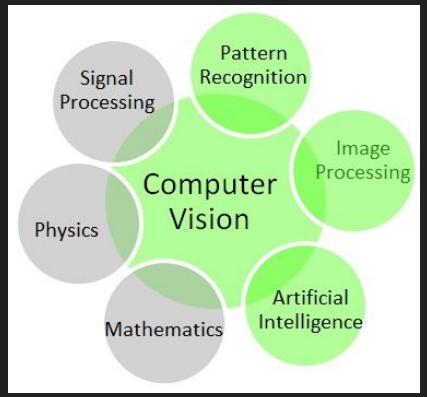
Computer Vision Overview & Pipeline Introduction

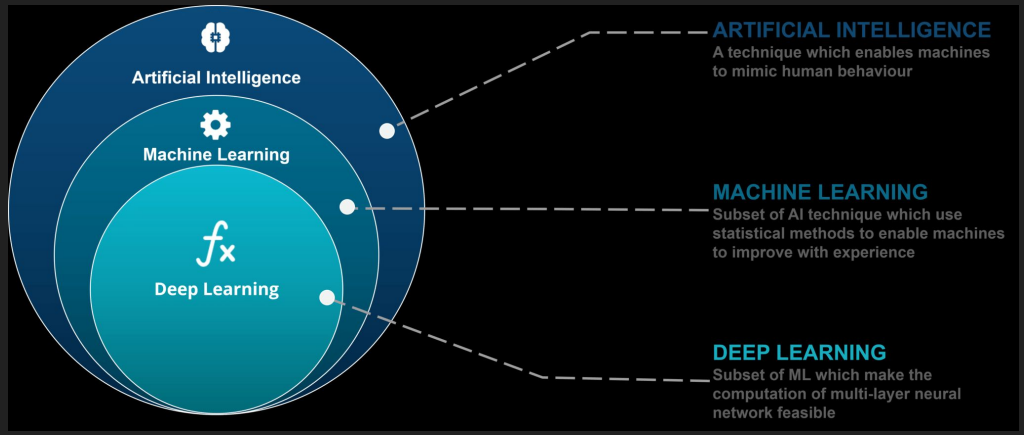
What is Computer Vision?

- Computer vision refers to algorithms that enable computers to derive meaningful information from images, videos and other visual inputs

Computer Vision and AI

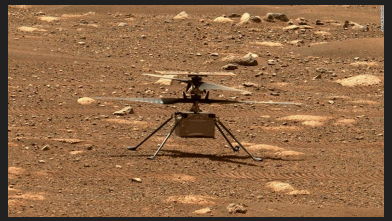
- Not all CV methods use machine learning

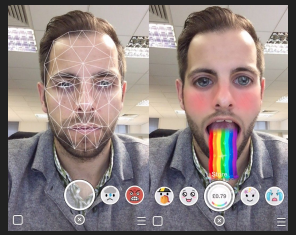




Popular Applications of Computer Vision

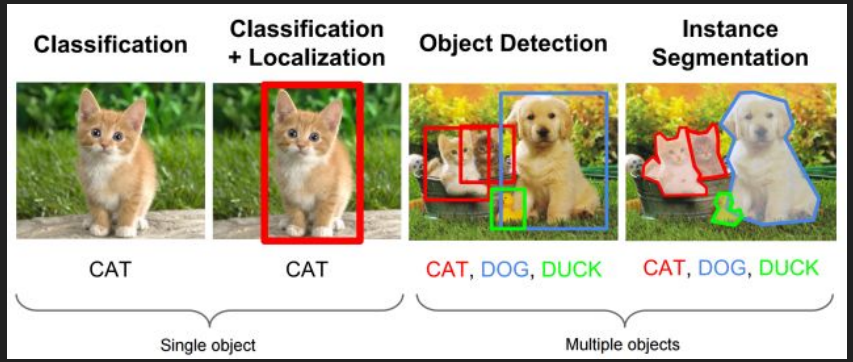
- Autonomous Vehicles
- Drones
- Crop Monitoring
- Photo Filters
- Animated Avatars





