



ConvoBot – Convolutional Neural Networks + Robotics

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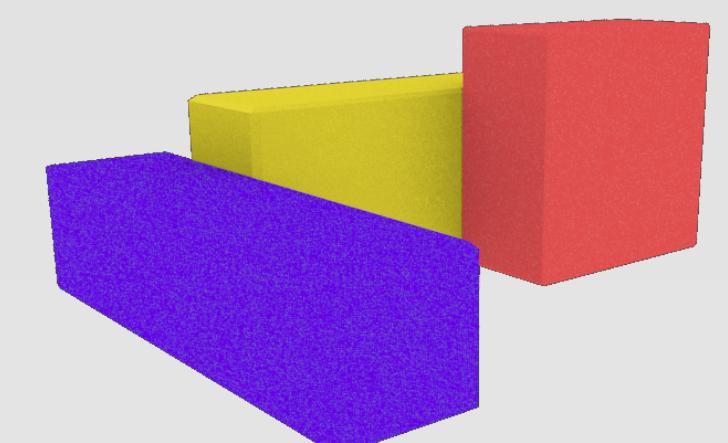
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Project Objectives

TRAIN CONVOLUTIONAL NEURAL NETWORK IN VIRTUAL WORLD TO NAVIGATE ROBOT IN PHYSICAL WORLD

