Domain Randomization for Cuboid Pose Estimation

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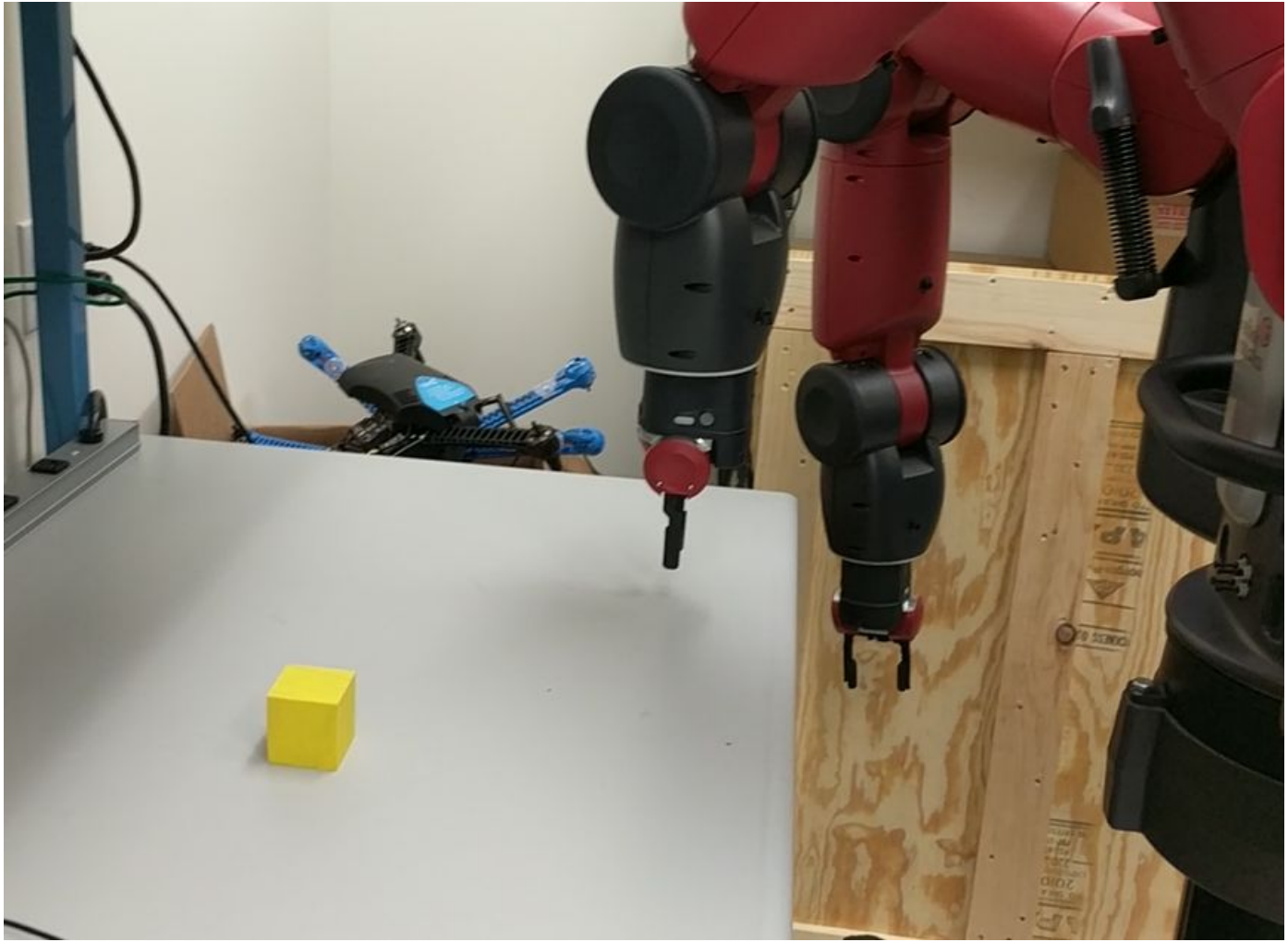
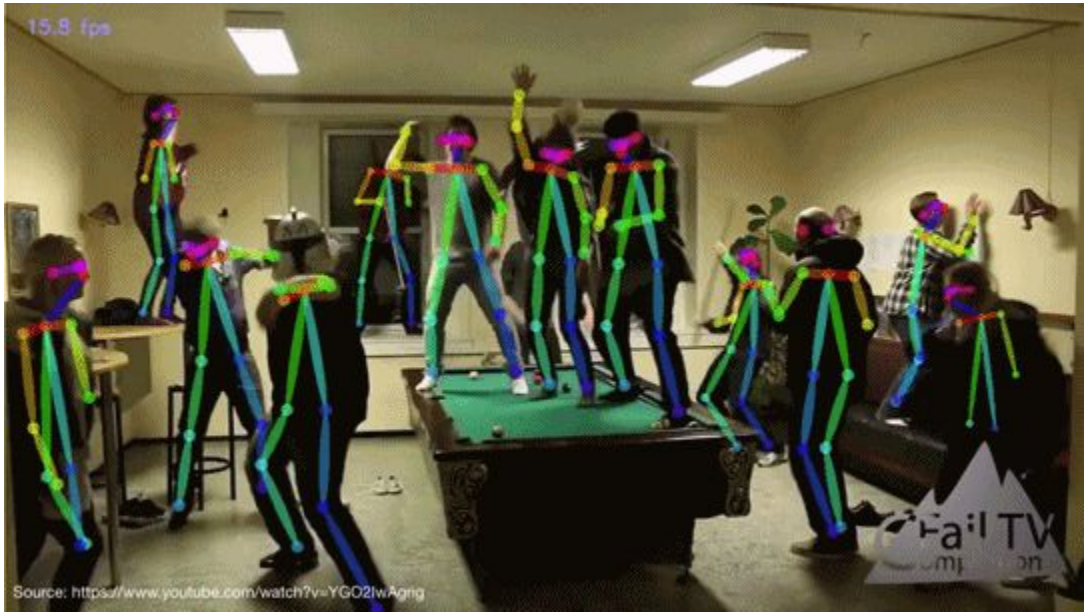
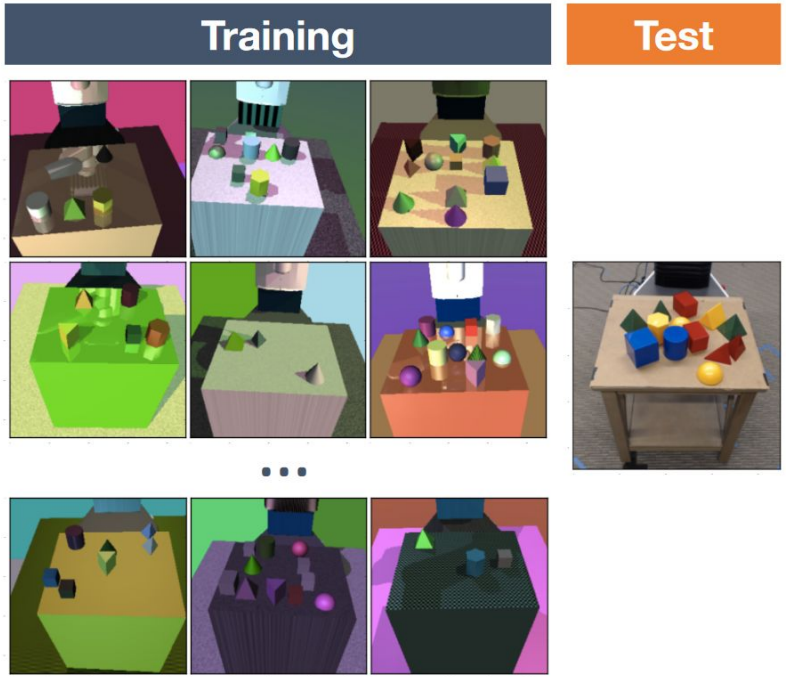