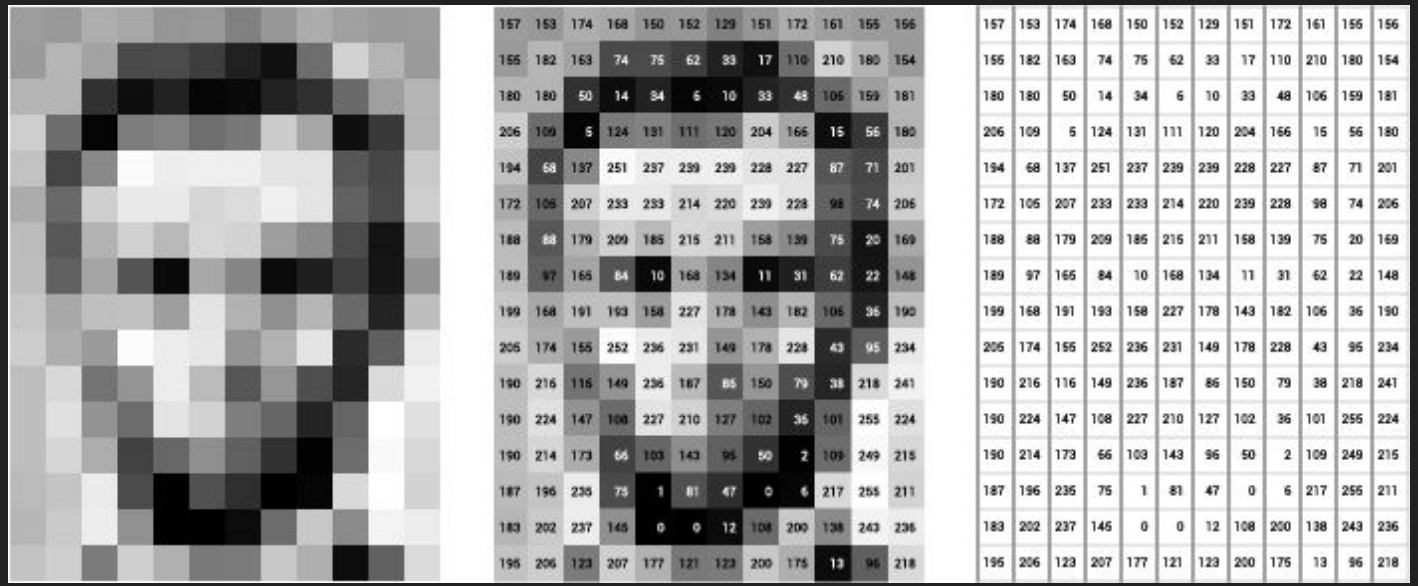
Common Benchmark Tasks in Computer Vision

- Image Classification
- Object Detection
- Object Segmentation



How does Computer Vision work?

- Powered by Math:
  - Linear Algebra, Matrix Theory, Probability/Statistics, Calculus, Set Theory, etc.



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206	109	5	124	131	111	120	204	166	15	56	180
194	68	137	251	237	239	239	228	227	87	71	201
172	105	207	233	233	214	220	239	228	98	74	206
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205	174	155	252	236	231	149	178	228	43	95	234
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187	196	235	75	1	81	47	0	6	217	255	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	96	218

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Introductory Materials to CV