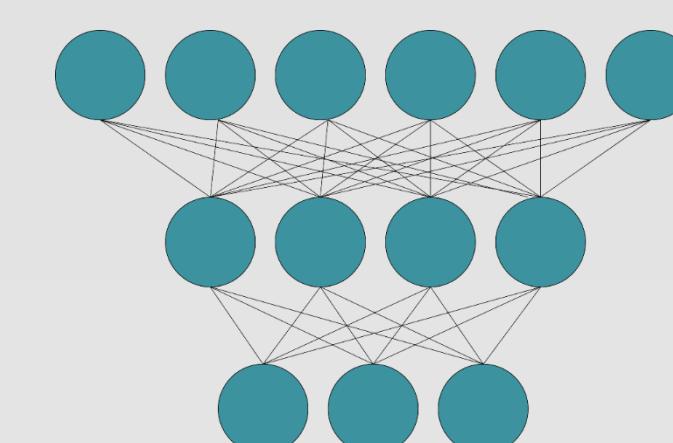
Simulation



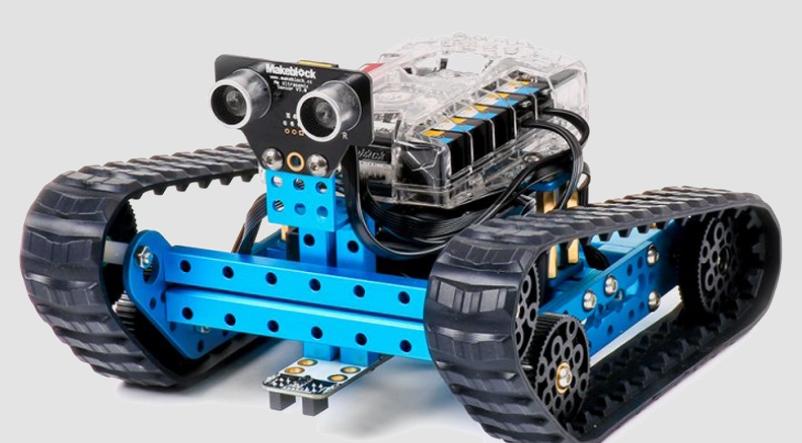
Labeled Data

R	Θ	α	Img
15.6	15	170.0	
22.5	97	180.5	
19.4	269	185.0	
29.8	305	172.5	

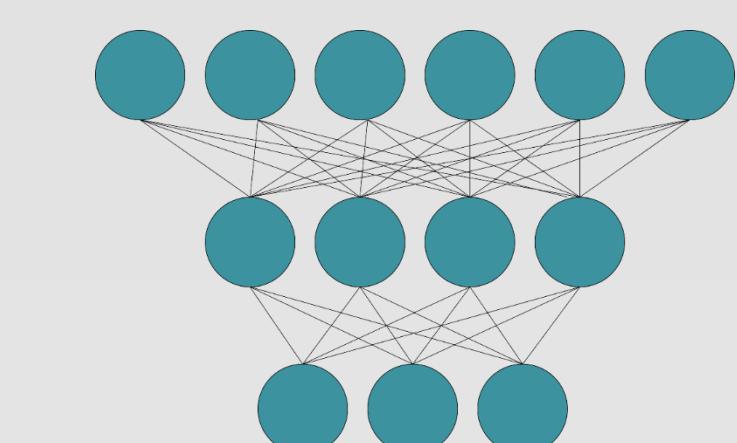
Trained CNN



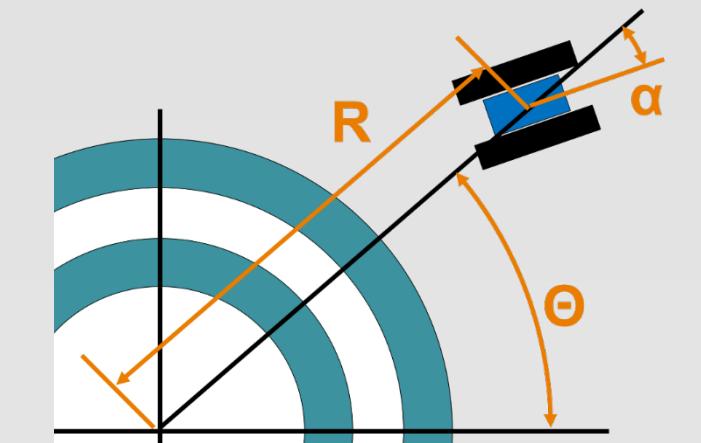
Robot



Prediction

