Data-driven approaches - Lecture 2

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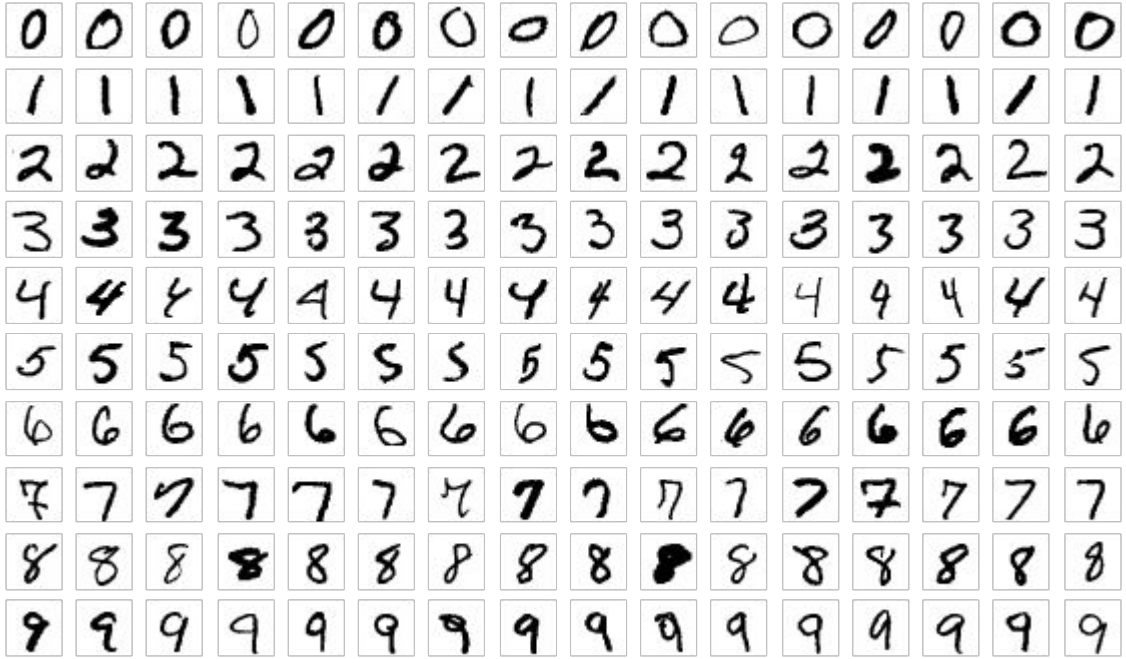
Administrative

