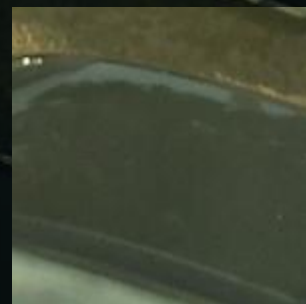
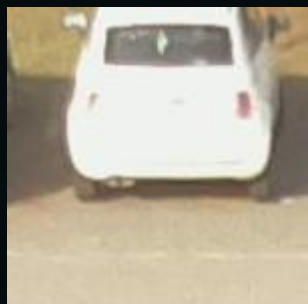
- \* 주차장 이미지

Output

- \* 주차장이 주차되어 있다면 **빨간색 박스**
- \* 비어 있다면 **초록색 박스**

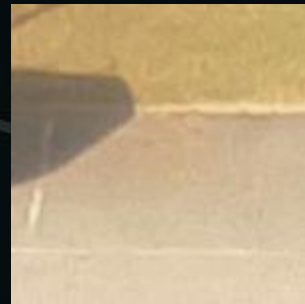
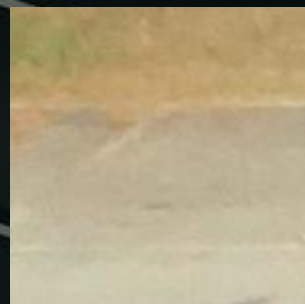
# 1. Data

busy



약 8000개

free



약 4000개

# 1. Data : preprocessing

1. Gray scale : 연산량 줄이기 위함

- \* Channel : 3  $\rightarrow$  1

2. Guassian blur : noise 줄임

- \* kernel 크기 : (7\*7) – 강하게 흐림

3. Adaptive threshold : 외곽선 따기

- \* 이미지 작은 영역별로 임계처리

- \*  $k = 5$  : block size(이미지 영역 크기)

- \*  $C = 1.5$  : 평균에서 차감할 값



# 1. Data : preprocessing

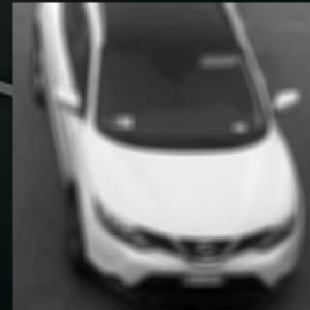
original



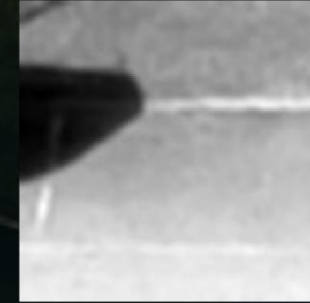
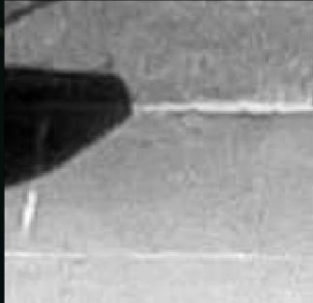
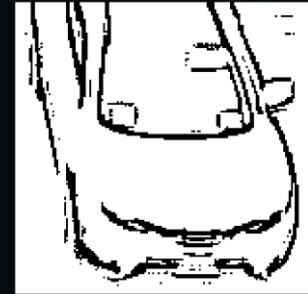
Gray  
scaling



