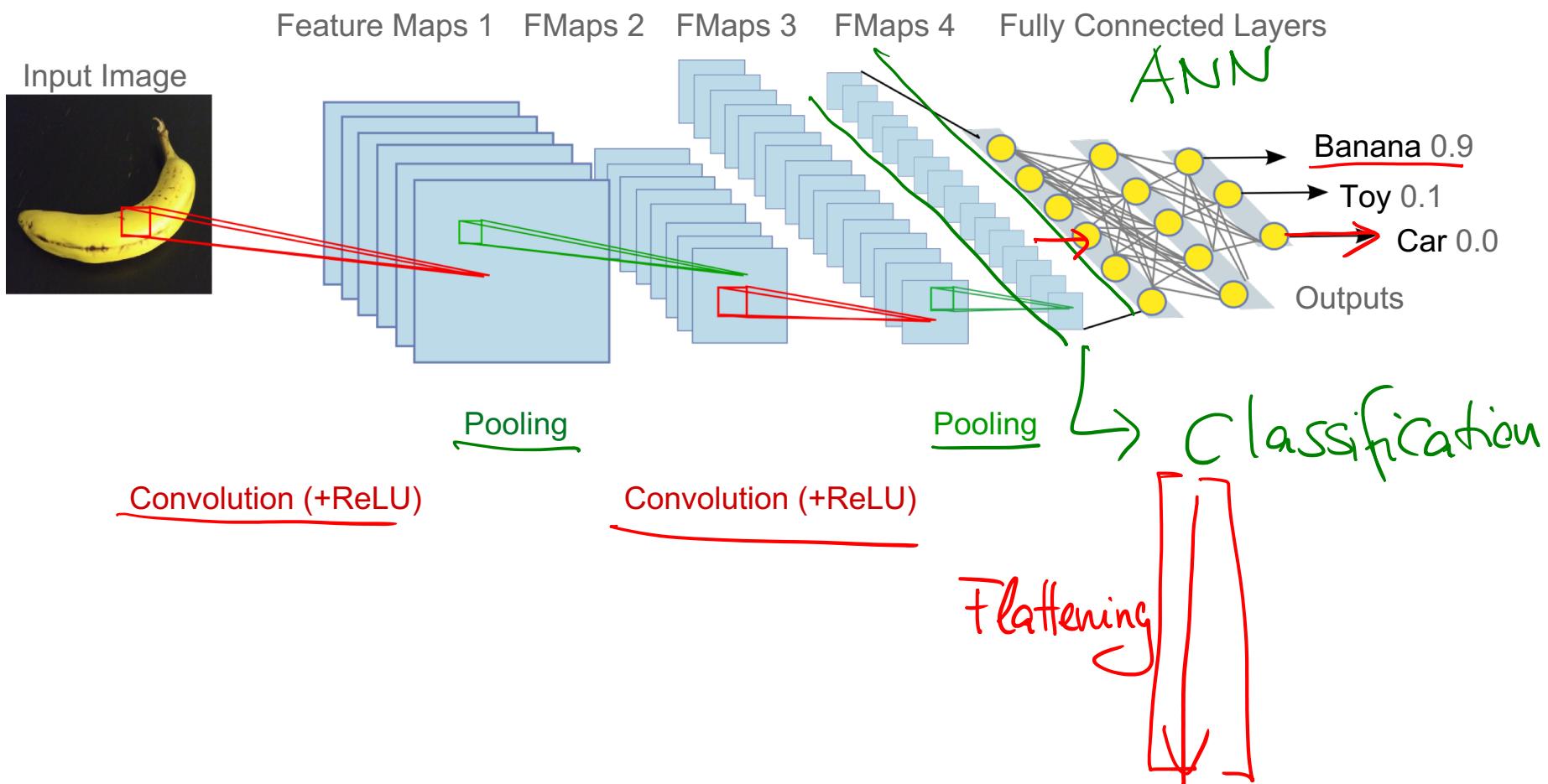


# Training a CNN