Real-time Multi-Person 2D Pose Estimation using Part Affinity Fields



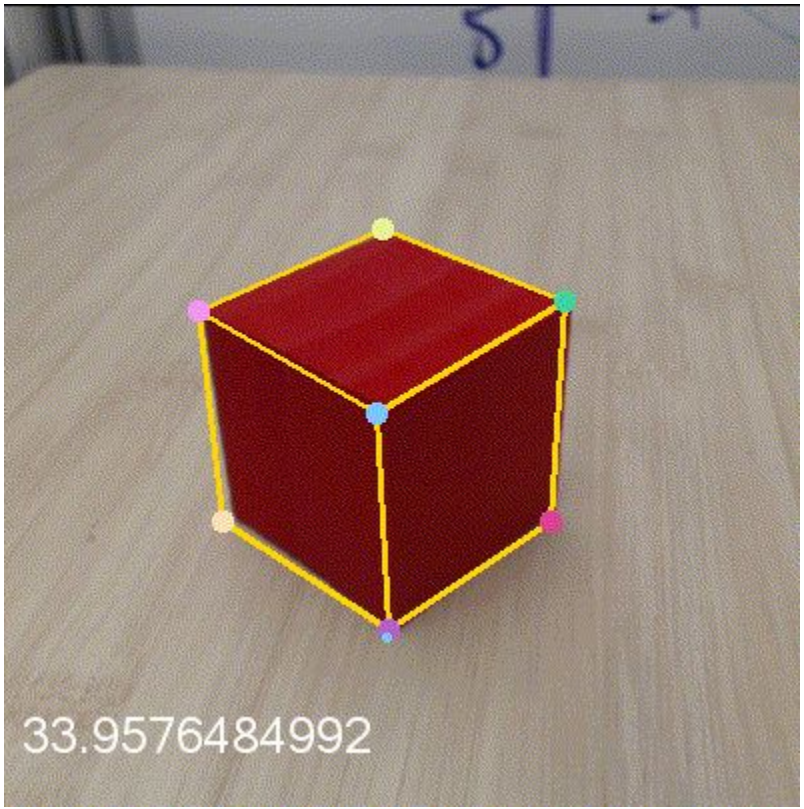
Cao et al.
CVPR 2017

Domain Randomization for Transferring Deep Neural Networks from Simulation to the Real World

