REVATURE

Computer Vision

Agenda

01 The What

02 The How

03 The Huh?

04 The Why

05 The “Oh Cool!”

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The What

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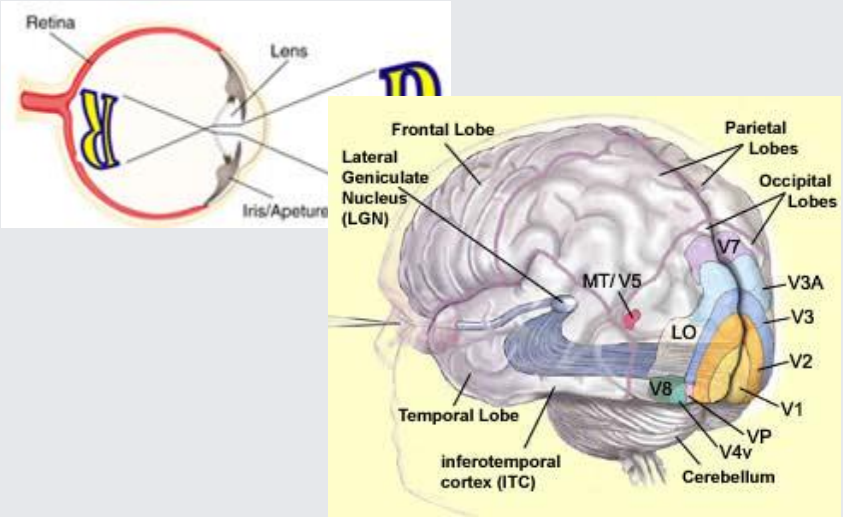
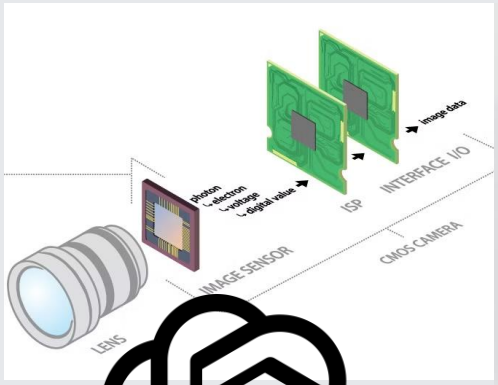
The What

Human Image Processing



Computer Image Processing



"Looks like a tree!"