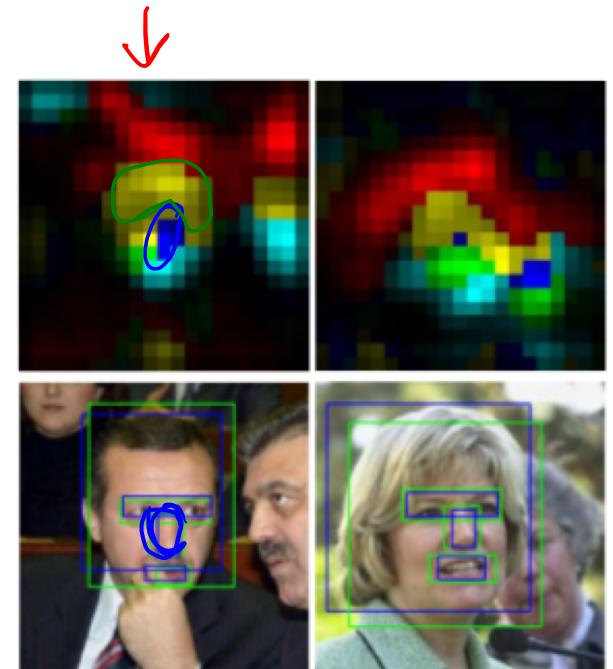
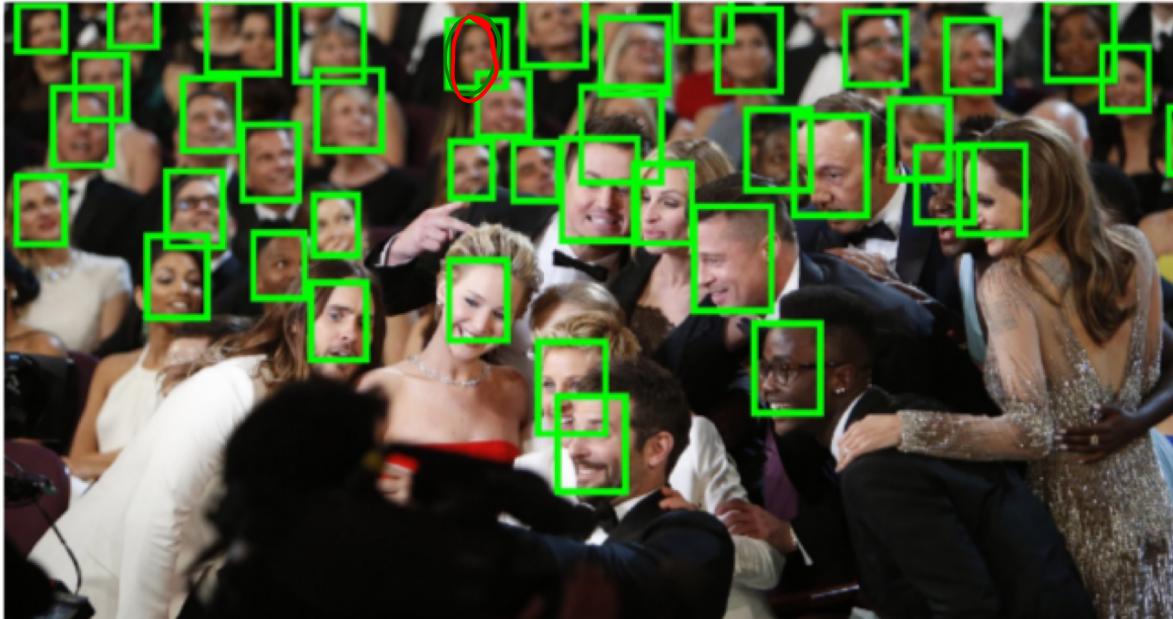