Gaussian  
blur



Adaptive  
Threshold



# 2. Model

Supervised learning

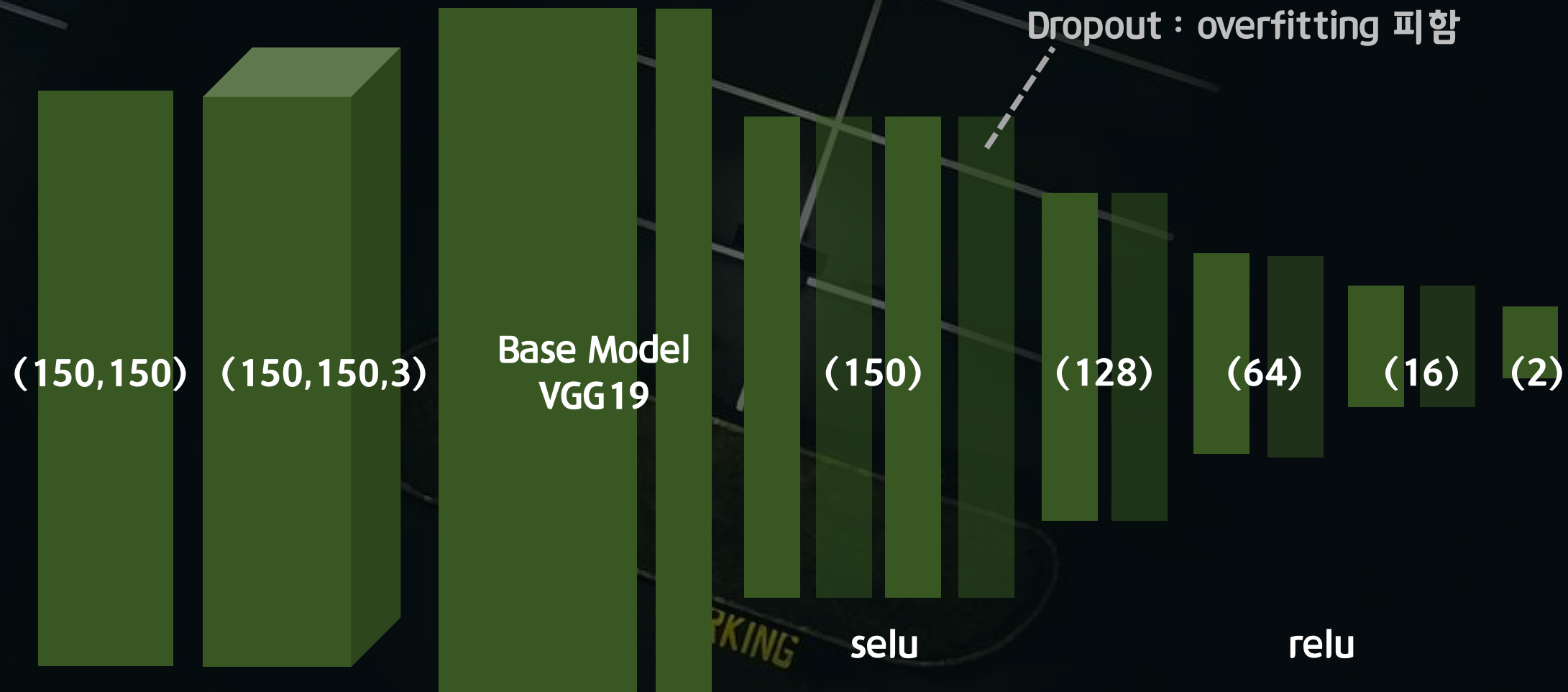
Base architecture : VGG19 (CNN)

- \* image 특징 추출
- \* 무난한 ImageNet 사용
- \* Lenet, Alexnet 보다는 성능이 좋음
- \* 연산량이 GoogLenet보다 많음

Output net : DNN

- \* ReLU, SeLU의 조합
- \* 마지막 분류시, softmax activation function 사용
  - \* 단일 라벨 분류이기 때문

