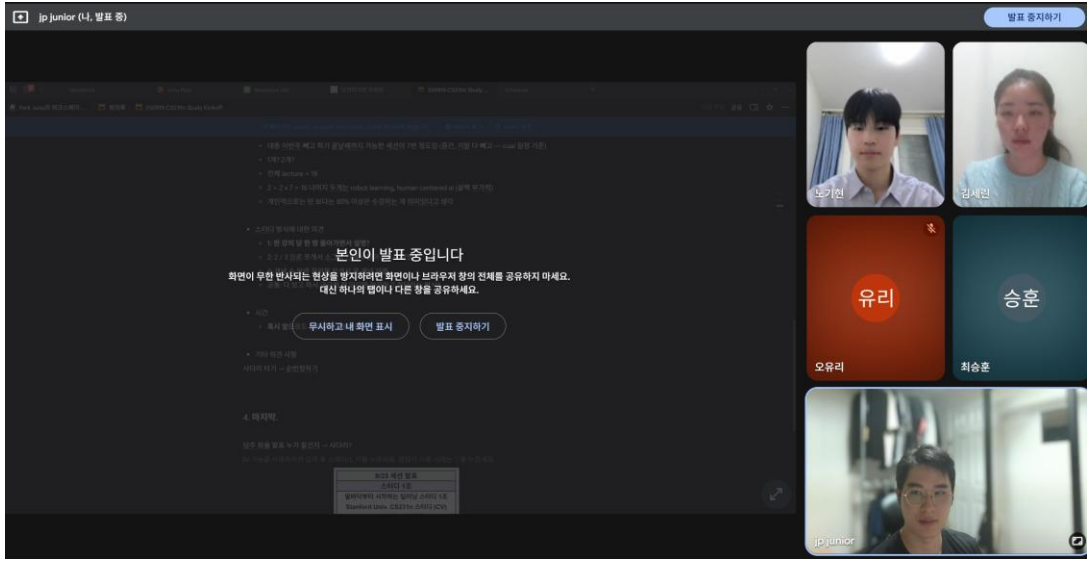
CUAI Standford Univ. CS231n스터디

2025.09.23

발표자 : 김세린

스터디원 소개 및 만남 인증



스터디원 1 : 김세린

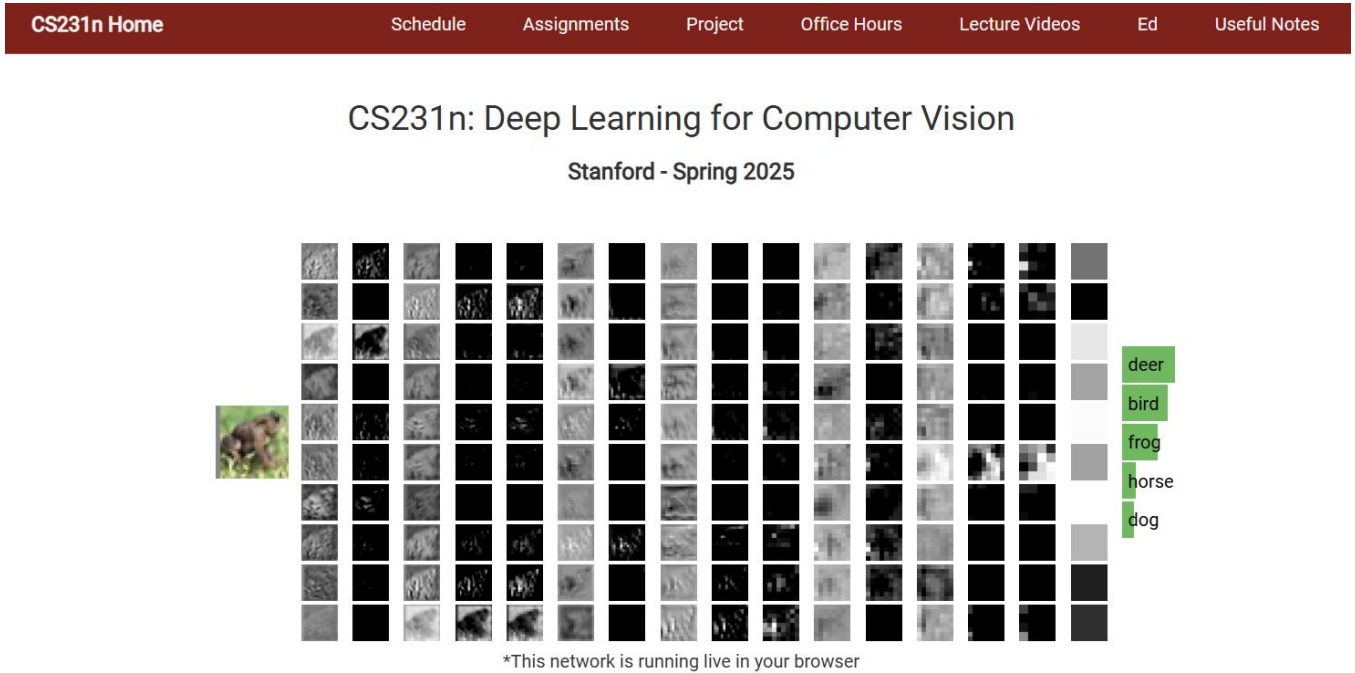
스터디원 2 : 노기현

스터디원 3 : 박준우

스터디원 4 : 오유리

스터디원 5 : 최승훈

스터디 주제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CS231n: Deep Learning for Computer Vision
Stanford - Spring 2025
deer
bird
frog
horse
dog
*This network is running live in your browser
Course Description
Computer Vision has become ubiquitous in our society, with applications in search, image understanding, apps, mapping, medicine, drones, and self-driving cars.

스터디 일정

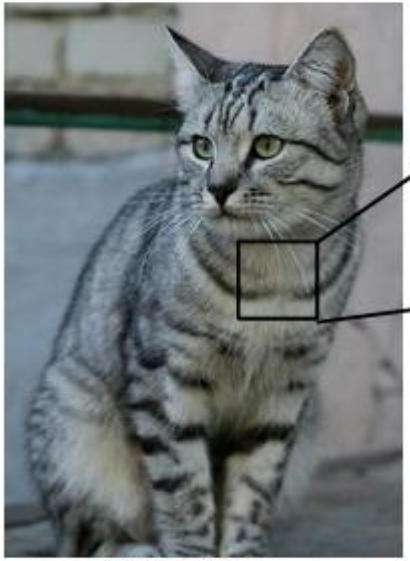
주차	날짜	내용
2-3주차	9/19	1, 2강
4주차	9/26	3, 4강
5주차	10/3	5, 6강
6-8주차	-	-
9주차	10/31	7, 8강
10주차	11/7	9, 10강
11주차	11/14	11, 12강
12주차	11/21	13, 14강
13주차	11/28	15, 16강
14-16주차	-	-

Image Classification

(assume given a set of possible labels)
{dog, cat, truck, plane, ...}

cat

Image Classification

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 [ 76  85  90 105 128 105  87  96  95  99 115 112 106 103  99  85]
 [ 99  81  81  93 120 131 127 100  95  98 102  99  96  93 101  94]
 [106  91  61  64  69  91  80  85 101 107 109  98  75  84  96  95]
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 [128 112  96 117 150 144 120 115 104 107 102  93  87  81  72  79]
 [123 107  96  86  83 112 153 149 122 109 104  75  80 107 112  99]
 [122 121 102  80  82  86  94 117 145 148 153 102  58  78  92 107]
 [122 164 148 103  71  56  78  83  93 103 119 139 102  61  69  84]]
```

What the computer sees

Image Classification

Machine Learning: Data-Driven Approach

1. Collect a dataset of images and labels
2. Use Machine Learning algorithms to train a classifier
3. Evaluate the classifier on new images