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The How

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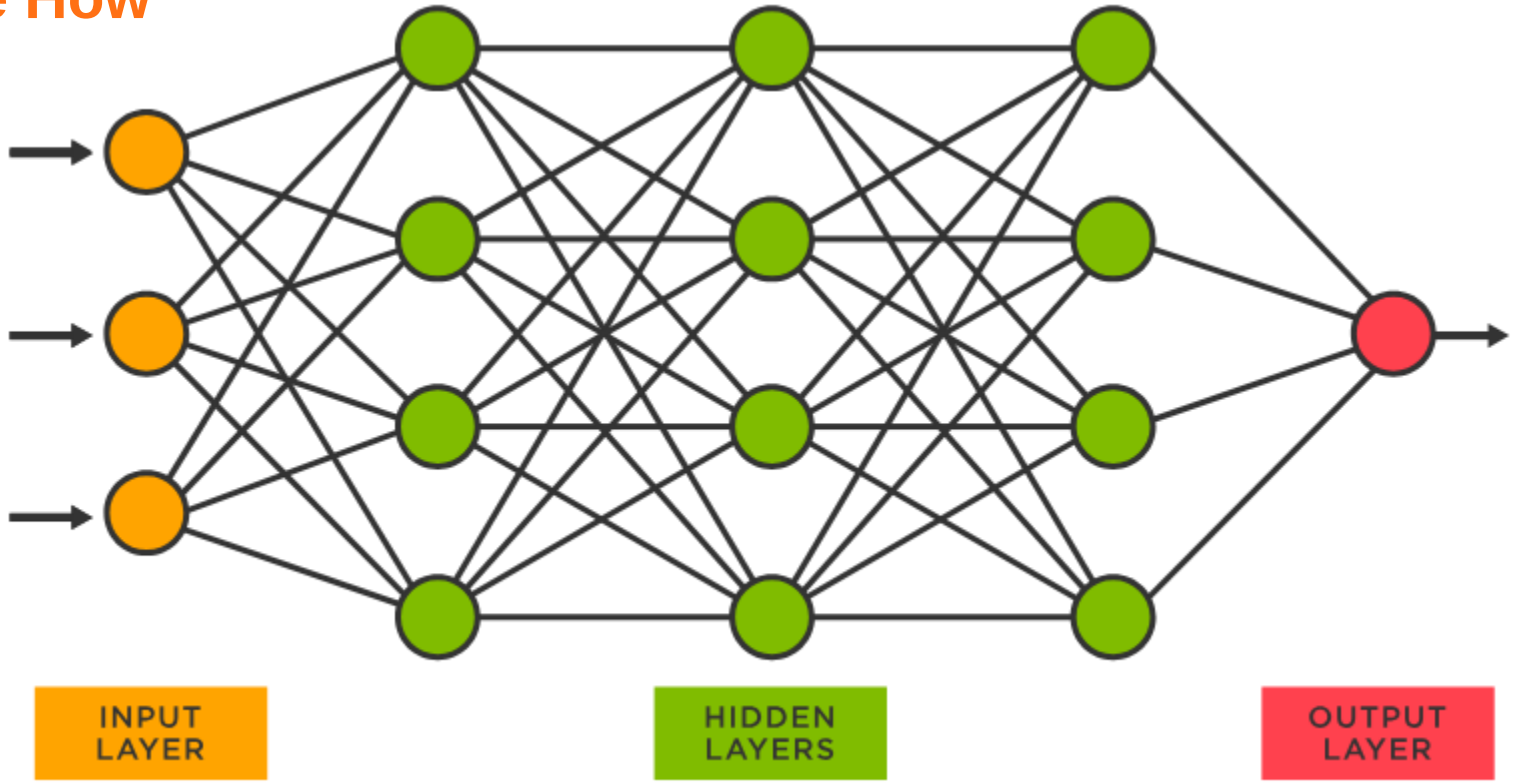
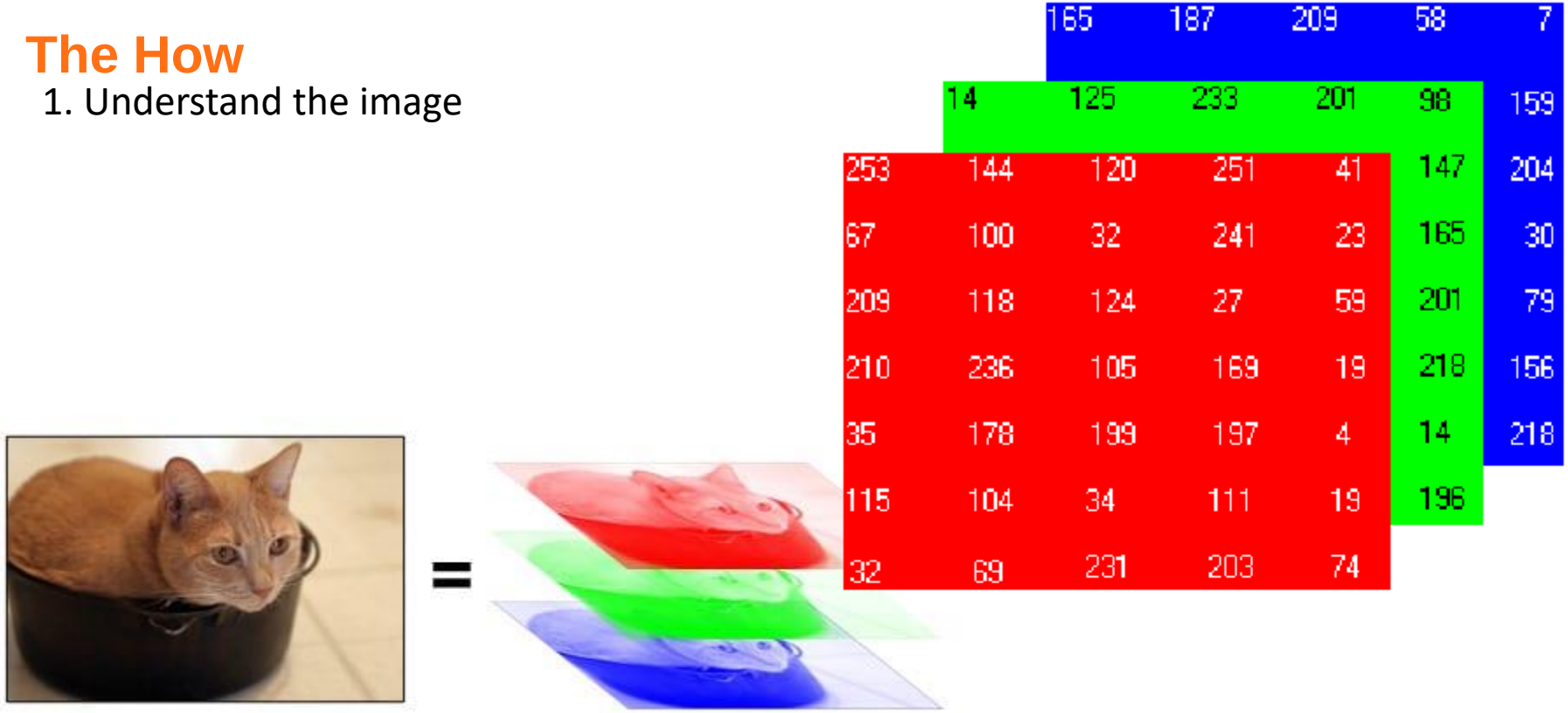
The How