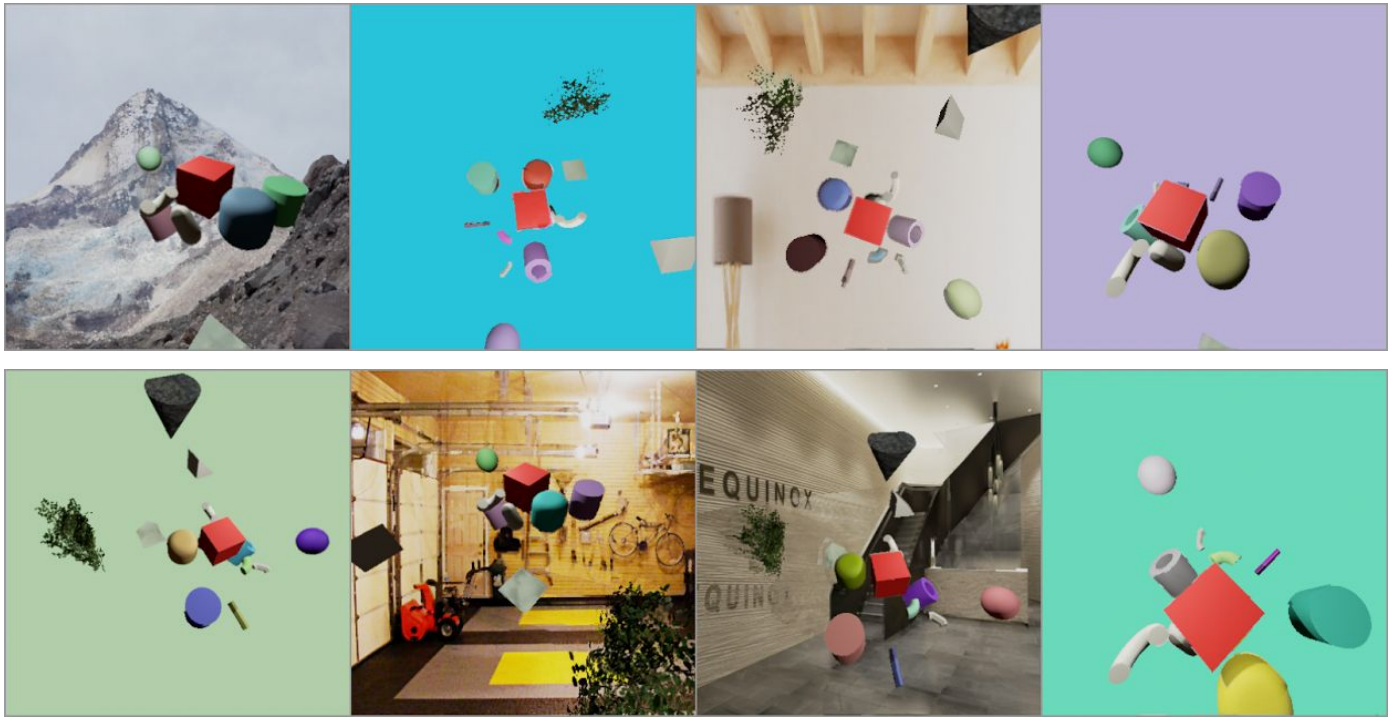


Tobin et al., 2017
arXiv:1703.06907

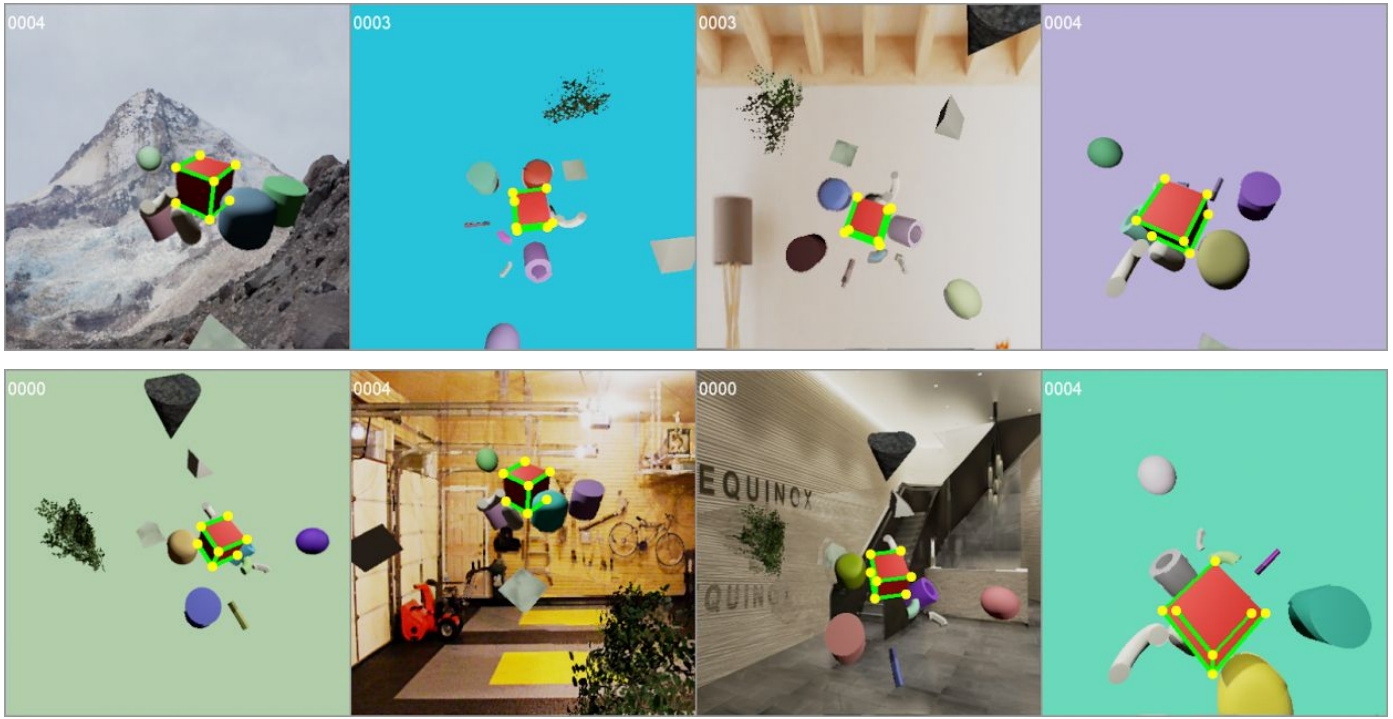
Cuboid Pose Estimation



Data Generation



Data Generation

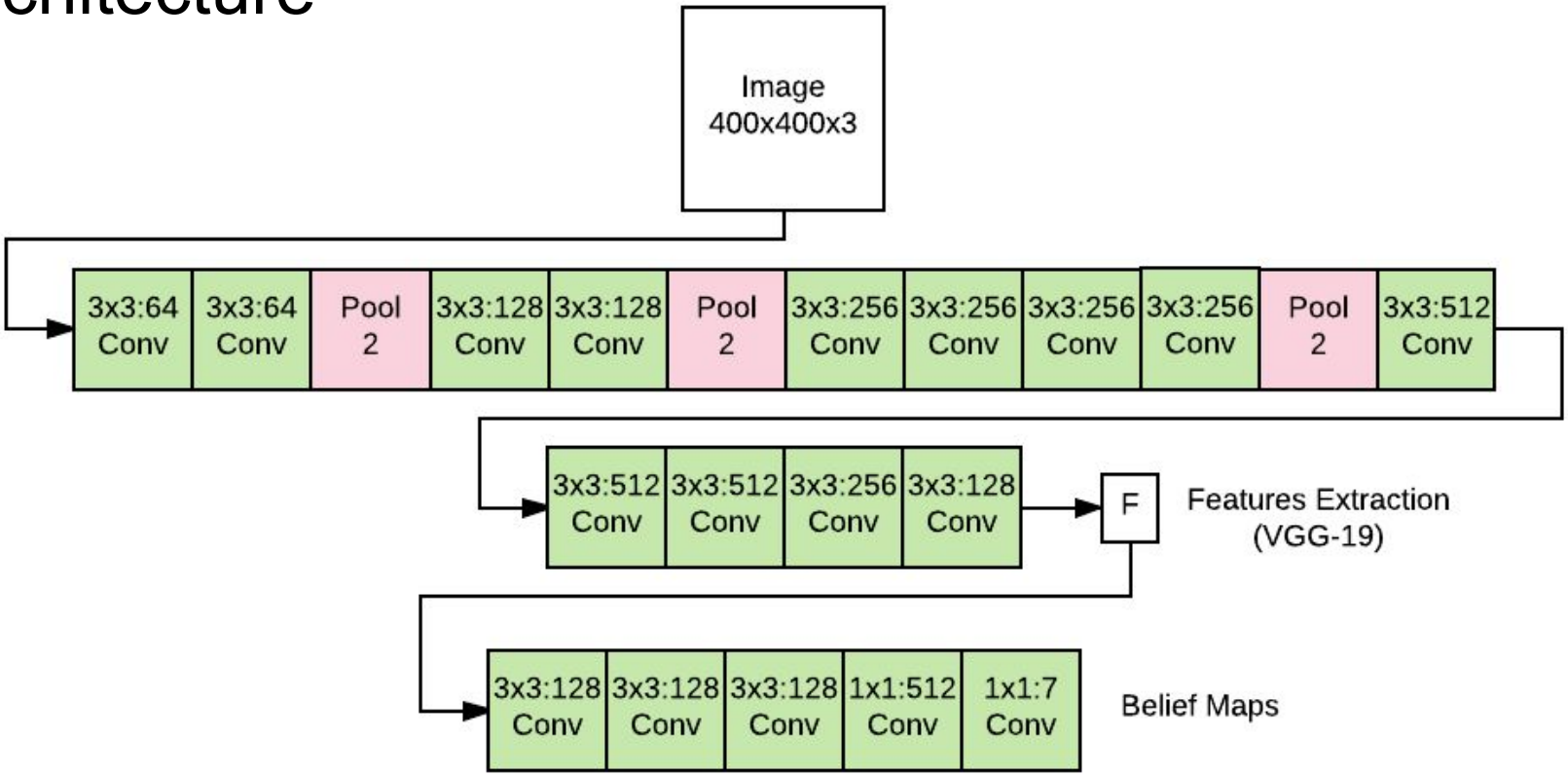