```
def train(images, labels):
  # Machine learning!
  return model
```

```
def predict(model, test_images):
  # Use model to predict labels
  return test_labels
```

Example training set

Nearest Neighbor Classifier

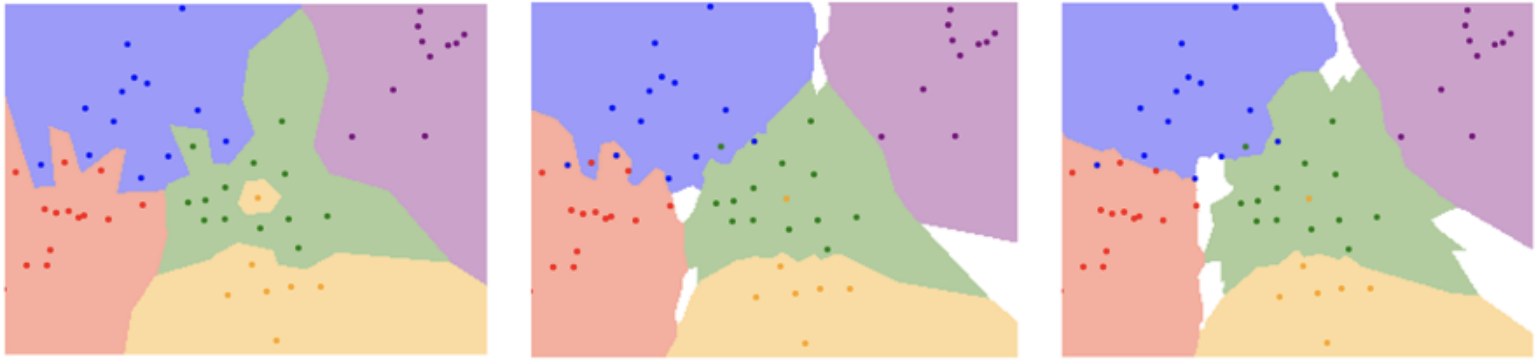
Training data with labels

query data

Distance Metric $\left| \quad , \quad \right| \rightarrow \mathbb{R}$

K-Nearest Neighbors

Instead of copying label from nearest neighbor,
take majority vote from K closest points



K = 1 K = 3 K = 5

K-fold Cross Validation

Setting Hyperparameters

train

Idea #4: Cross-Validation: Split data into folds, try each fold as validation and average the results

fold 1	fold 2	fold 3	fold 4	fold 5
fold 1	fold 2	fold 3	fold 4	fold 5
fold 1	fold 2	fold 3	fold 4	fold 5
fold 1	fold 2	fold 3	fold 4	fold 5
fold 1	fold 2	fold 3	fold 4	fold 5

test

Linear Classifier

$$f(x,W) = Wx$$

Image

Array of 32x32x3 numbers
(3072 numbers total)

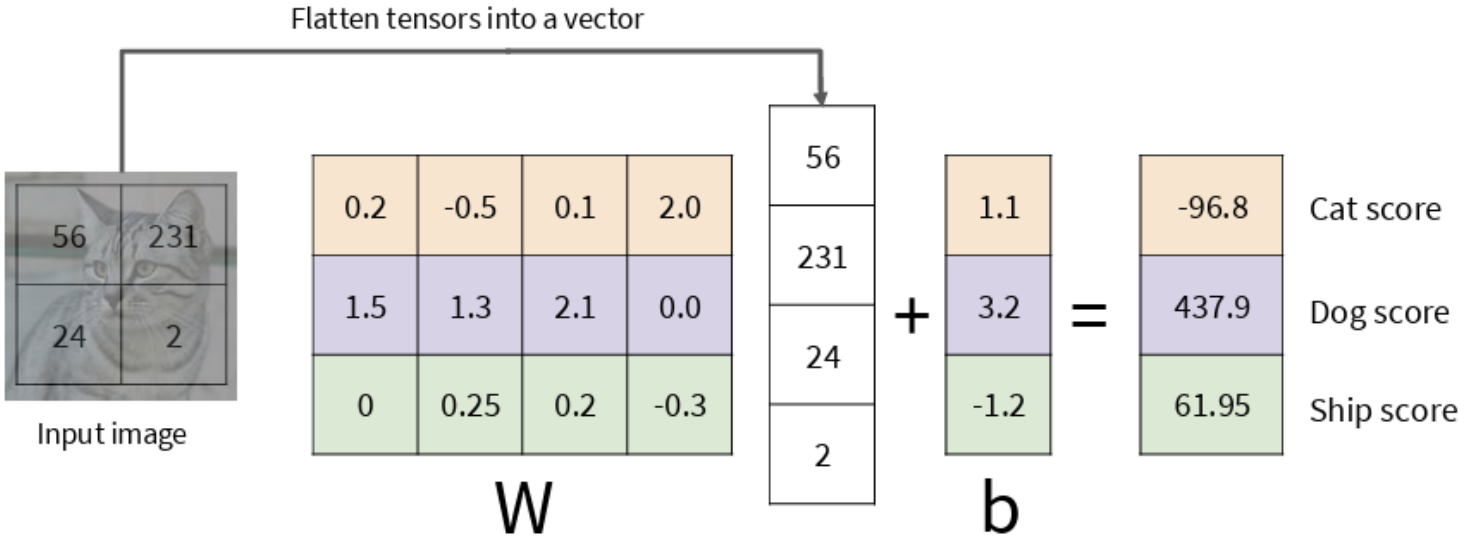
f(x,W)

10 numbers giving class scores

W

parameters or weights

Linear Classifier



Softmax Classifier

Want to interpret raw classifier scores as probabilities

$$s = f(x_i; W)$$

$$P(Y = k|X = x_i) = \frac{e^{s_k}}{\sum_j e^{s_j}}$$

Softmax Function

$$L_i = -\log P(Y = y_i|X = x_i)$$

Probabilities must be >= 0

Probabilities must sum to 1

	Unnormalized log-probabilities / logits	exp	unnormalized probabilities	normalize	probabilities	compare	Correct probs
cat	3.2		24.5		0.13		1.00
car	5.1		164.0		0.87		0.00
frog	-1.7		0.18		0.00		0.00

Cross Entropy

$$H(P,Q) = H(p) + D_{KL}(P\|Q)$$