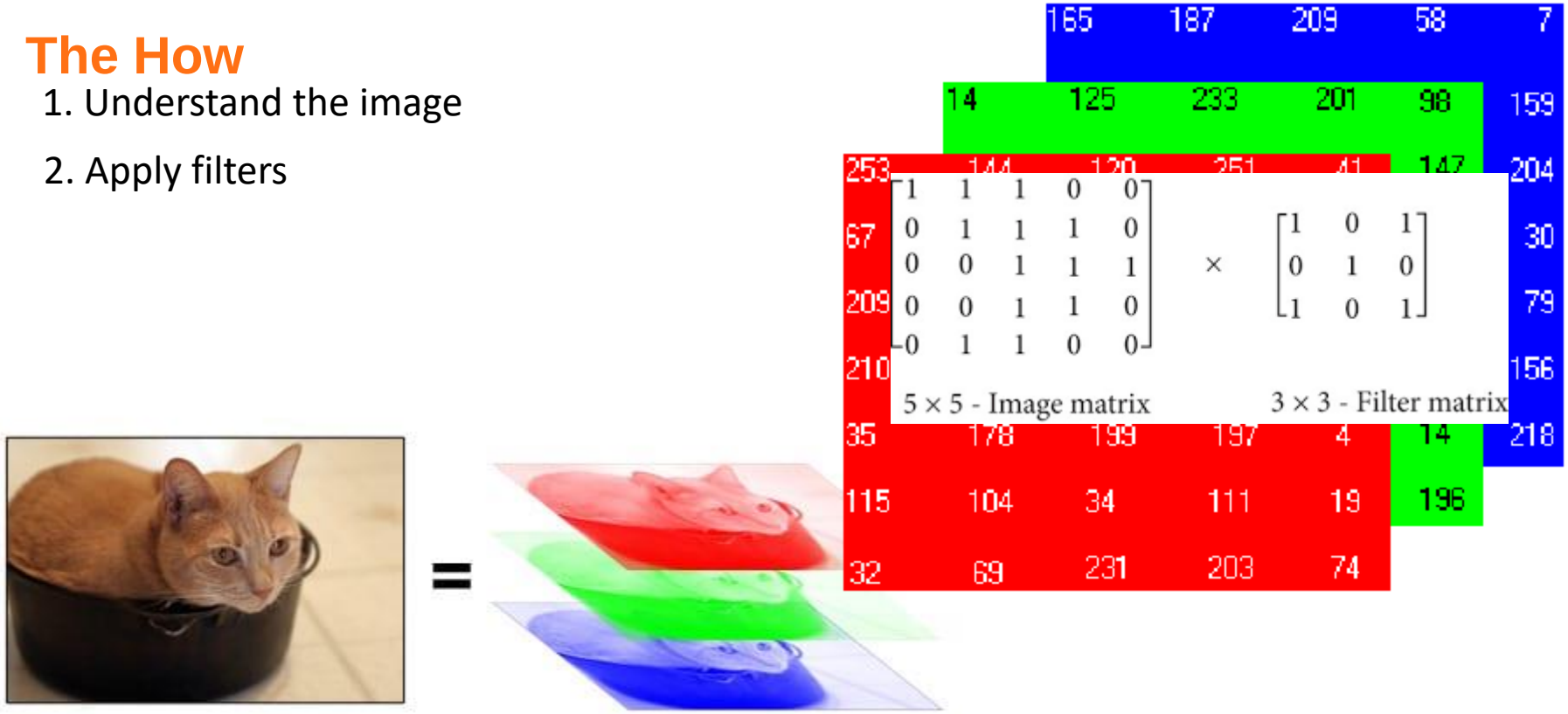
The How

1. Understand the image



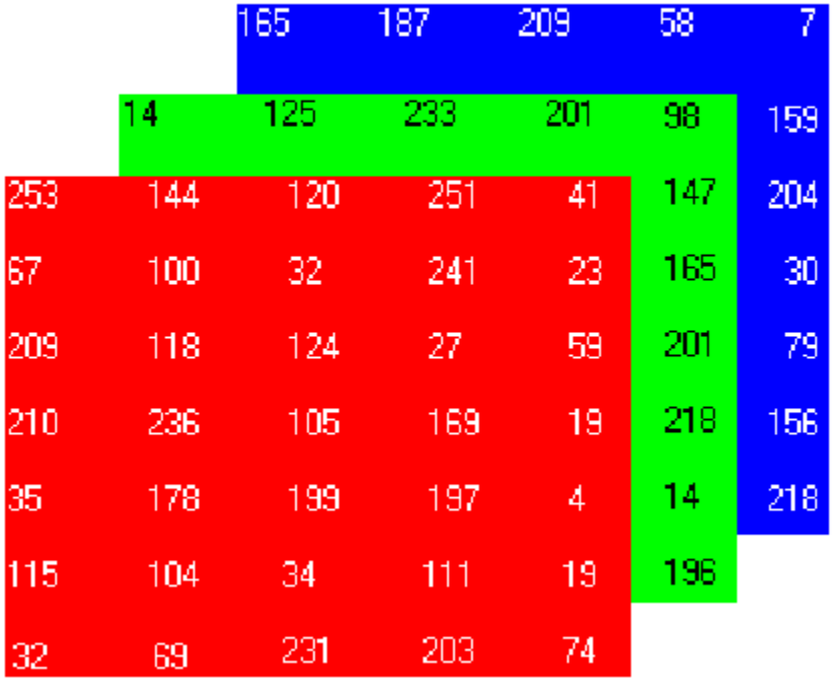
The How

1. Understand the image
2. Apply filters



The How

1. Understand the image