Data Generation - Domain Randomization

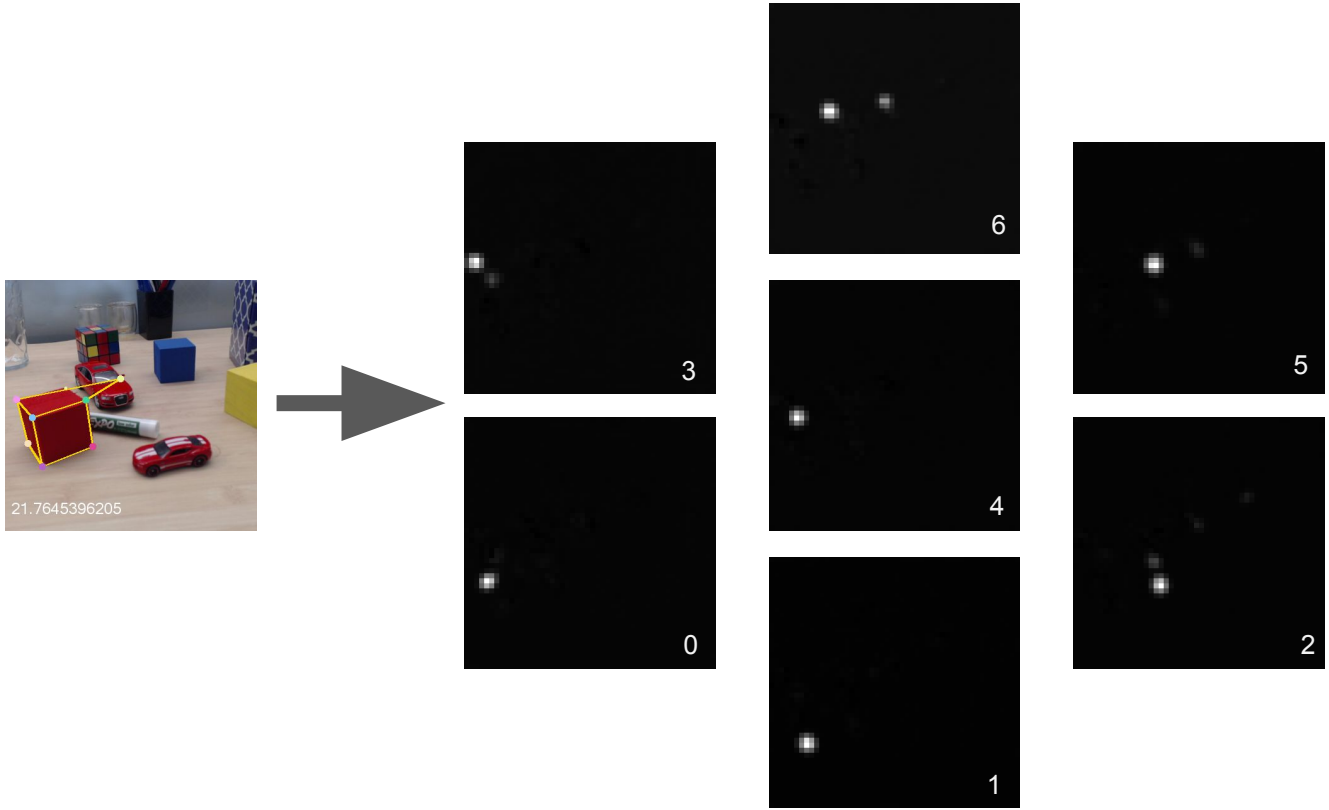
- Unreal Engine 4
- Random distractor objects with random color
- Random lights
- Random solid color or imagenet sample as background