1. Tutorial progress: ~~https://forms.gle/k1iZT23QqdHyuPGE7~~

2. Practice?

Task 1 - MNIST classifier

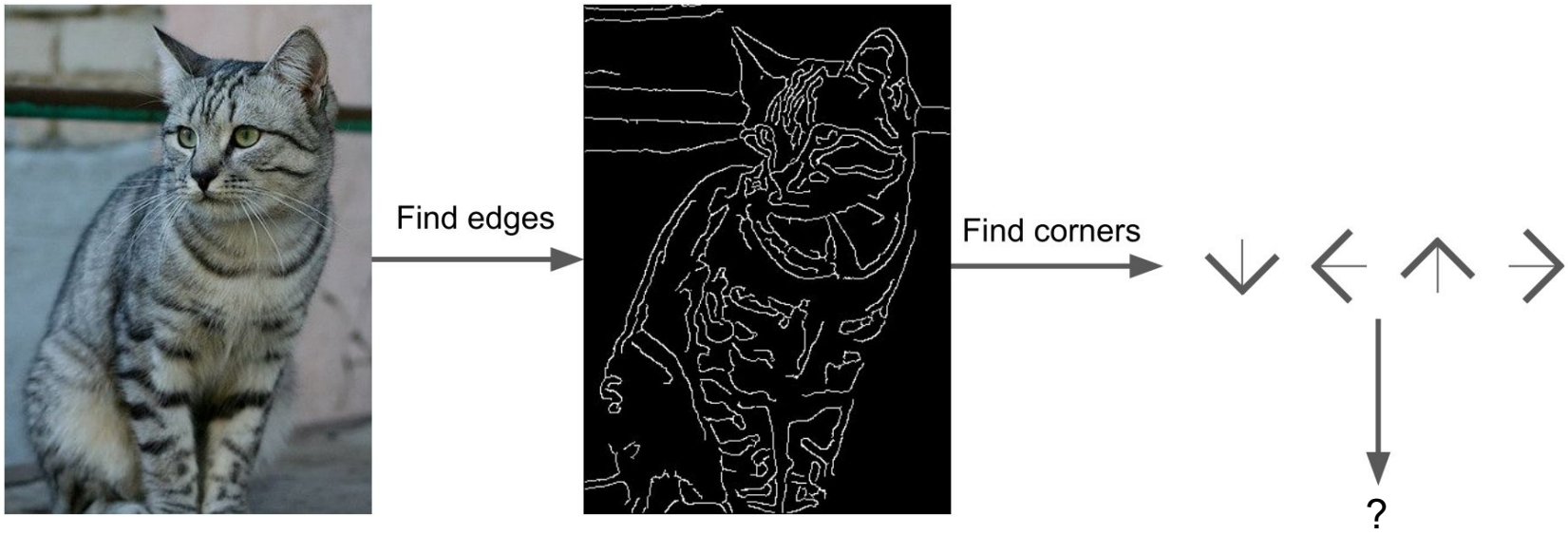
Handwritten digits between 0 and 9: 28×28 pixel grayscale images



Task 1 - MNIST classifier

1. The MNIST database of handwritten digits: http://yann.lecun.com/exdb/mnist/
2. MNIST in CSV: https://www.kaggle.com/oddrationale/mnist-in-csv
3. Google Colab: https://colab.research.google.com/drive/1rIPS5wCjcE-EhJBBKYzzsQB7ZLgmWwQ_#scrollTo=lB6PAstgKfp6
4. kNN: https://en.wikipedia.org/wiki/K-nearest_neighbors_algorithm
5. Deadline: **23:59 07.10.2020**
6. Competition:
   a. Features?
   b. Distance function?

Why data-driven approach?