# 2. Model





# 2. Model

## Details

### 1. class\_weights

- Busy data(8000개)
- Free data (4000개) – 더 큰 가중치 설정
- 불균형 해결

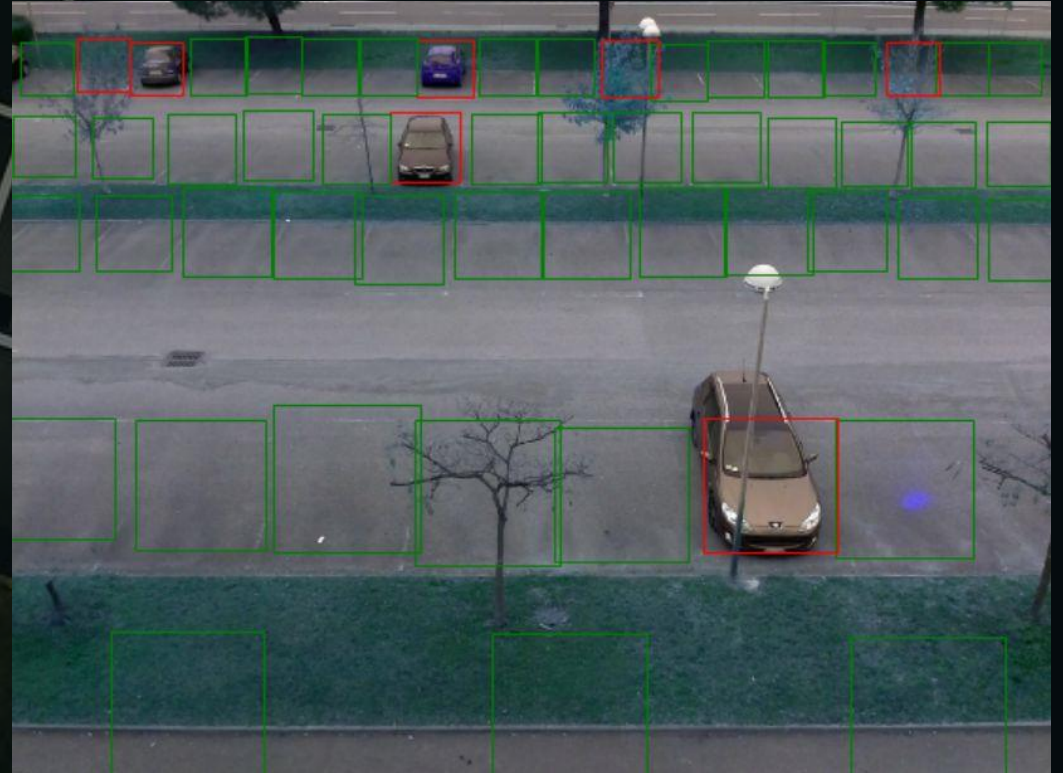
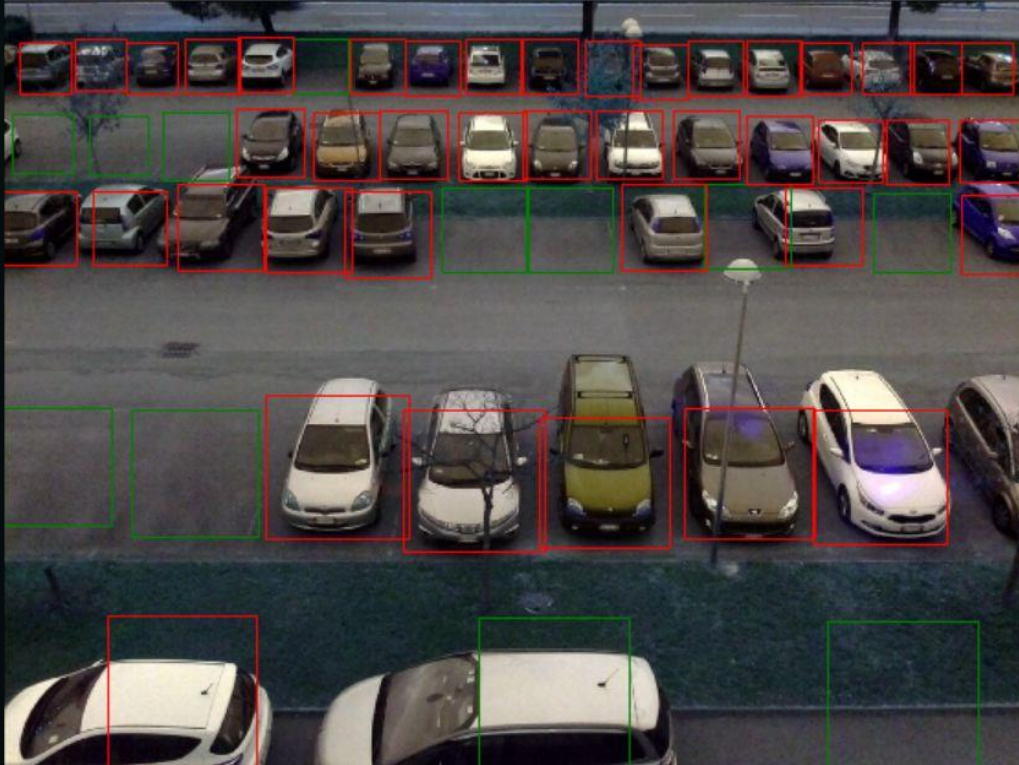
### 2. loss : categorical crossentropy