2. Apply filters



$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

5 × 5 - Image matrix 3 × 3 - Filter matrix

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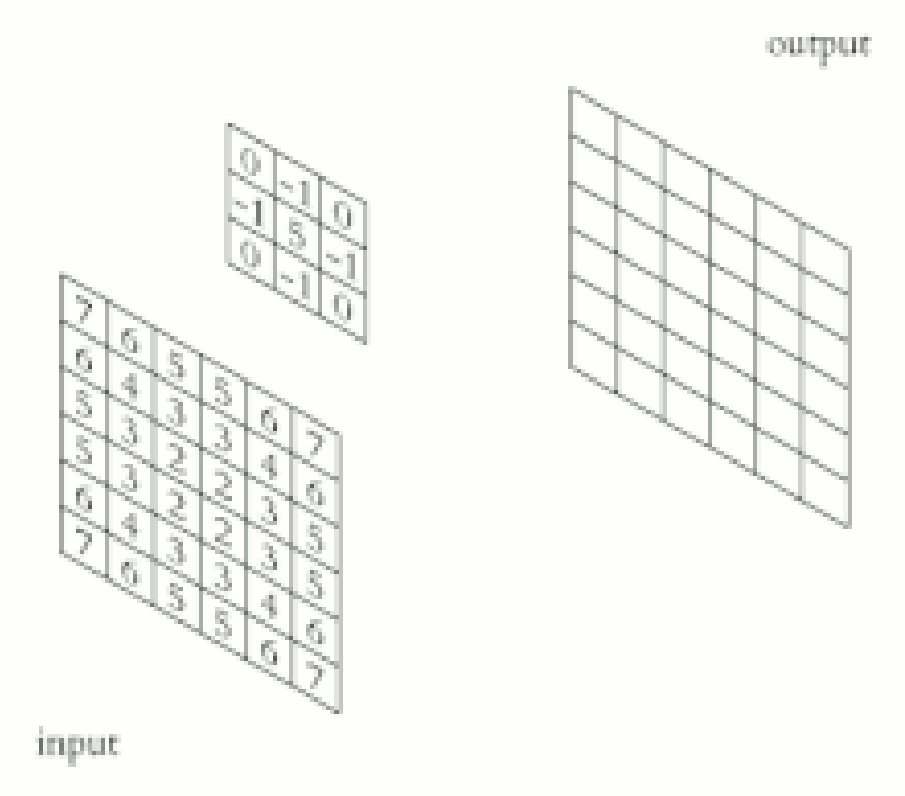
The How

