

Hot Dog, Not Hot Dog!

Generate new training data
Without taking more photos

Annie Flippo
October, 2017



Image Source: HBO



Image Source: HBO



Image Source: HBO



Image Source: HBO



Image Source: HBO



Image Source: HBO



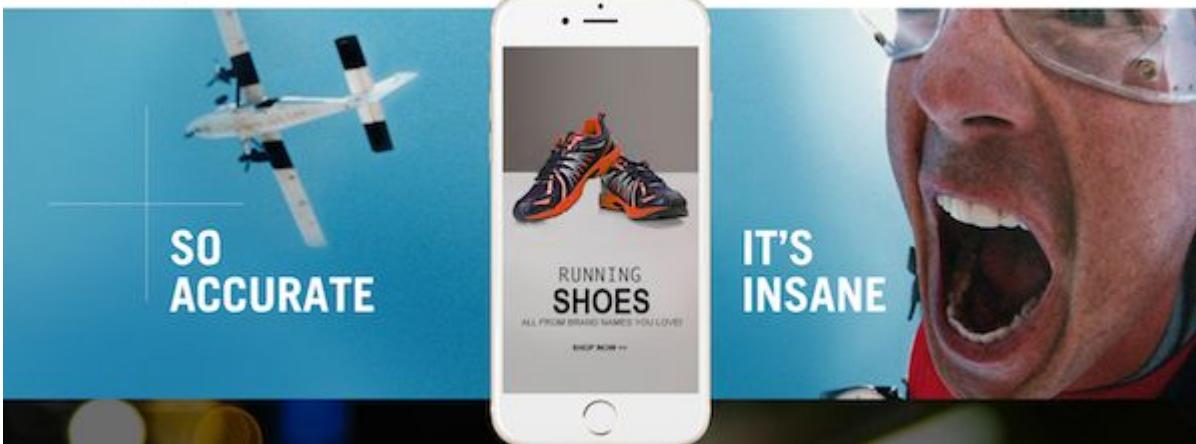
Image Source: HBO



Image Source: HBO



I work as a Manager of Analytics
At Thinknear by Telenav



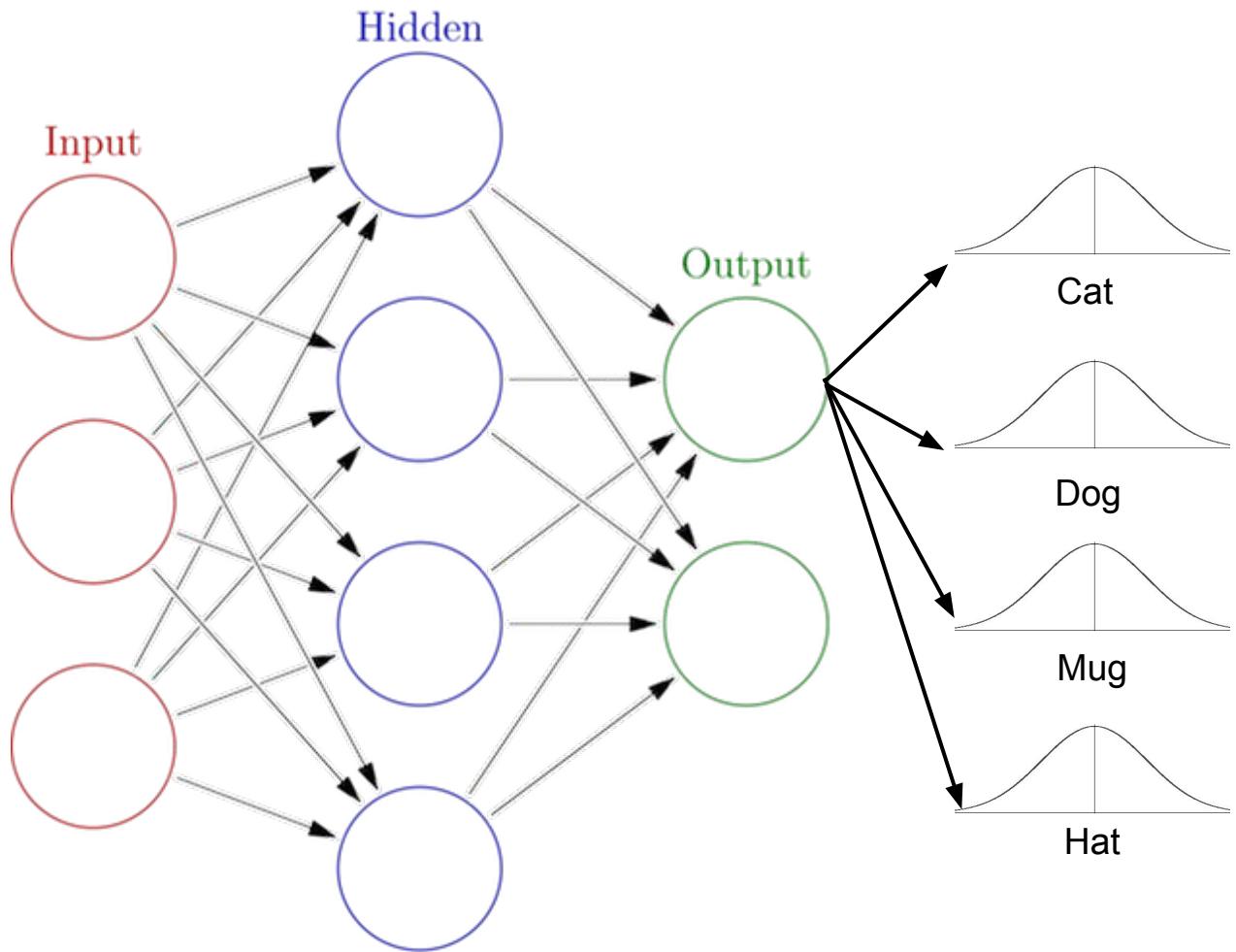
We are a location-based advertising platform