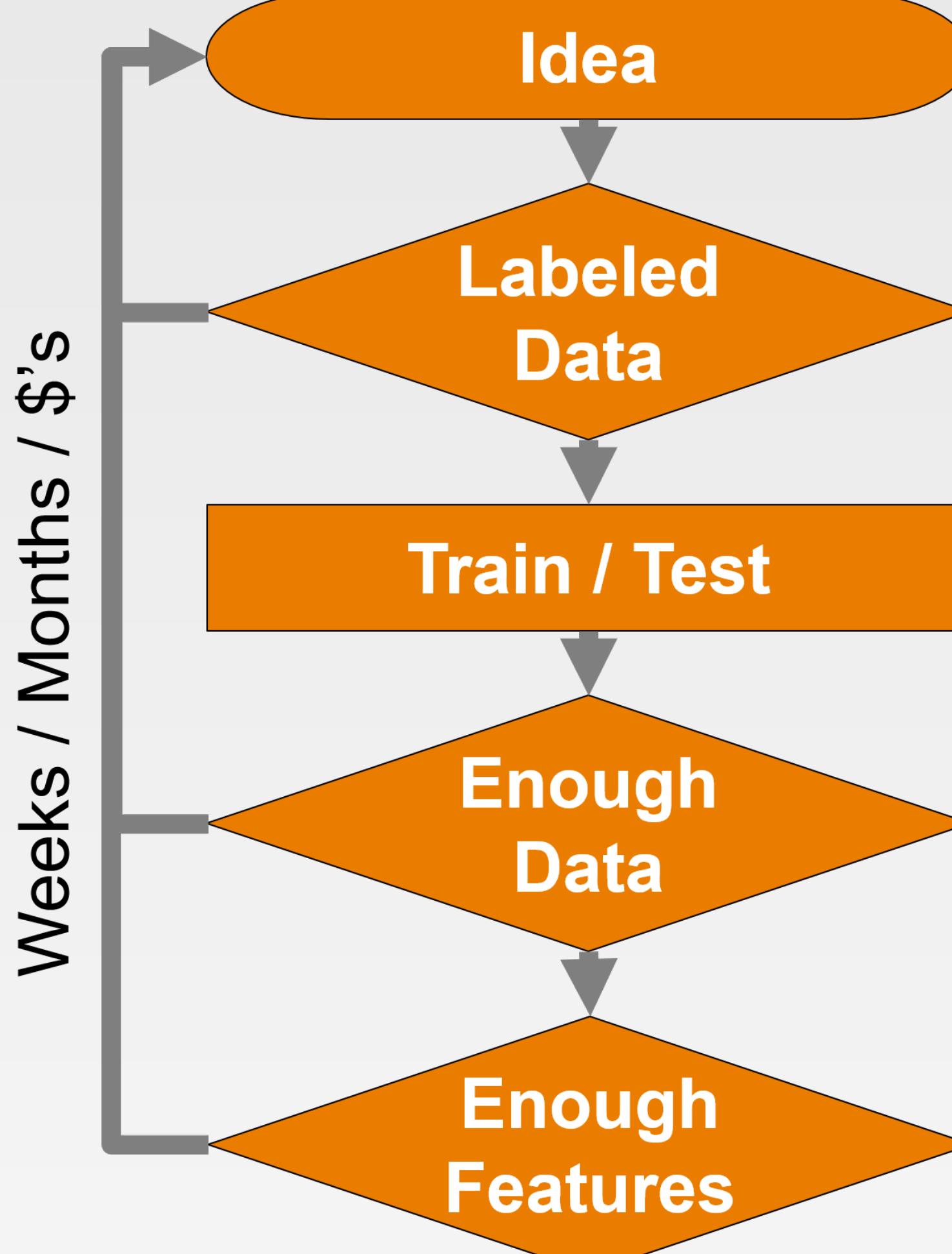


Navigation

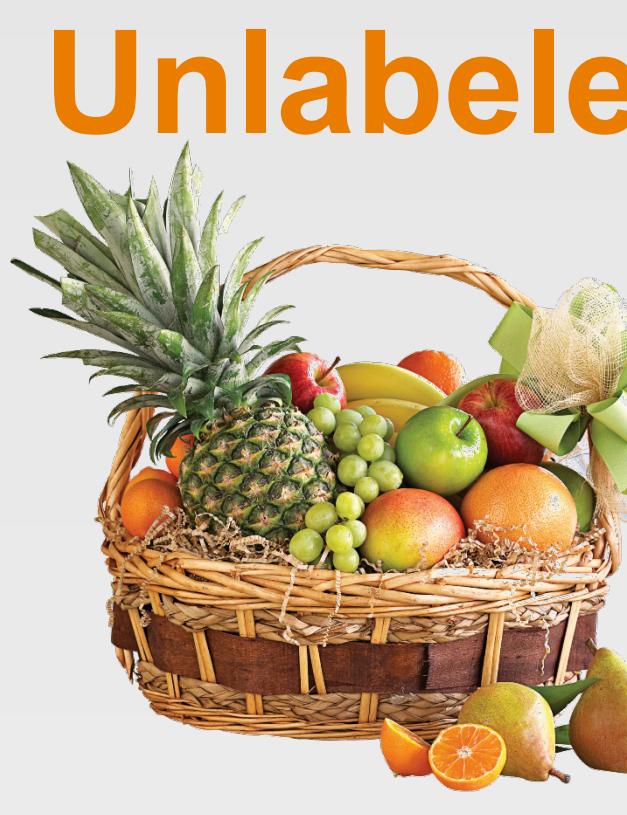


w/o Simulation

Data Science is a constant search for more labeled data.



Methods



Network

CNN regression model trained on 100,000 simulated 64x64 RGB images to predict Radius, Θ and α position of Robot.