1. Understand the image
2. Apply filters

Different filters detect different features or manipulate an image different ways.

Edges, curves, textures, blurring, sharpening, etc.



Resulting matrix: a likelihood that the filters pattern is present at that location

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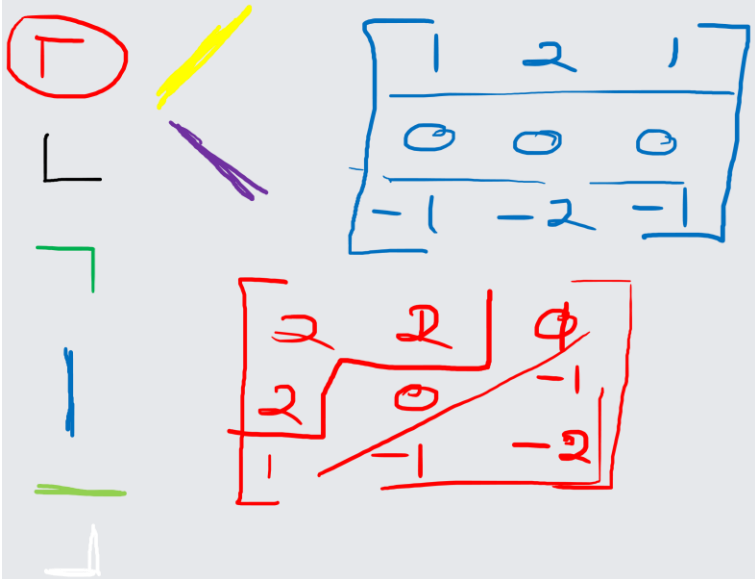
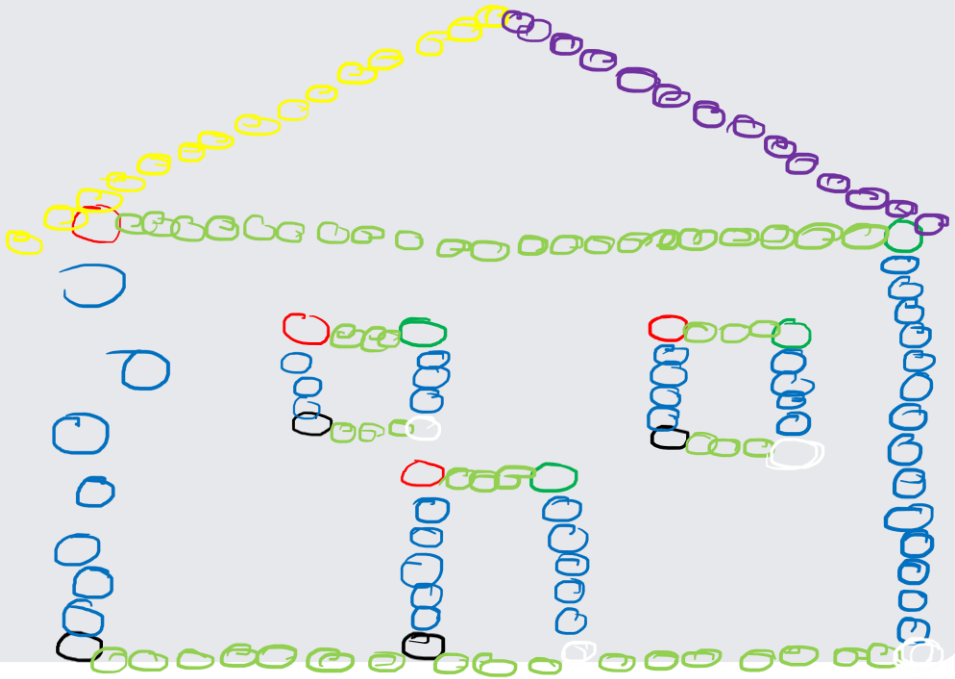
The How

Pictionary Anyone?