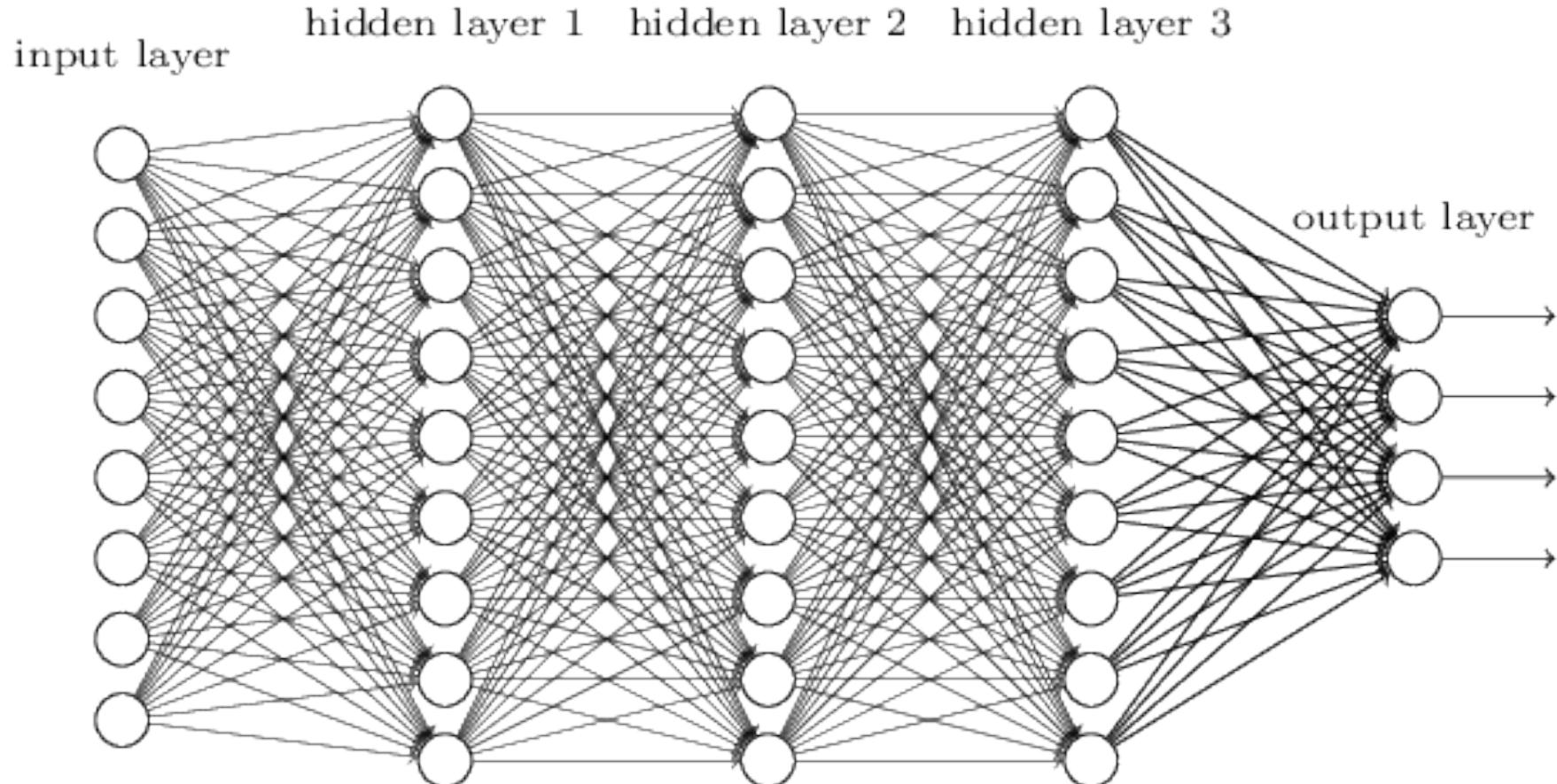
Transforming life on the go for millions of people around the world.

We're on a mission to make people's lives less stressful, more productive, and more fun.