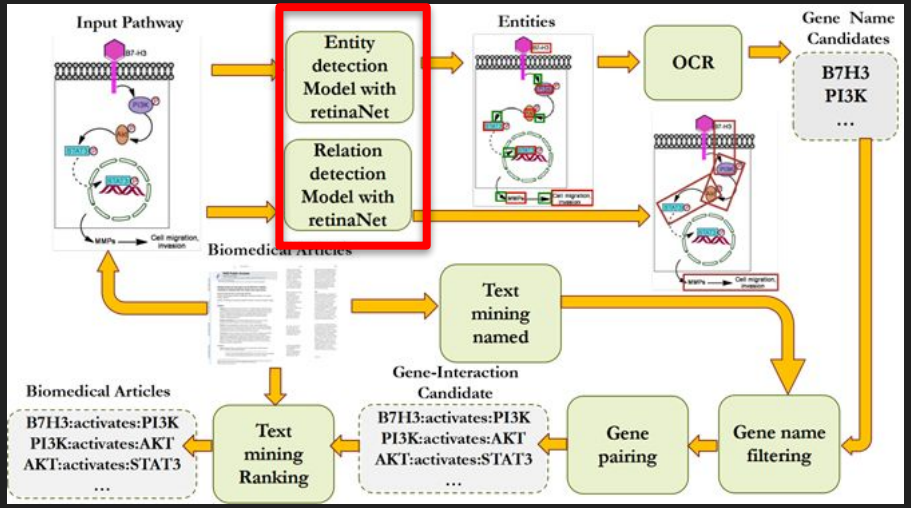
- Textbooks
  - Multiple View Geometry in Computer Vision | Richard Hartley and Andrew Zisserman
  - Neural Networks and Learning Machines | Simon Haykin
- 3Blue1Brown Youtube Videos
  - Linear Algebra
    - https://www.youtube.com/playlist?list=PLZHQObOWTQDPD3MizzM2xVFitgF8hE_ab
  - Neural Networks
    - https://www.youtube.com/playlist?list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi
- Andrew Ng's Coursera on Machine Learning
  - https://www.coursera.org/learn/machine-learning
- PyTorch
  - https://pytorch.org/tutorials/beginner/deep_learning_60min_blitz.html

How does our project use computer vision?

- Object detection/localization
- Entity Pairing
- Generating Synthetic Data

Pipeline Overview

1. Two models
   a. Find Text and Indicator Heads
   b. Find relationship body



Pipeline Overview

1. Two models
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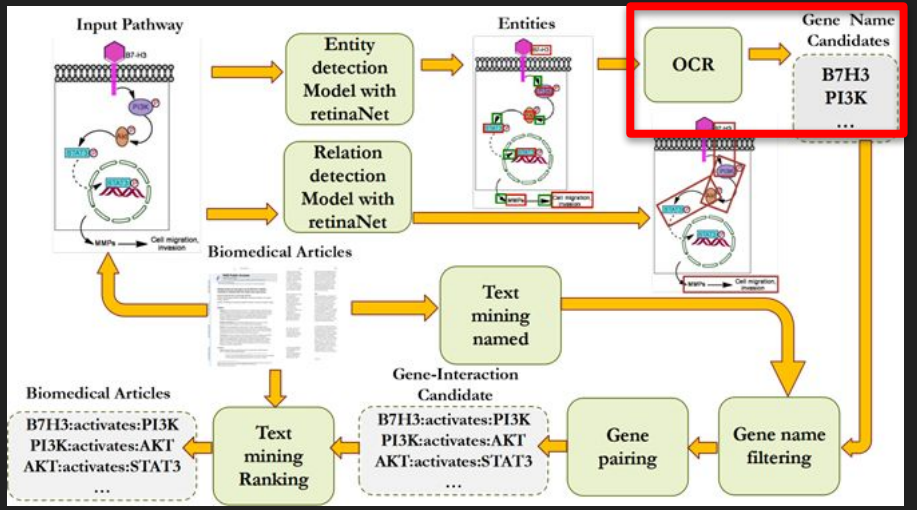
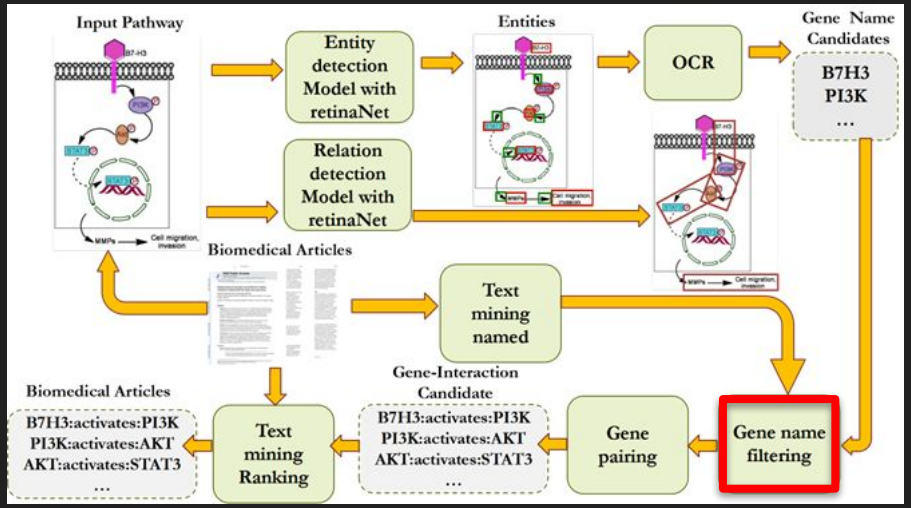
    b. Find relationship body
2. OCR
    a. Use Google OCR to get text