# Training a CNN



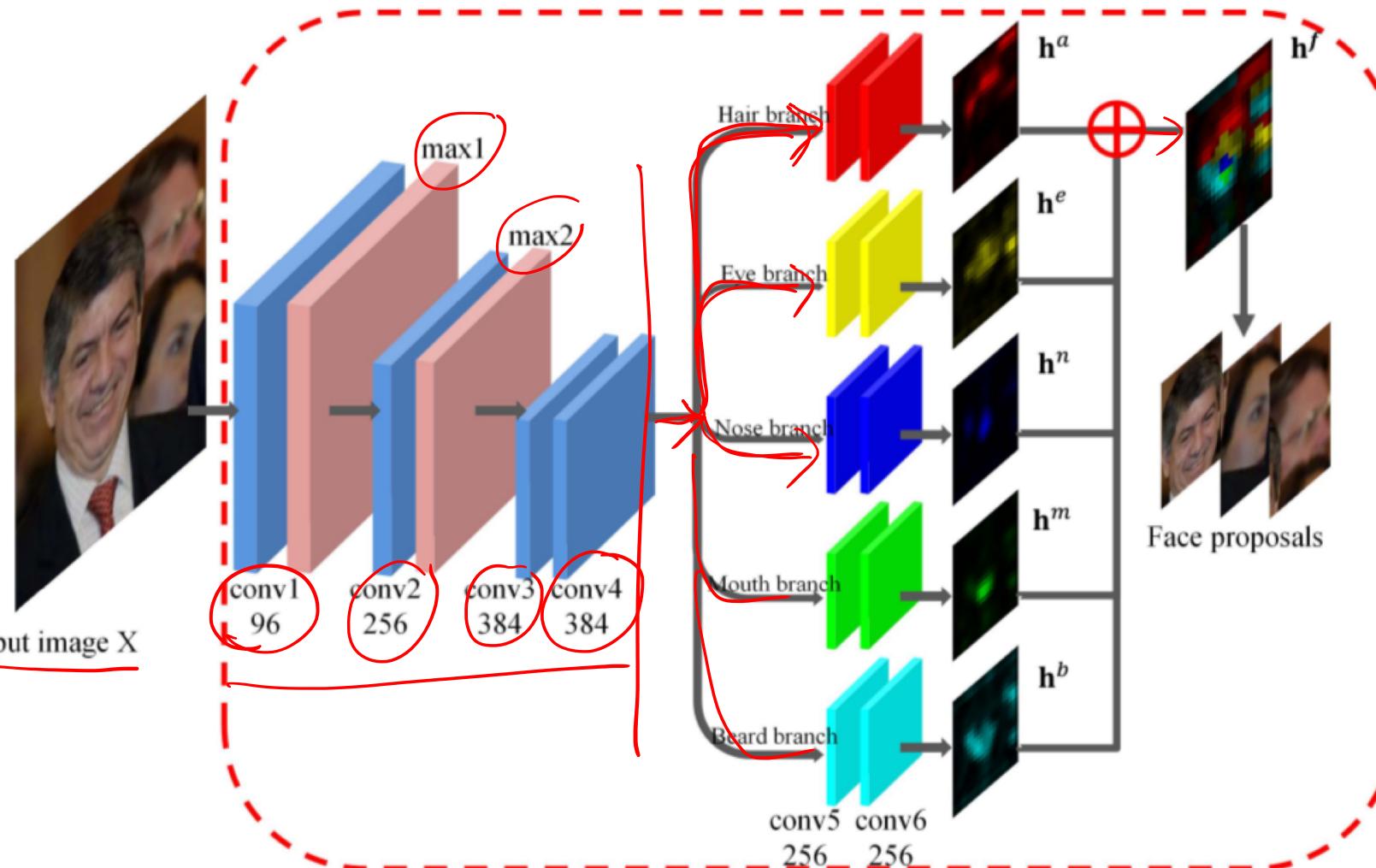
- | Back-propagation Algorithm
- | Typically requires a substantial training set
- | Number of convolutional filters / layers is critical
- | Dropout can be used to improve generalization
- | Potentially used pre-trained network
  - VGG →
  - Inception
  - AlexNet
  - ...

# Example: Face Detection



■ Hair ■ Eye ■ Nose ■ Mouth ■ Beard

# Example: Face Detection



# Example: Robot Dodgeball

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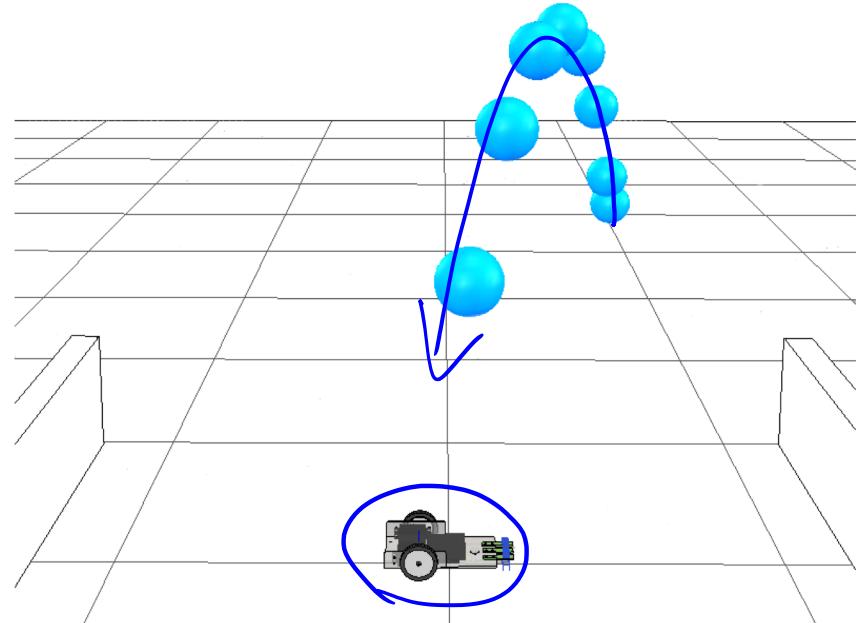
| Can a robot dodge projectiles with an RGB video?