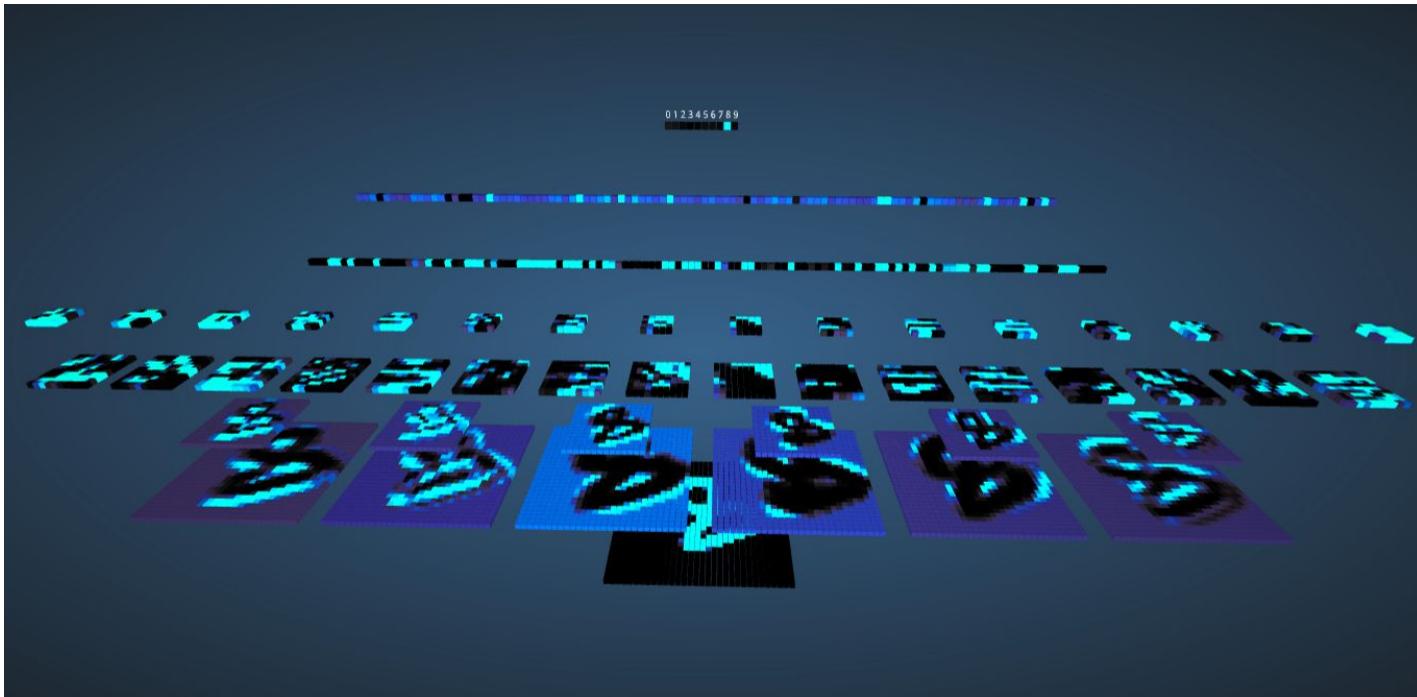
GPS navigation for vehicles and mobile phones



Deep Neural Network

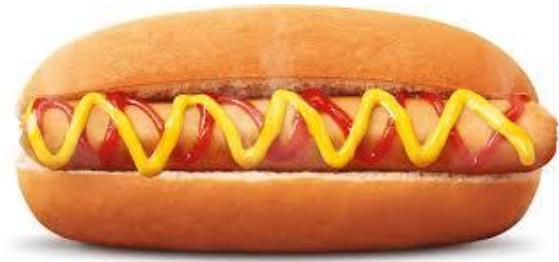
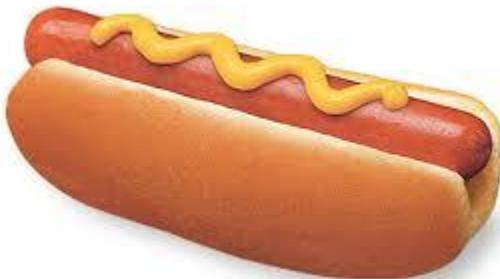
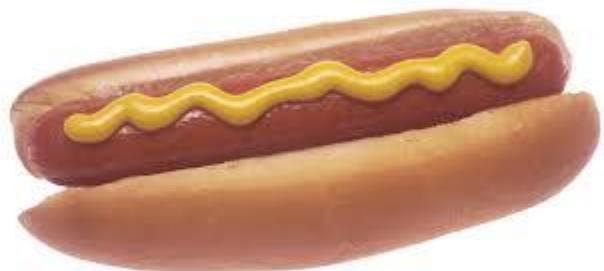


Neural Network Visualized



<http://scs.ryerson.ca/~aharley/vis/conv/>

Perfect Training Data



Real-life Data



Real-life Data



Hot Dogs or Meatballs?