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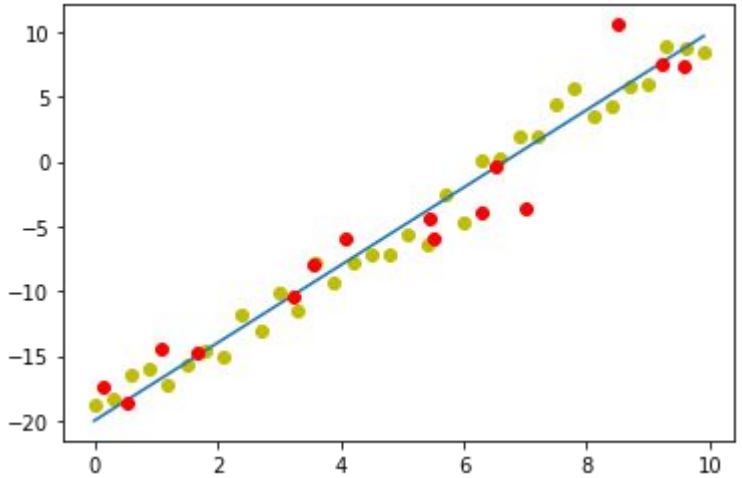
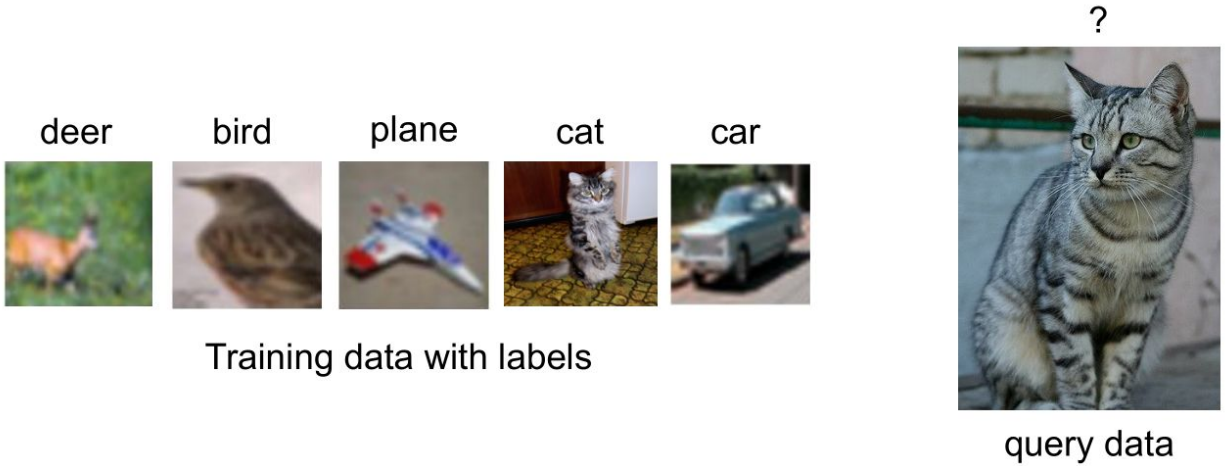
Data-driven approaches

Machine Learning:

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



kNN: k-nearest neighbors



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

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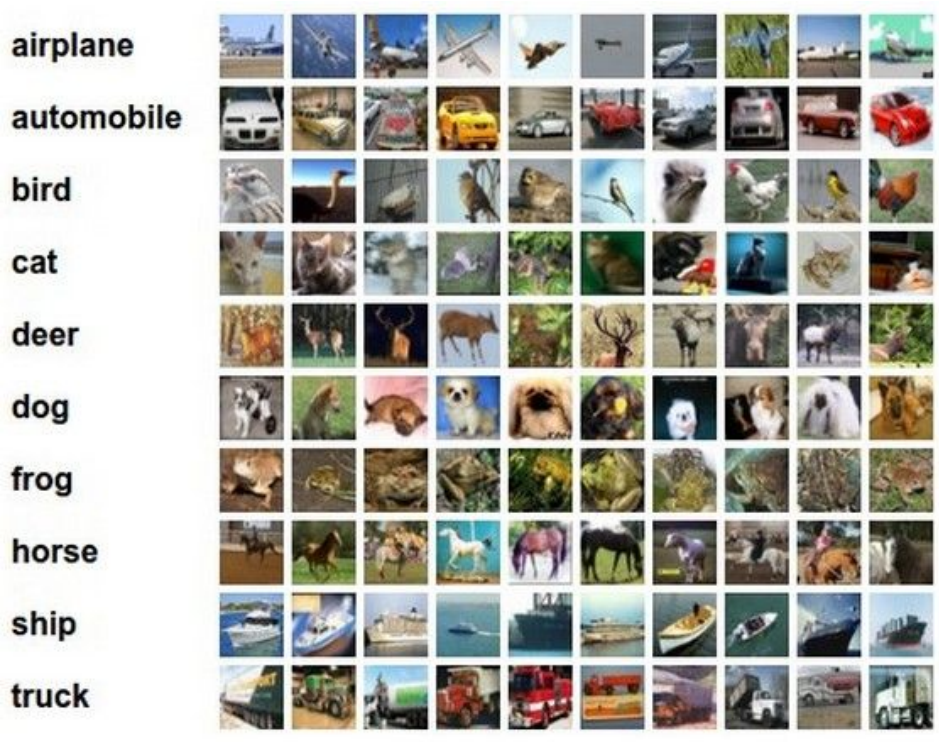
https://forms.gle/yvUNTkKYLP1TurAG7