| Goal:

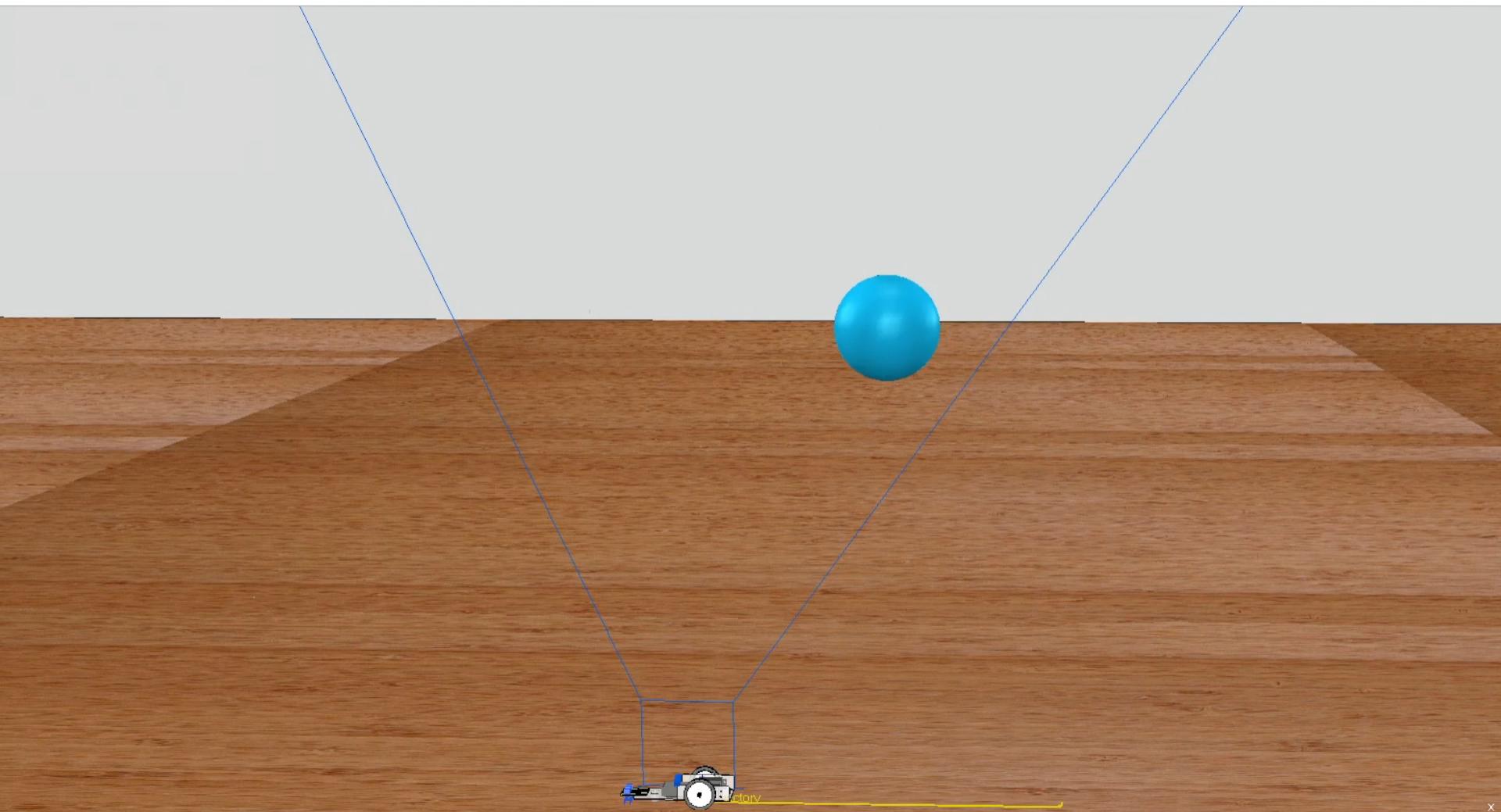
- Successfully predict future collisions given a randomly initialized projectile

| Solution:

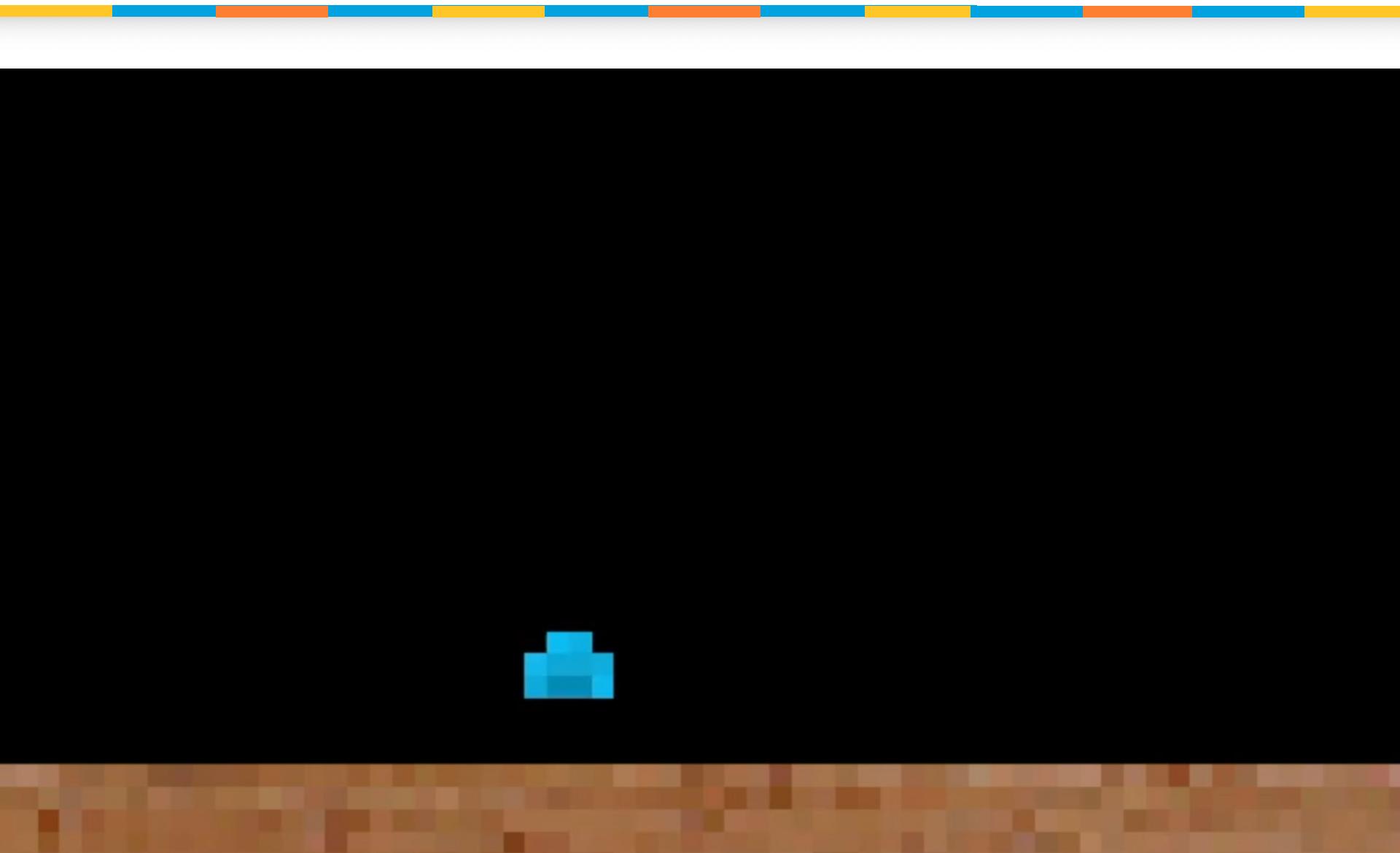
- CNN that learns the mapping between video input and probability of collision