Image recognition is one of the most important developments in AI. Close your eyes and imagine:

- Taking a shower
- Eating your lunch
- Driving



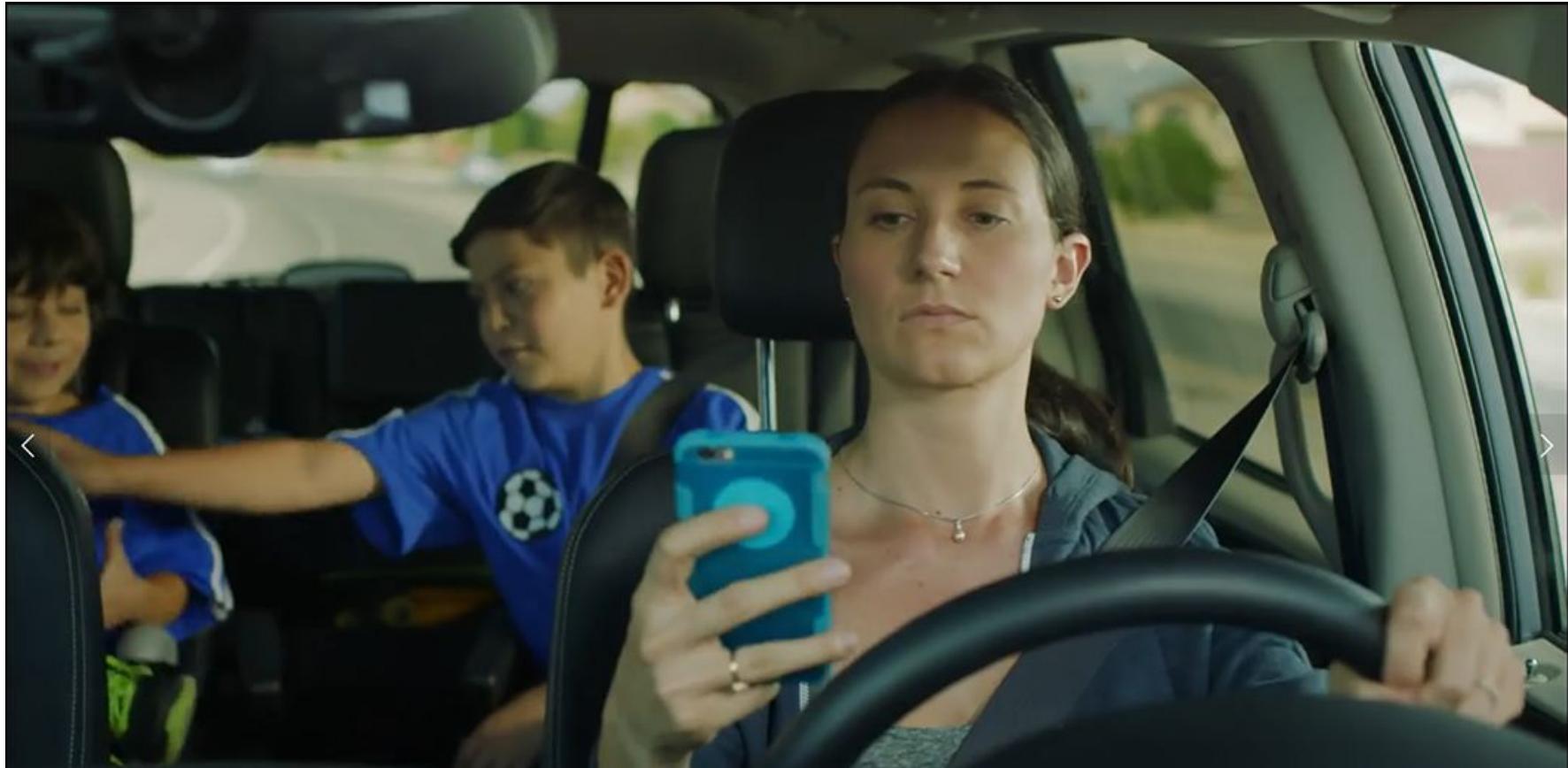
Real-life Driving: Distracted



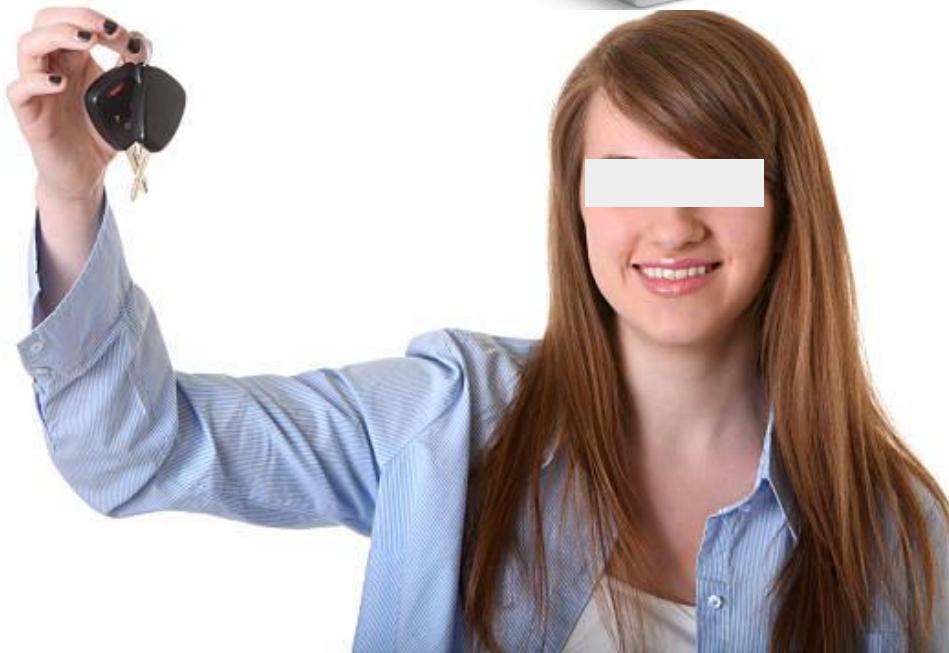
Real-life Driving: Distracted



Real-life Driving: Distracted



Our Eyes Only



Autonomous Driving: Sign Recognition



Real Signs



Real Signs



Why is object recognition so hard?

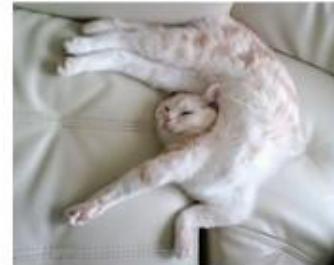