CIFAR-10 and kNN



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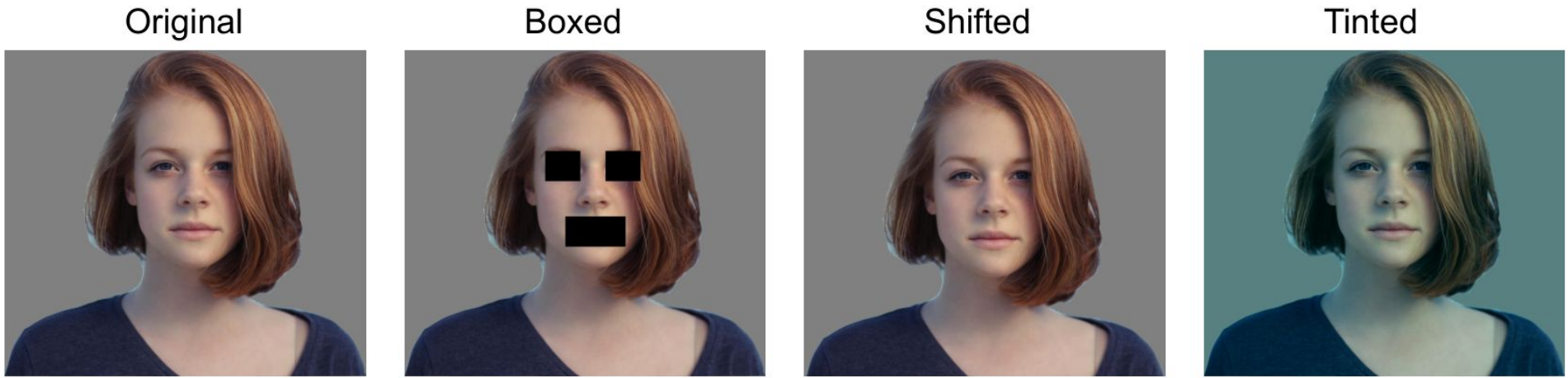
kNN

- Distance metrics on pixels are not informative
- Very slow at test time



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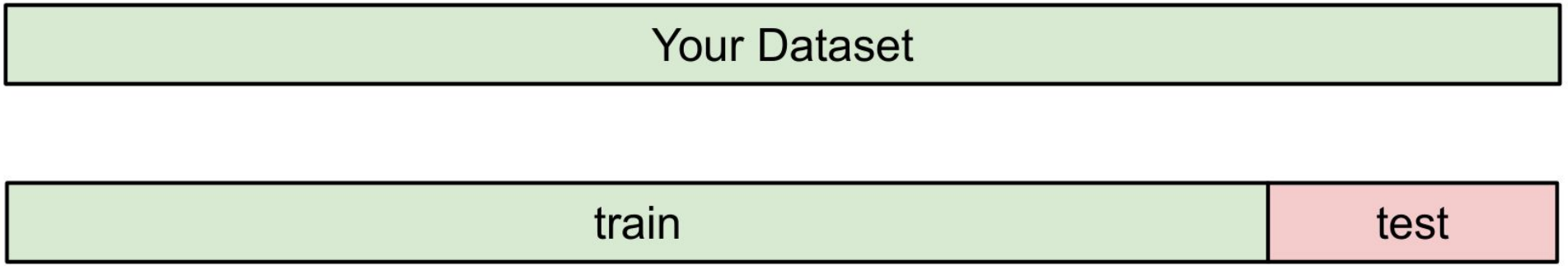
Setting Hyperparameters