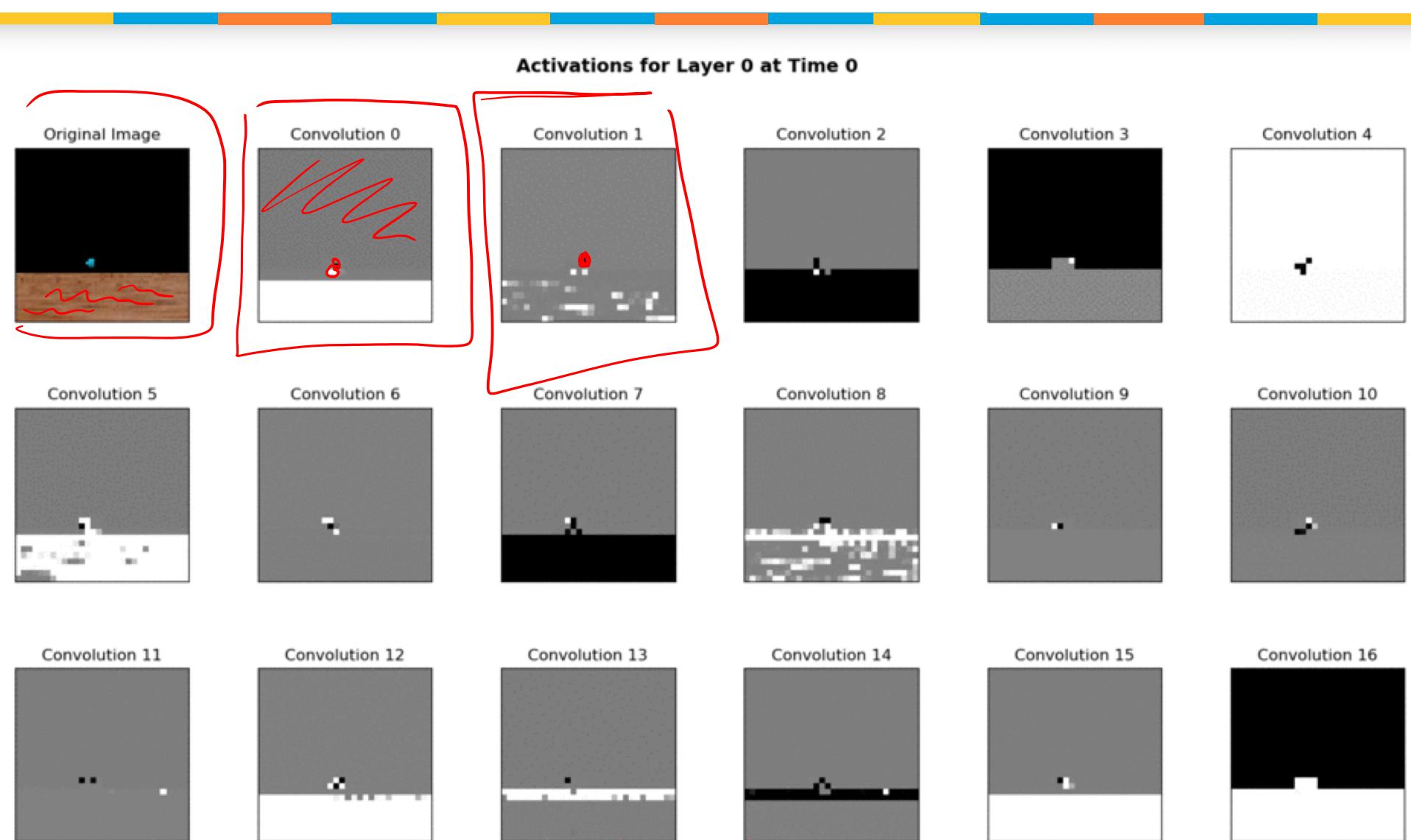
# Dodgeball



# Dodgeball (Robot Perspective)



# Visualizing Activation Maps



# Summary



- | **Convolutional neural network for image processing**
- | **Very powerful for a variety of operations on images: detection, recognition, generation**
- | **Hierarchy of filters detect features of increasing size**
- | **A lot of training data is needed, so pre-train if possible**