Viewpoint variation



Scale variation



Deformation



Occlusion



Illumination conditions



Background clutter



Intra-class variation



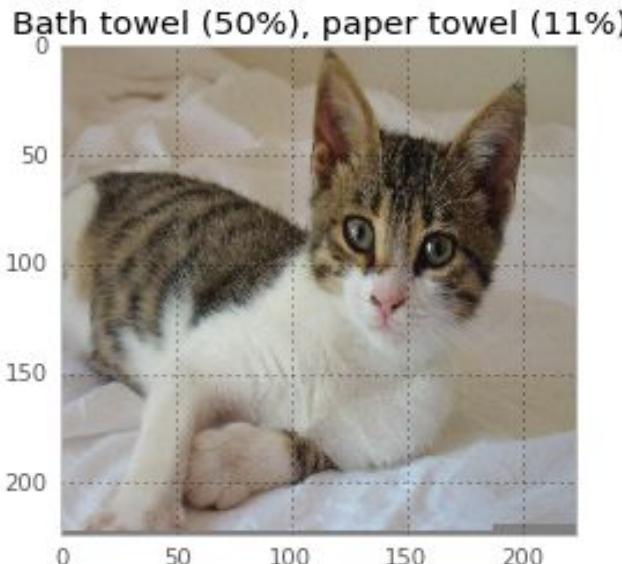
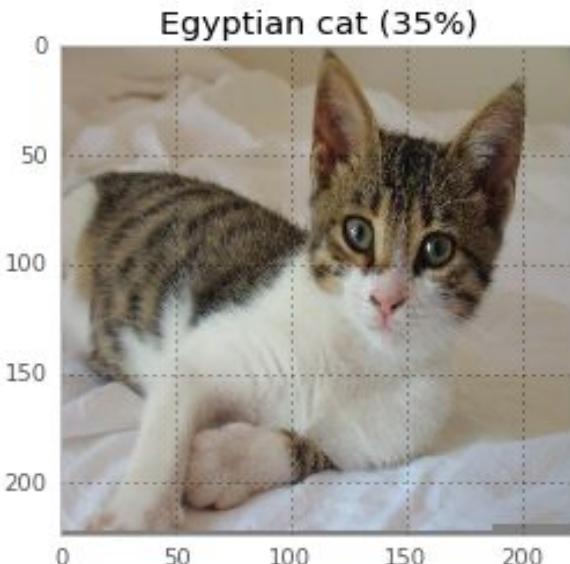
The Humble Stop Sign



The Humble Stop Sign



Be Aware of Image Hacking 1



Be Aware of Image Hacking 2

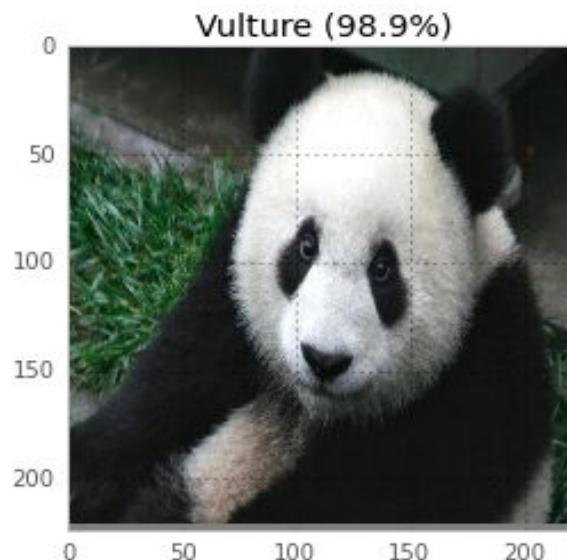
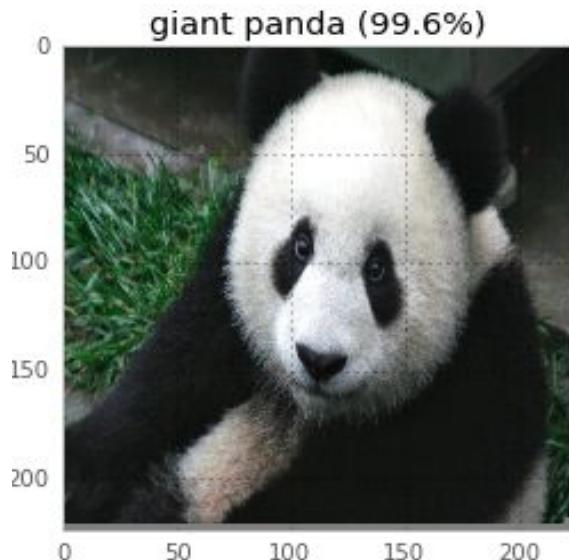
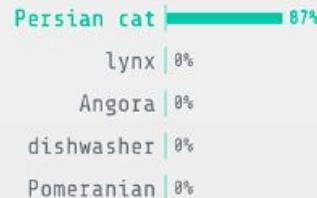