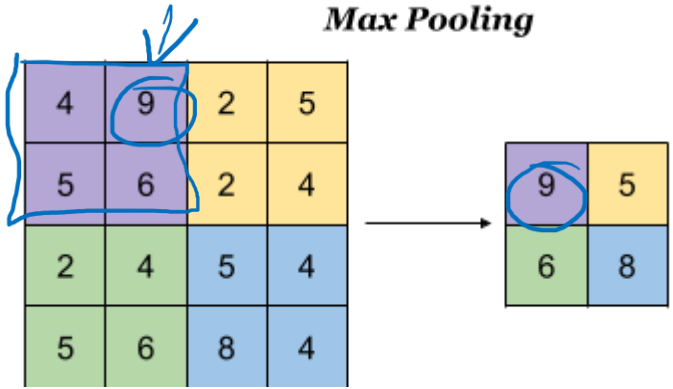


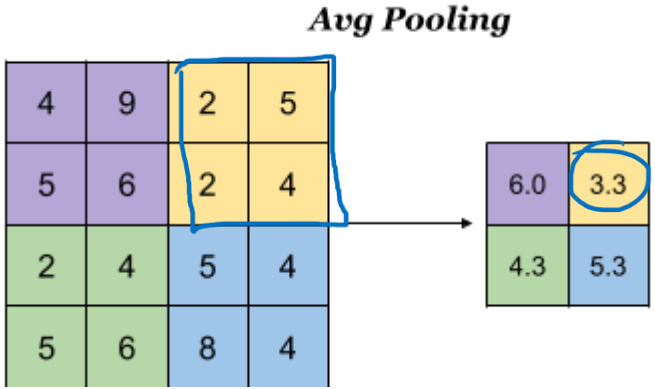


The How

1. Understand the image
2. Apply filters
2. Downsample by pooling

Downsampling reduces the volume of information to process, while pooing preserves the import features.





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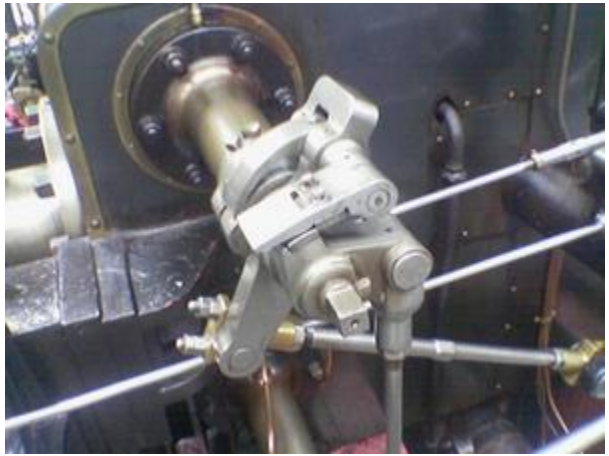
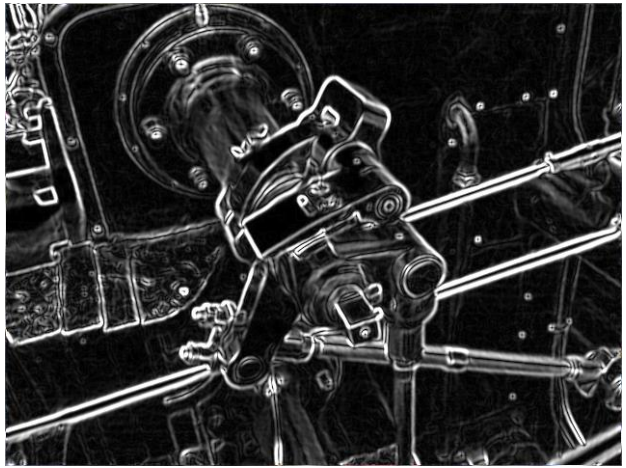
The How

1. Understand the image

2. Apply filters

2. Downsample by pooling





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The Huh?