Image 64x64x3

2D Convolution: 8x8

- Filters: 16

2D Convolution: 2x2

- Filters: 32

Max Pool: 2x2

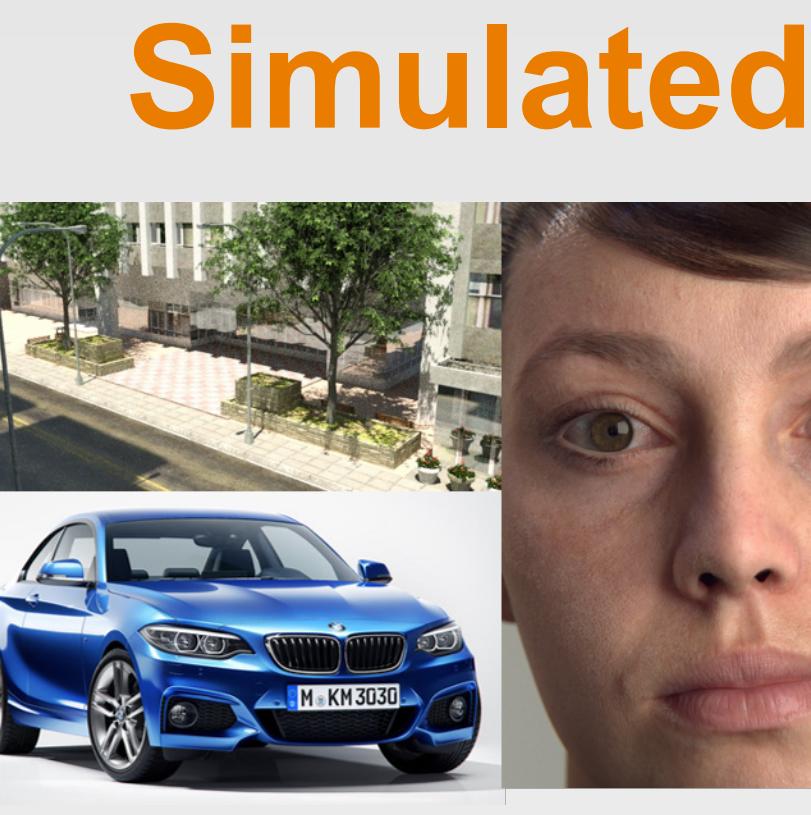
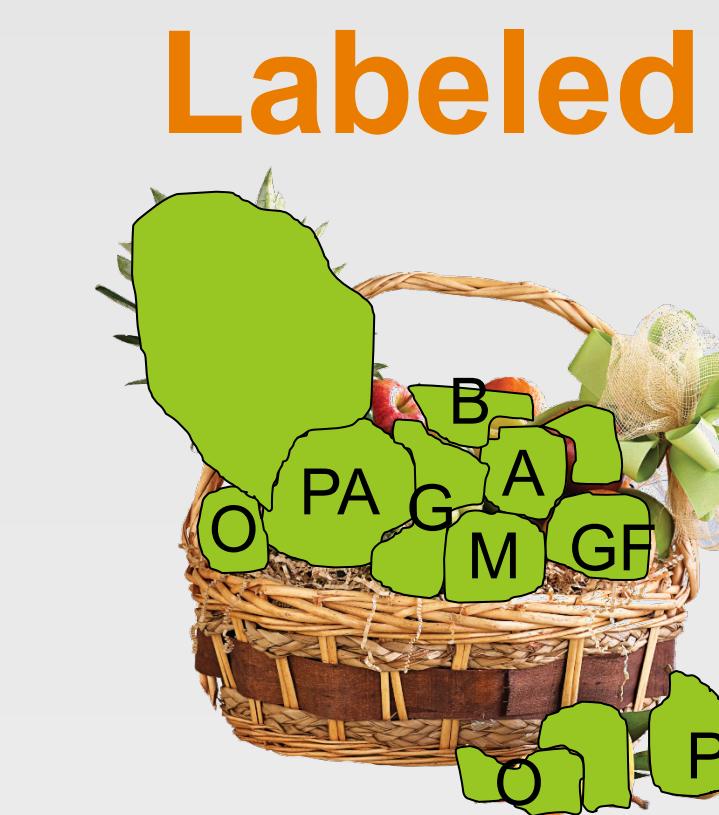
Dropout: 25%

Flatten:

Dense: 256

Dropout: 25%

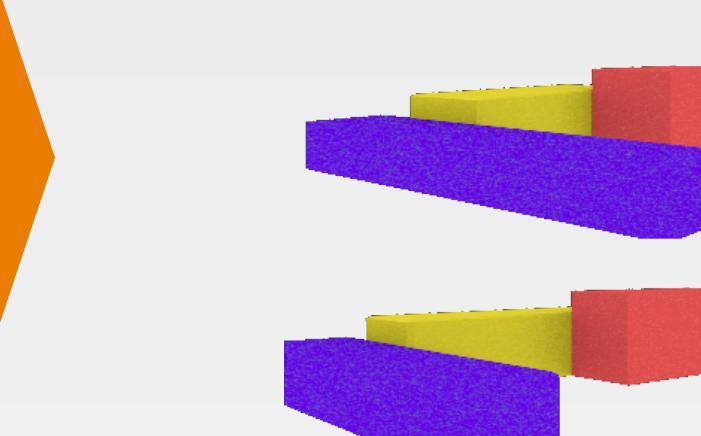
Dense: 3 (R, Θ , α)