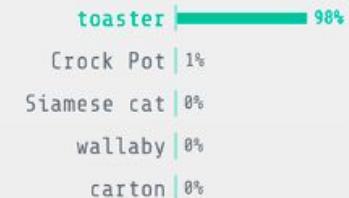
Image Source: <https://codewords.recurse.com/issues/five/why-do-neural-networks-think-a-panda-is-a-vulture>

Be Aware of Image Hacking 3

Original Image



Hacked Image



Be Aware of Image Hacking - Fake Fakes

Pedestrian (98.5%)



Newspaper (95.9%)



This could be a devastating example if the autonomous vehicle is trained to drive over newspaper!

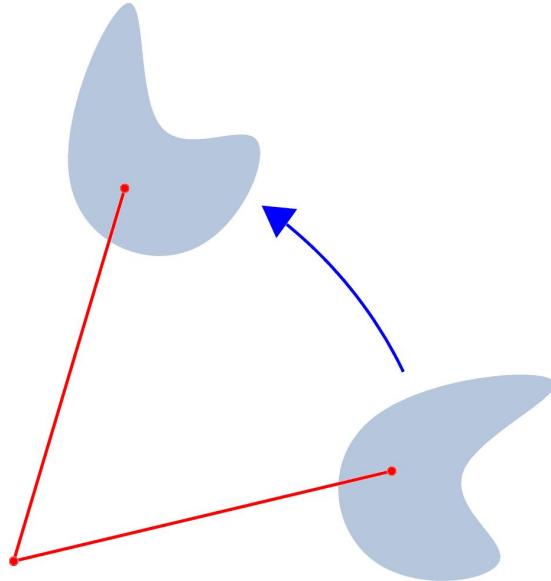
What can we do?



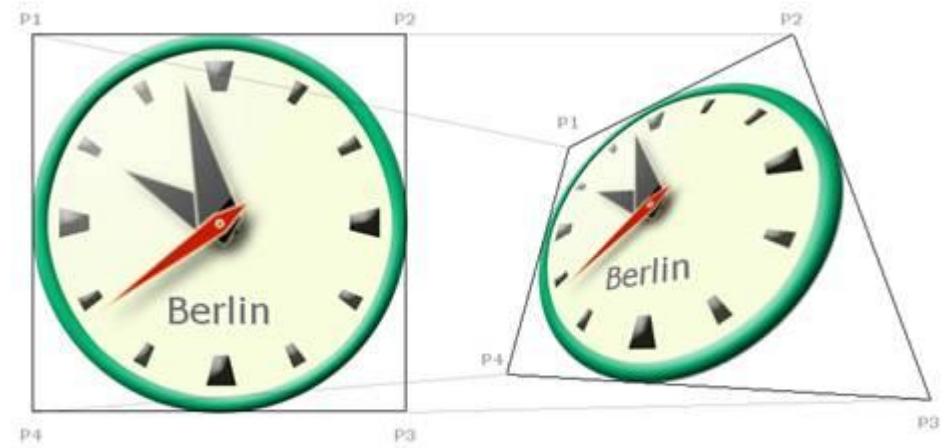
I need better training!
Any ideas?

Generate Training Data Idea 1

Augment source image by:



Rotation



Source Surface

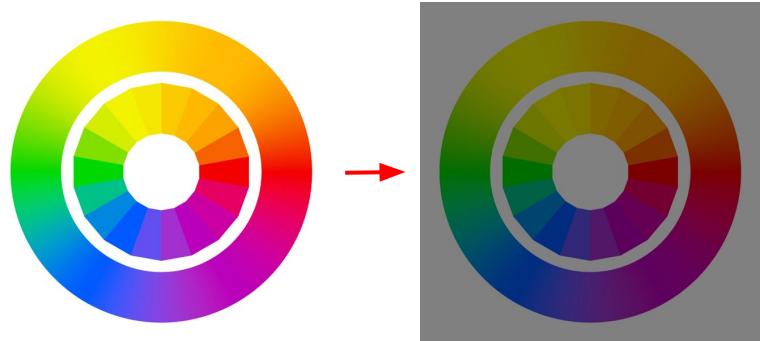
Destination Surface

Perspective Transformation

Generate Training Data Idea 2

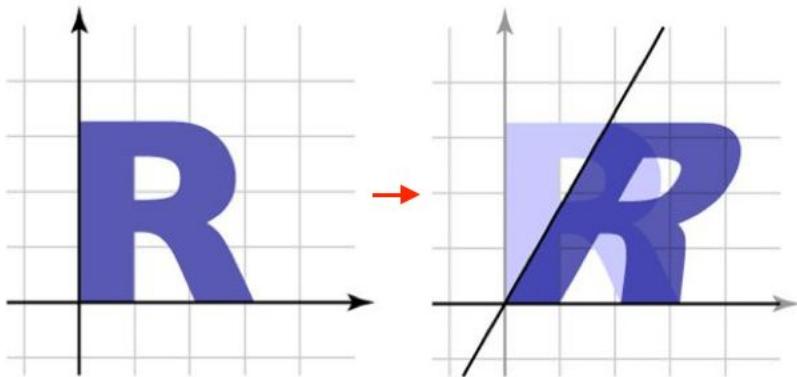


Blurring



Brightness Adjustment

Generate Training Data Idea 3



Shearing



Add Noise

Apply Blurring



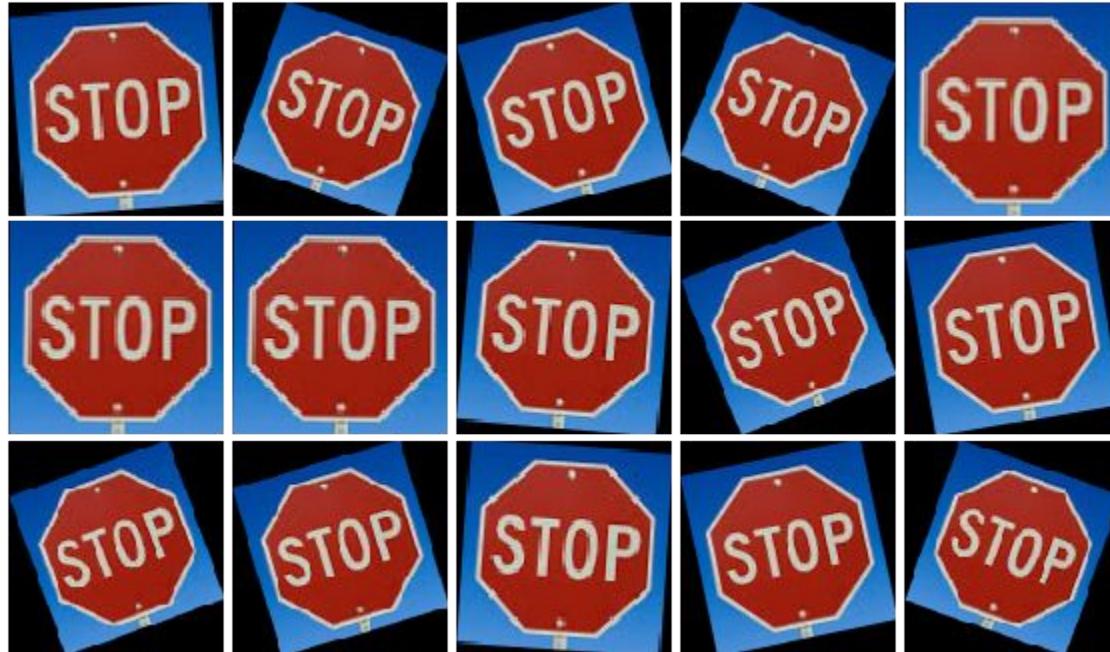
Apply Noise



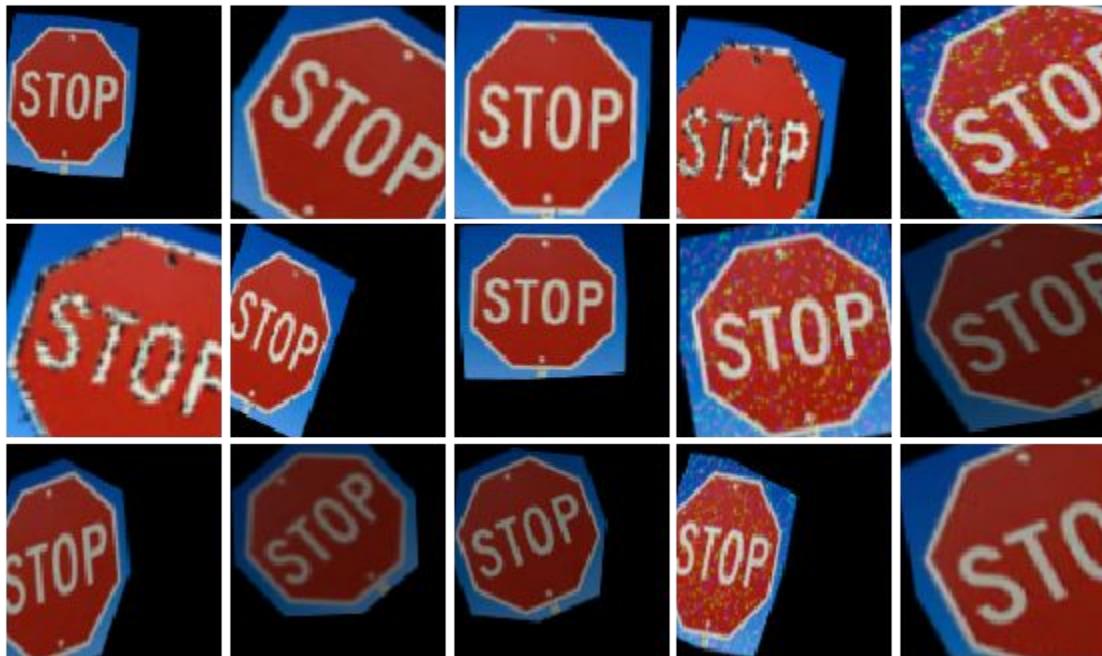
Adjust Brightness