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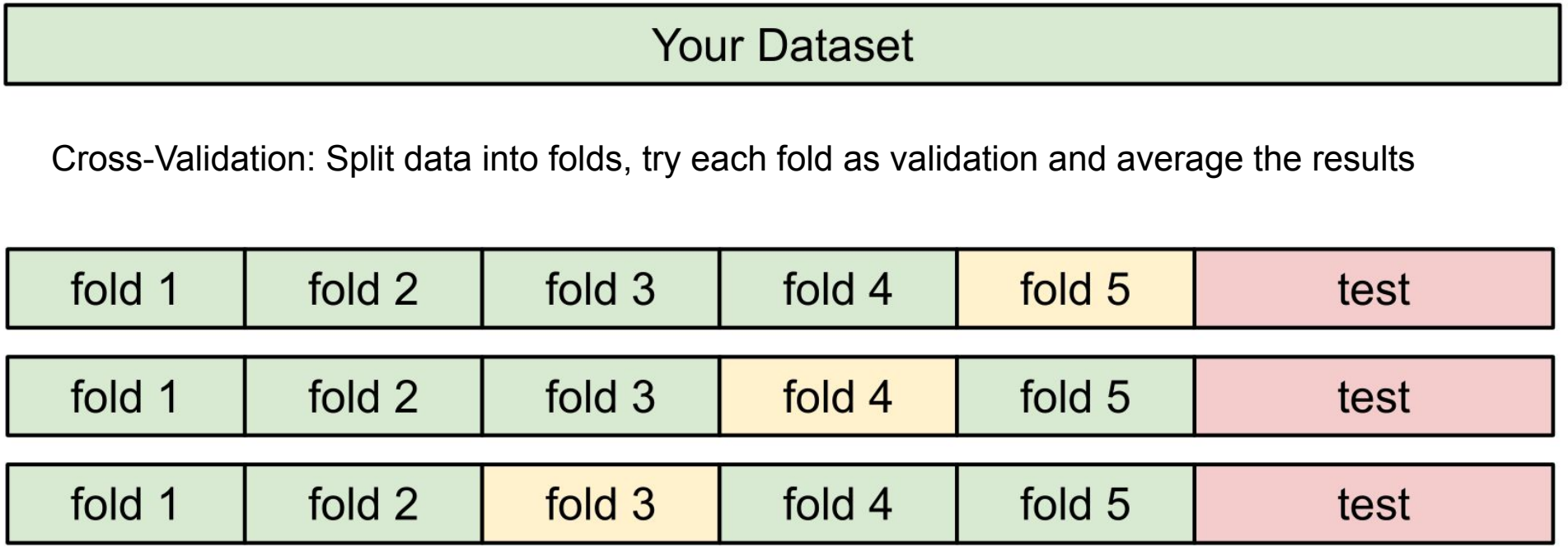
Setting Hyperparameters



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Linear Classifier (2)

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

3072x1 (x)

10x1 (b)

10x1 (f(x,W))

10x3072 (W)

Image

Array of **32x32x3** numbers
(3072 numbers total)

f(**x**,**W**)