Pipeline Overview

1. Two models
   a. Find Text and Indicator Heads
   b. Find relationship body
2. OCR
   a. Use Google OCR to get text
3. Filter Text Results
   a. Filter with pubtator gene names
   b. Filter with gene name list



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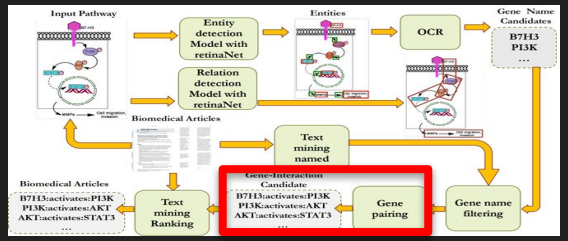
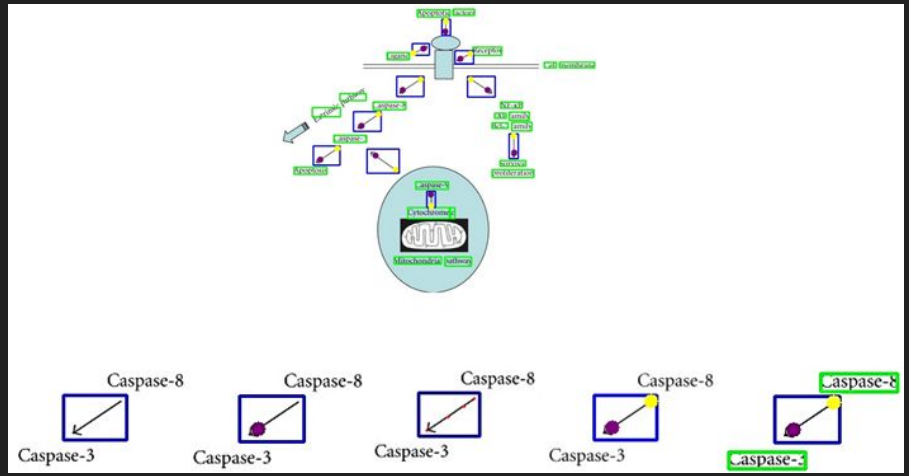
4. Gene Pairing





Homework Task

- Evaluating Model Output
  - Problem: Matching Similar Strings Gene Names
    - want to consider root of elements
    - ignore suffix
    - could treat alpha as a beta as b etc.
    - ignore after dash and backslash
      - can't ignore all text after dashes ex.) N-Wasp