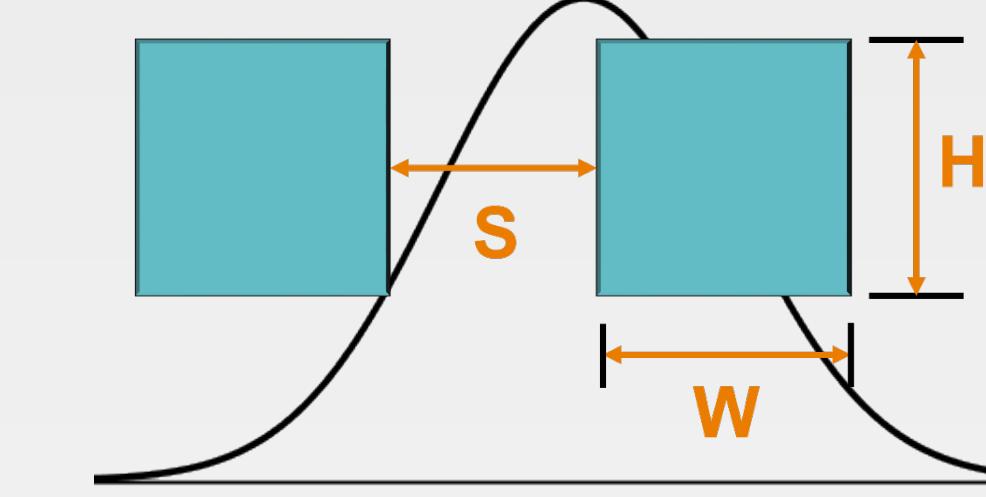
Simulated

- Rendered images can be quite realistic
- Know what, where, and the extents of every object in the image
- Automatically label this data!