10 numbers giving class scores

W

parameters or weights

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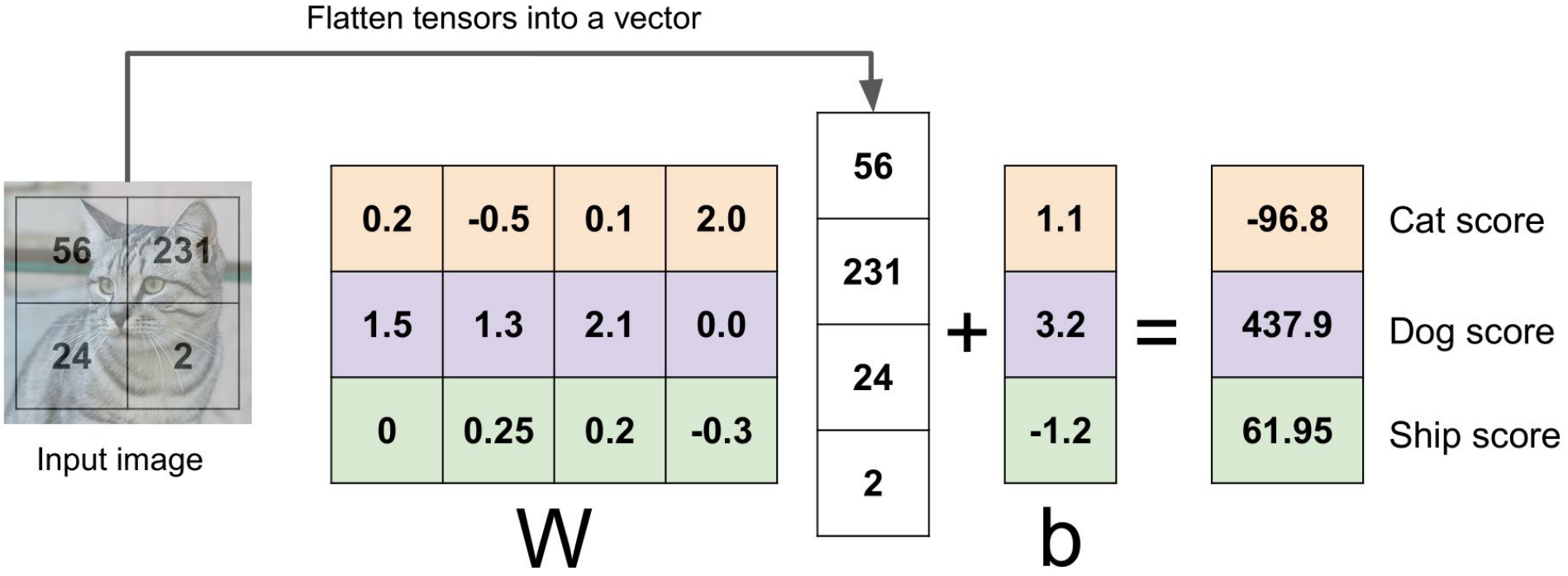
Linear Classifier: Example



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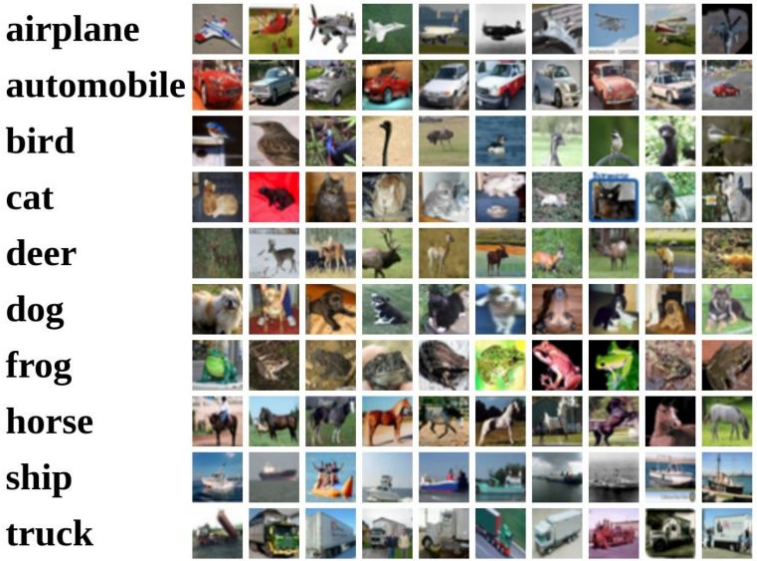
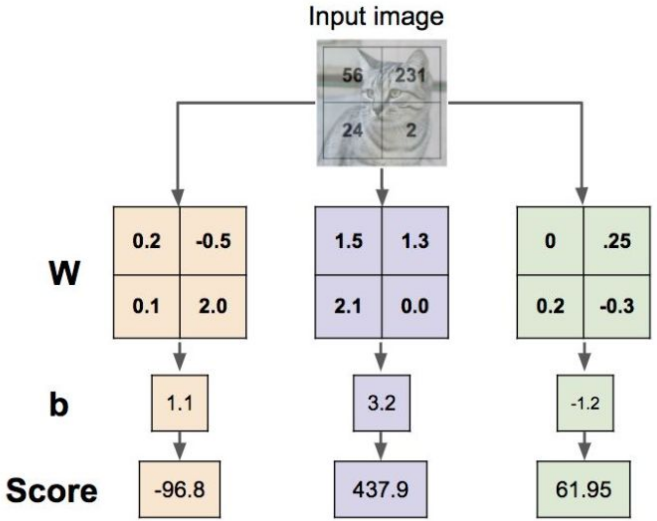
Interpreting a Linear Classifier