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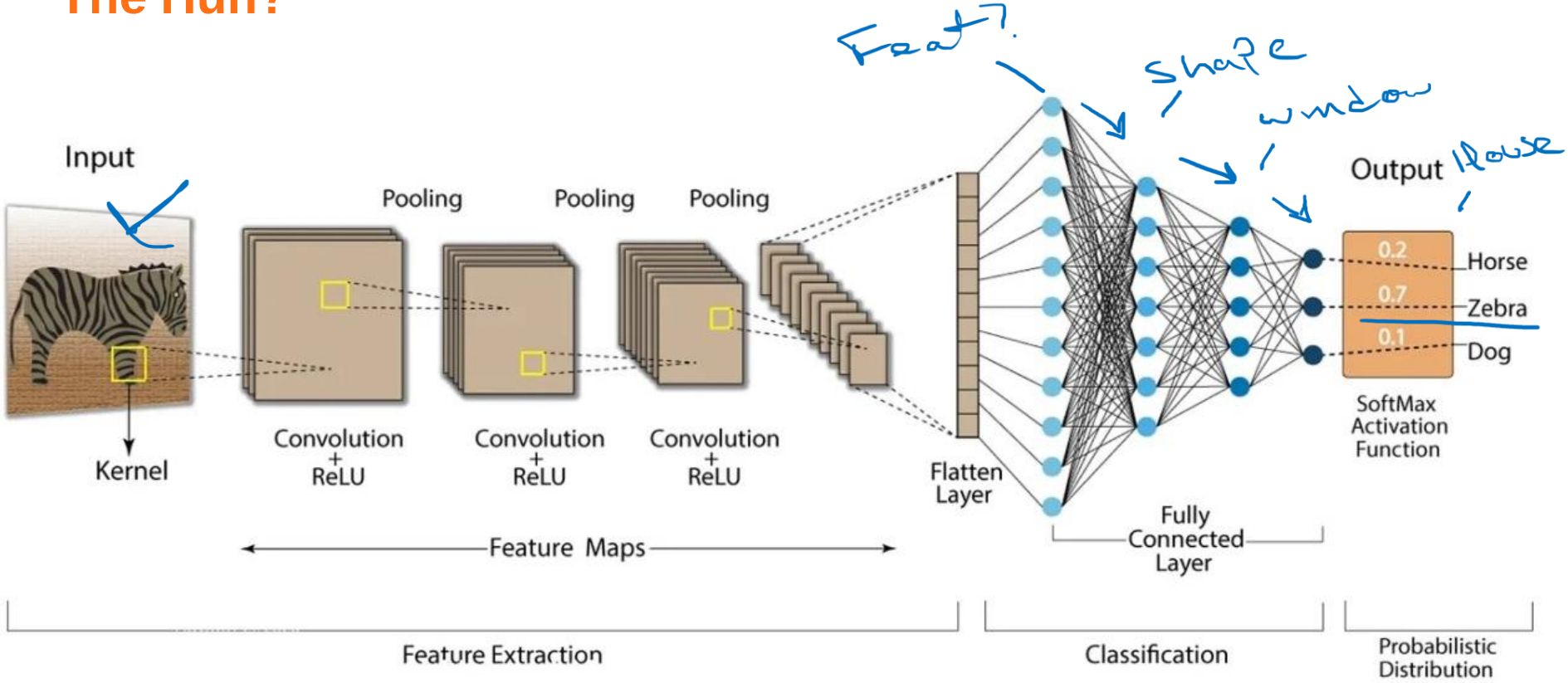
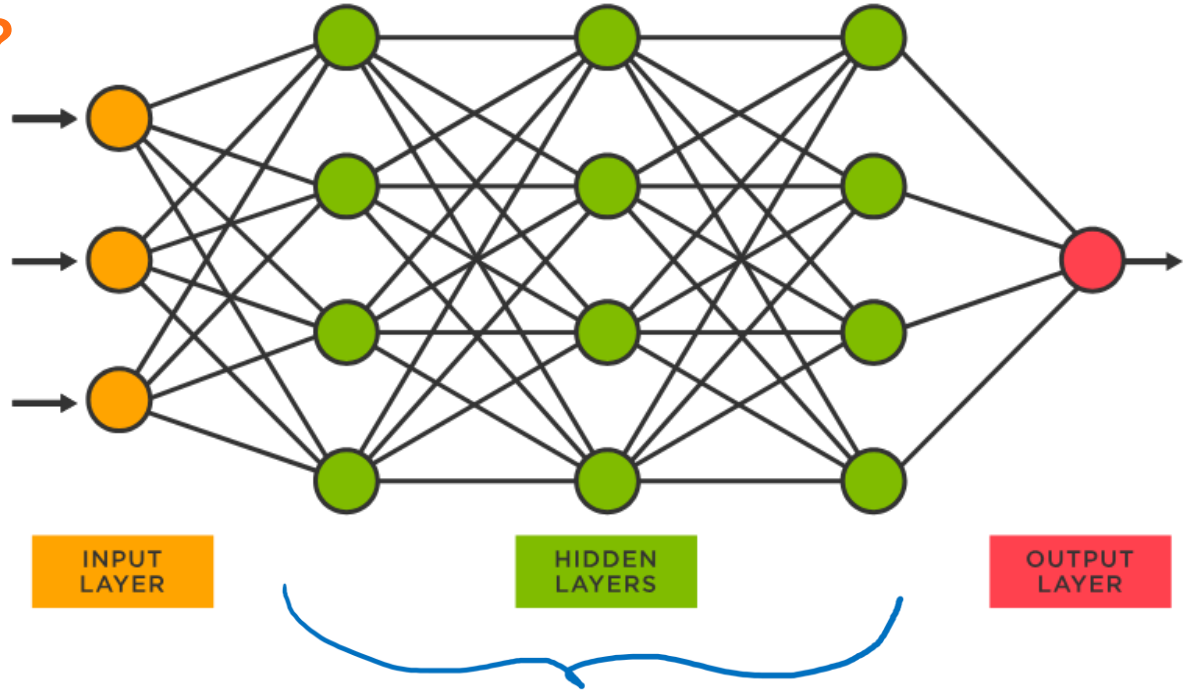
The Huh?