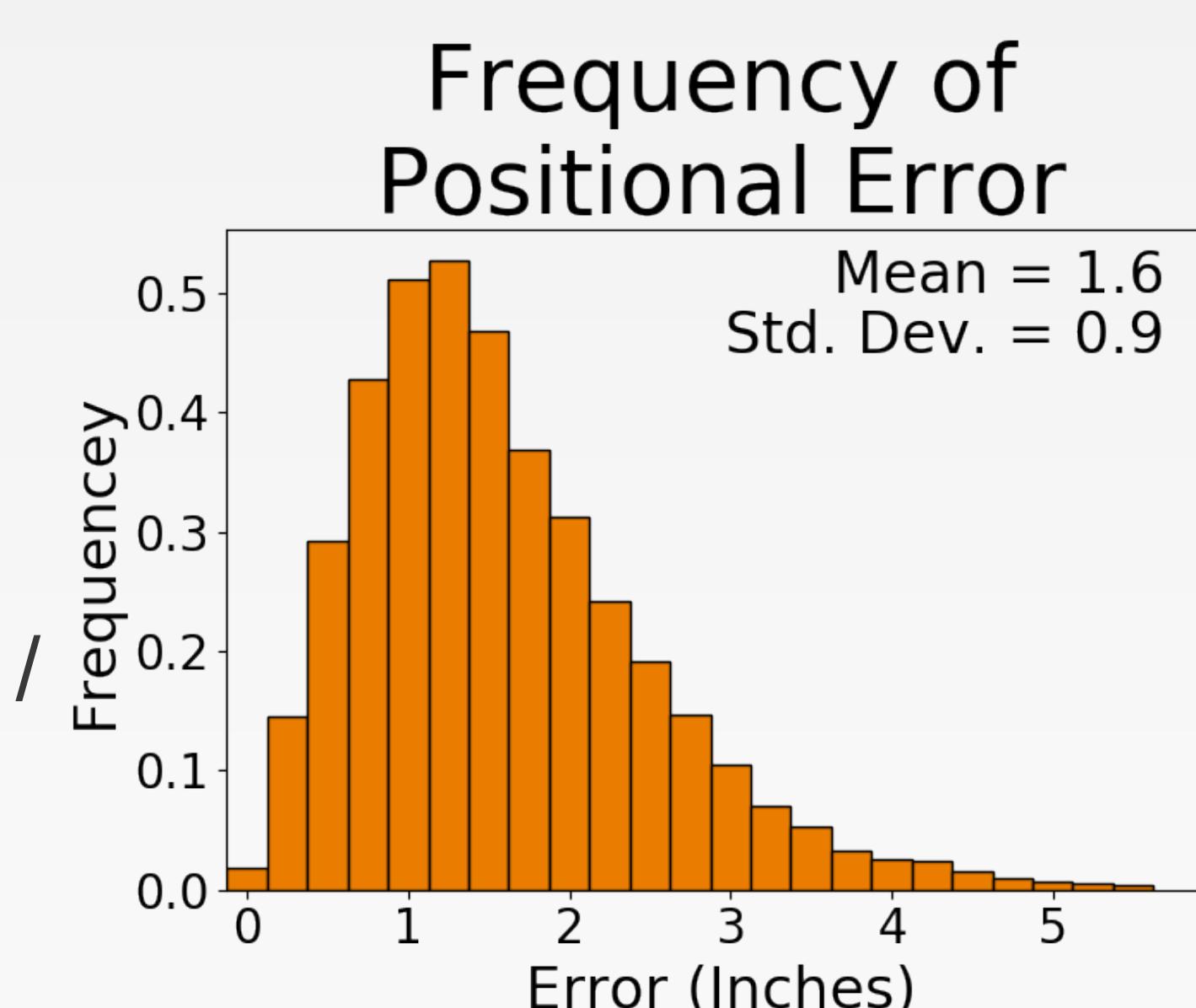
Stereoscopic



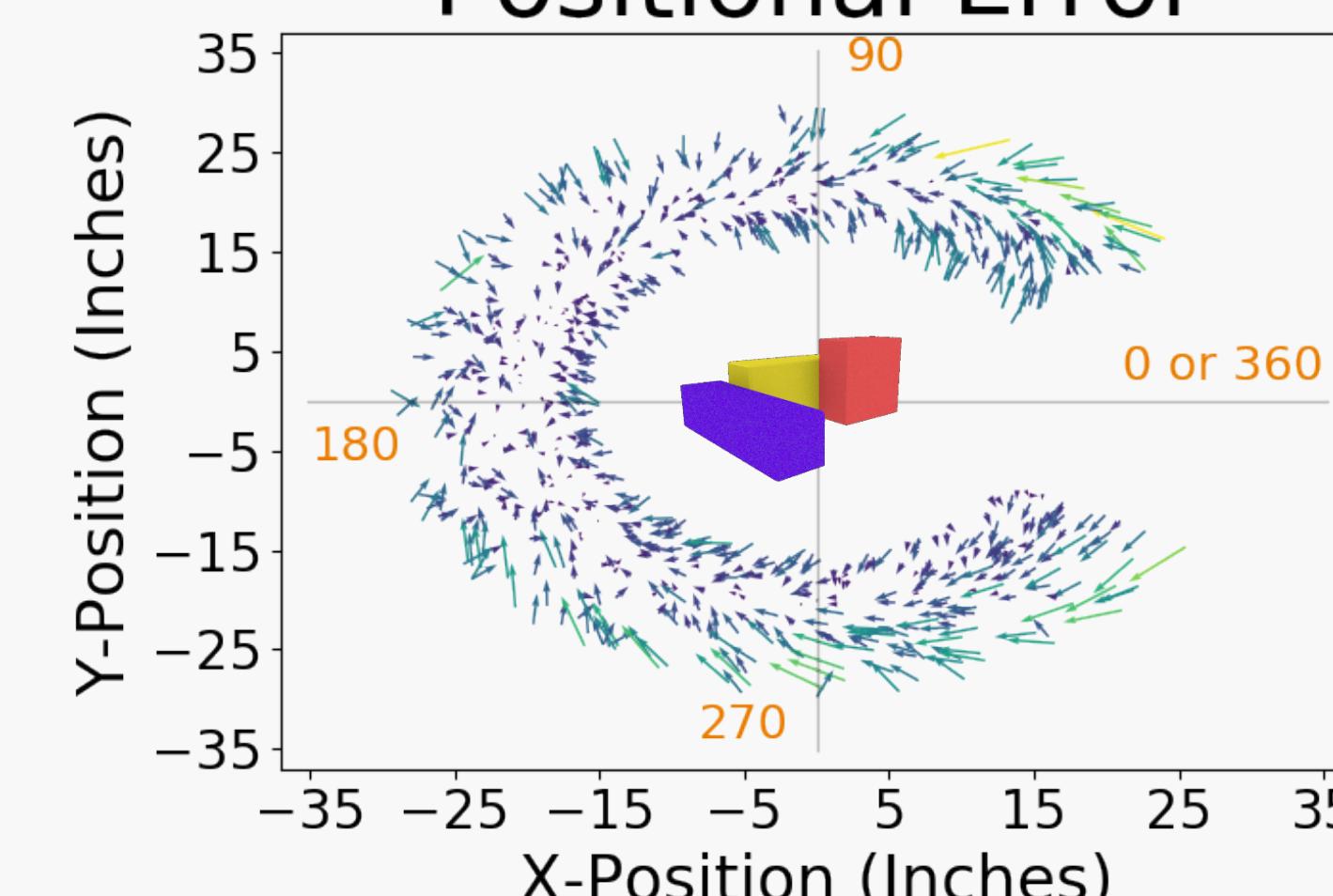
Noise



Results



Location of Positional Error