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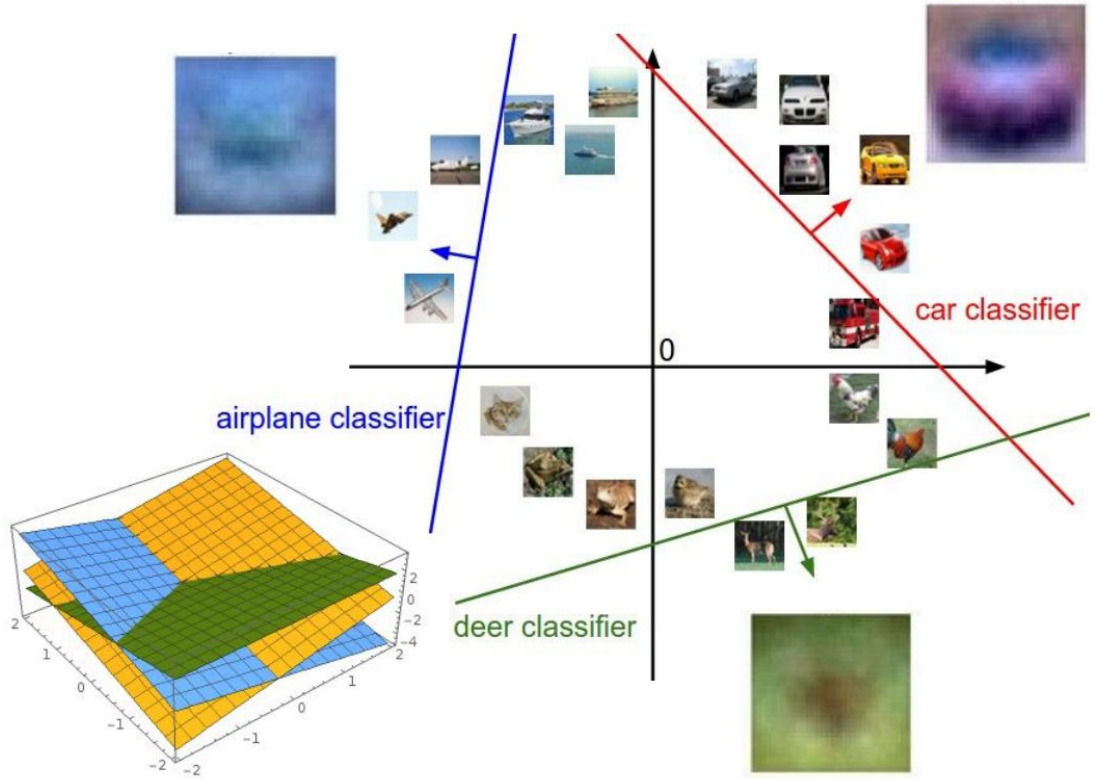
Interpreting a Linear Classifier:Geometric Viewpoint



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

Array of **32x32x3** numbers
(3072 numbers total)