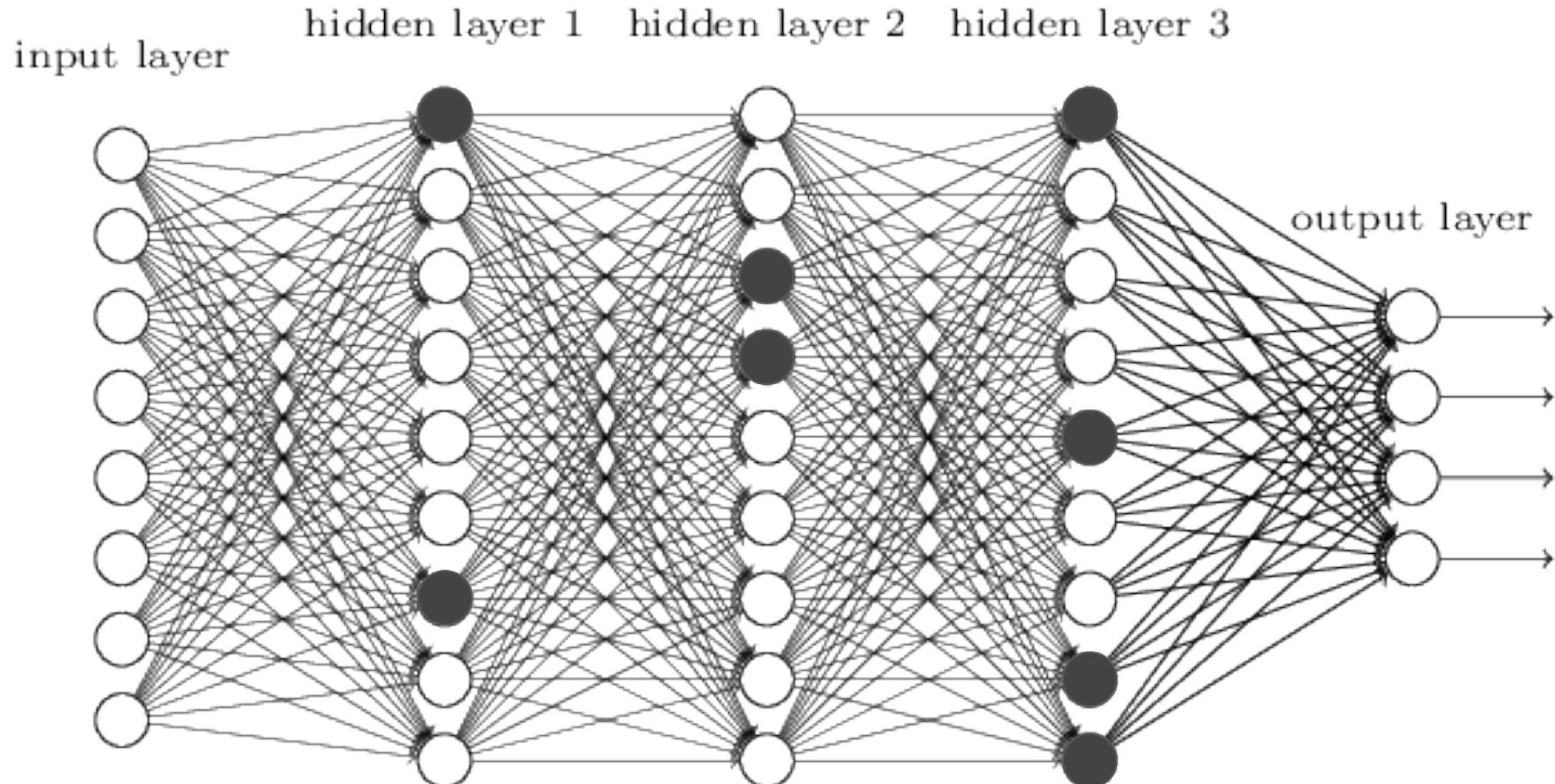
Apply Rotations



All Adjustments



Dropout in Neural Network



Time Saving Tip

Generate many variations per source image
but:

- Don't save to disk (slow and takes space)
- Run it under a Python Generator Object
 - Generate images as you train (fast and scalable)

Train a Winning Model

... and become a billionaire!



Image Source: HBO

Thank You



Slides and code: bit.ly/scds-acflippo