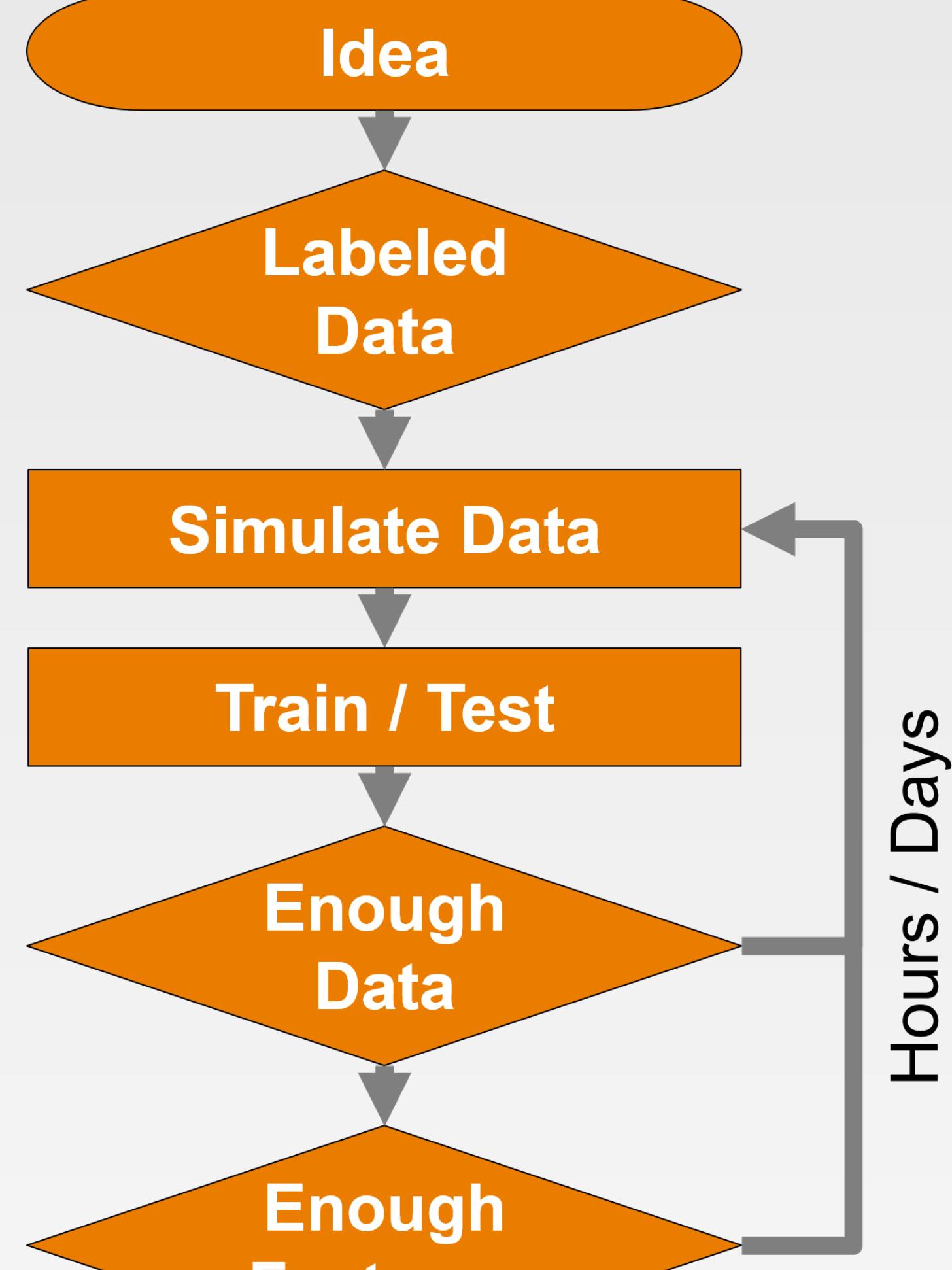


Tech Stack

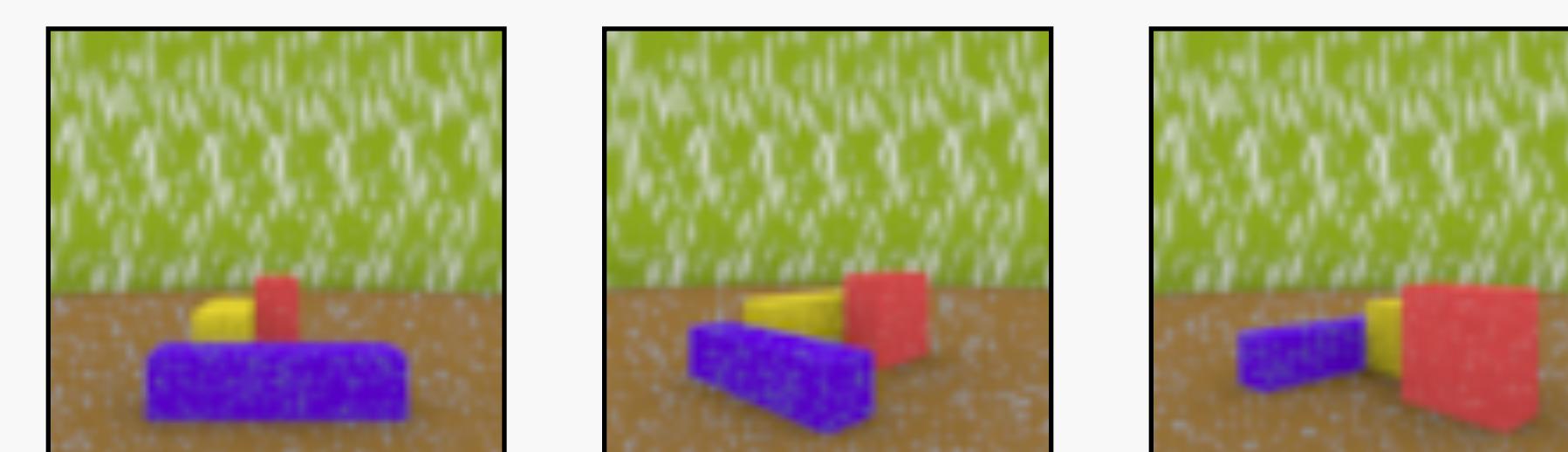


w/ Simulation

Data Science creatively searches feature & model space for solutions.



Training Images



Next Steps

- Categorical Predictor
- Robot Navigation
- TensorFlow Deep Dive