Input
Kernel
Pooling
Pooling
Pooling
Convolution + ReLU
Convolution + ReLU
Convolution + ReLU
Feature Maps
Flatten Layer
Fully Connected Layer
Output
0.2
Horse
0.7
Zebra
0.1
Dog
SoftMax Activation Function
Feature Extraction
Classification
Probabilistic Distribution

The Huh?



The Why

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The Why

Use Cases?

- Healthcare/Diagnosis
- Plant recognition
- Med. Aid/Devices
- Aug. Reality/Gaming
- Facial Recog.
- Safety in Manufacturing
  - Alerting
  - Maint/Monitor
- Distribution Monitor
- Retail/Shelf Analytics
- Customer Ex/Journey
- Auto. Driving

The Why

Use Cases

Image Classification

- **Product Categorization:** Sorting products in e-commerce platforms (apparel, electronics, groceries) for better search and recommendations.
- **Quality Control:** Inspecting manufactured goods for defects (e.g., cracks in machinery parts, blemishes on food).
- **Medical Imaging:** Analyzing X-rays, MRIs, and CT scans to detect abnormalities (tumors, fractures).
- **Remote Sensing:** Classifying land cover (forests, urban areas, water bodies) from satellite imagery.

Project Manager/Business Analyst Perspective:

- **Increased Efficiency:** Automate tasks that previously required manual inspection, saving time and resources.
- **Improved Accuracy:** Reduce human error in classification tasks, leading to more reliable and consistent outcomes.
- **Data-Driven Insights:** Gain valuable insights from visual data that can inform business decisions (e.g., market trends, customer behavior).

The Why

Use Cases

Object Detection

- **Autonomous Vehicles:** Detecting pedestrians, vehicles, and traffic signs for safe navigation.
- **Surveillance Systems:** Identifying and tracking objects of interest (e.g., suspicious activity, missing persons).
- **Retail:** Analyzing customer behavior in stores (e.g., identifying product interactions, counting customers) to optimize store layout and marketing strategies.
- **Agriculture:** Monitoring crop health, detecting pests and diseases in plants.

Project Manager/Business Analyst Perspective:

- **Enhanced Safety:** Improve safety in various applications (e.g., autonomous vehicles, industrial settings).
- **Improved Efficiency:** Automate tasks that require visual inspection and object identification.
- **Data-Driven Decision Making:** Gain valuable insights from visual data to optimize business processes and improve operational efficiency.

The “Oh Cool!”

REVATURE

The What

Time to give it a try!

https://revachat.azurewebsites.net

“Vision” page in the navbar

250121AIUpskill

Limited to .png, .jpg, .jpeg, and .gif format

Thank You!

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