- Softmax loss
- Multi-label이 아닌 multi-class problem

### 3. Validation accuracy : 97%

```
- ETA: 12:22 - loss: 0.0538 - accuracy: 0.9792 ██████████
- ETA: 12:18 - loss: 0.0548 - accuracy: 0.9790 ██████████
- ETA: 12:15 - loss: 0.0537 - accuracy: 0.9794 ██████████
- ETA: 12:13 - loss: 0.0531 - accuracy: 0.9798 ██████████
- ETA: 12:09 - loss: 0.0538 - accuracy: 0.9796 ██████████
```

# 3. Test



PARKING

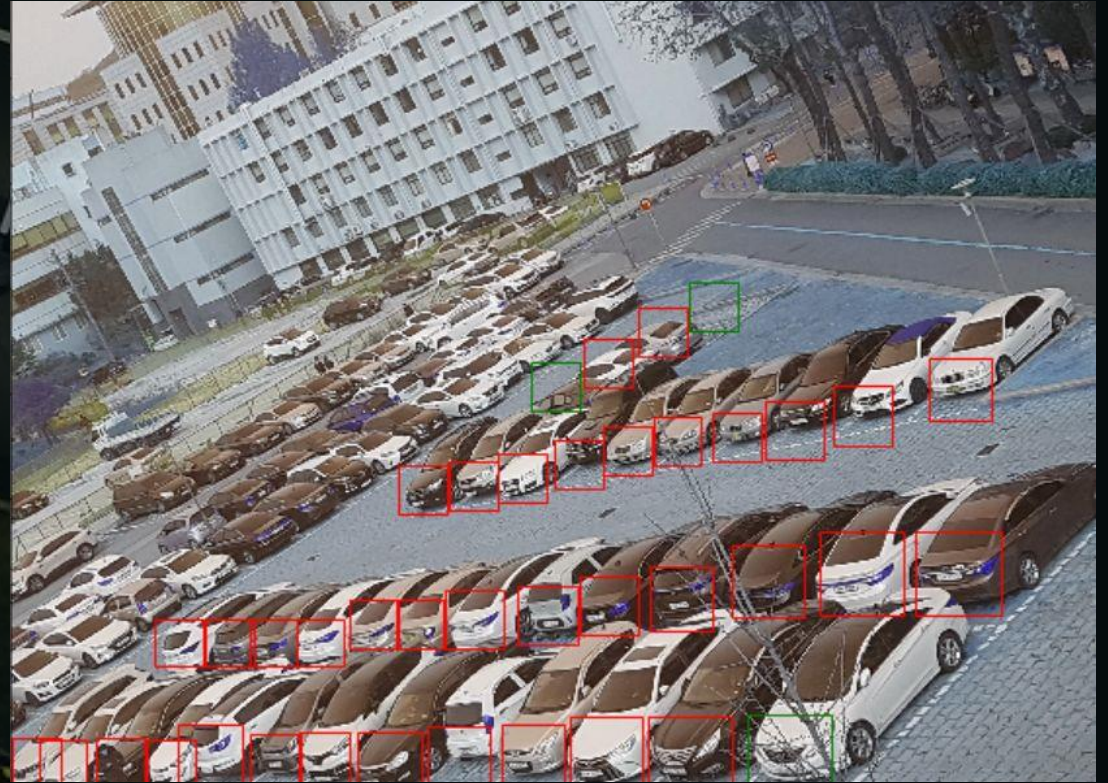


# 3. Test

original



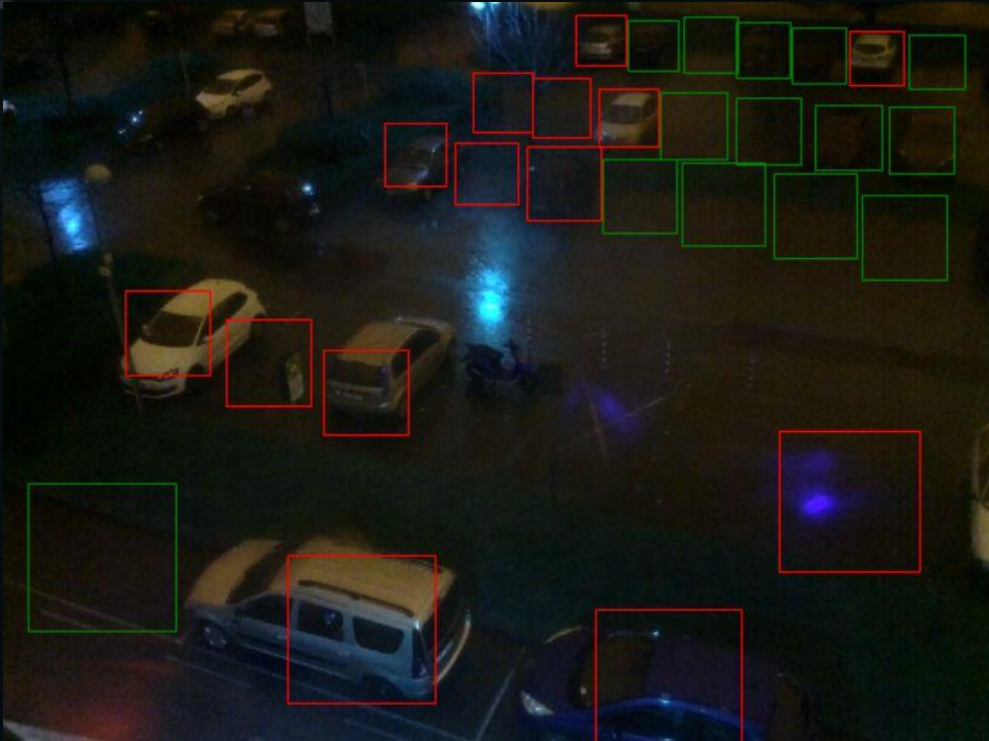
result



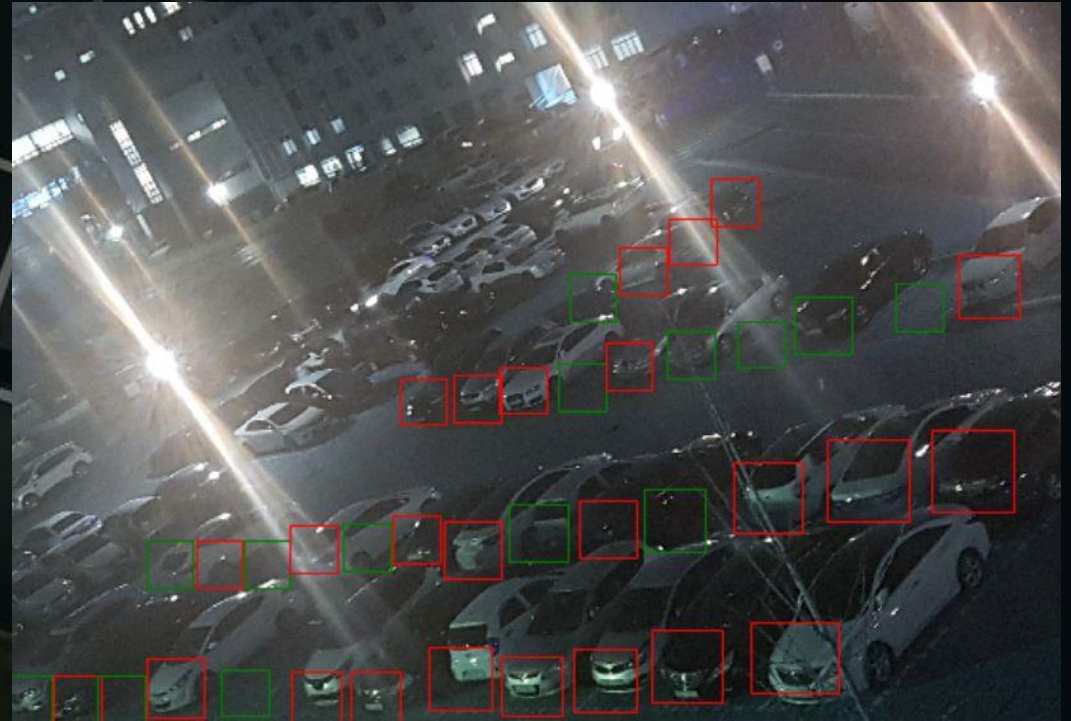
직접 찍은 학교 사진



### 3. Test : 아쉬운 점



밤 : 빛이 없음. 정확함



밤 : 빛이 있음. 부정확함

빛에 따라 정확도가 떨어지는 경향이 보임