- Random camera position (depth, azimuth, elevation, yaw)

- Pixel location vertexes
- 2d bounding box
- Depth maps
- Labels

Architecture



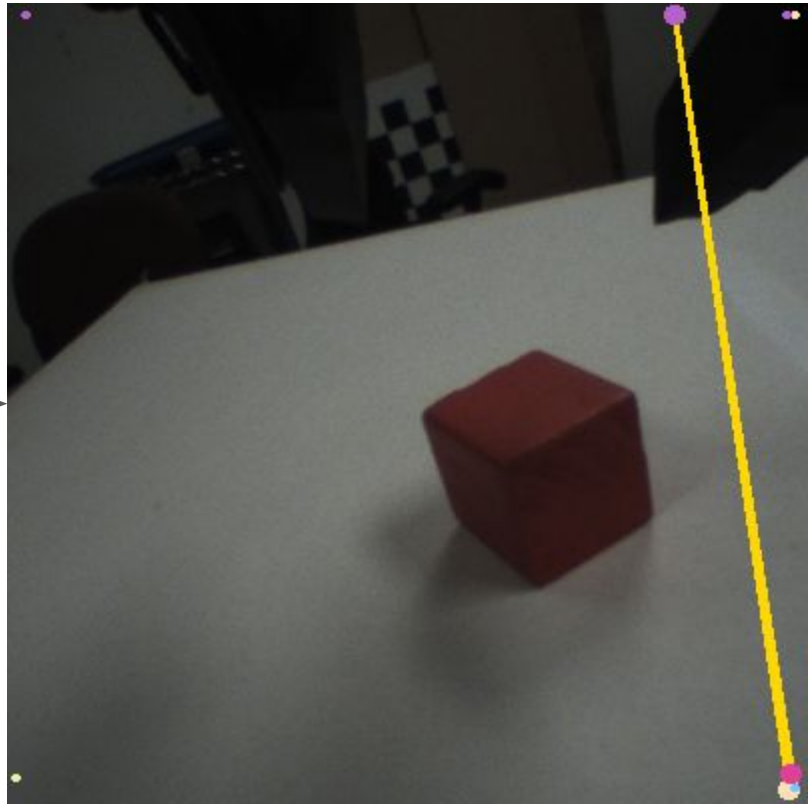
Model Output - Belief Maps



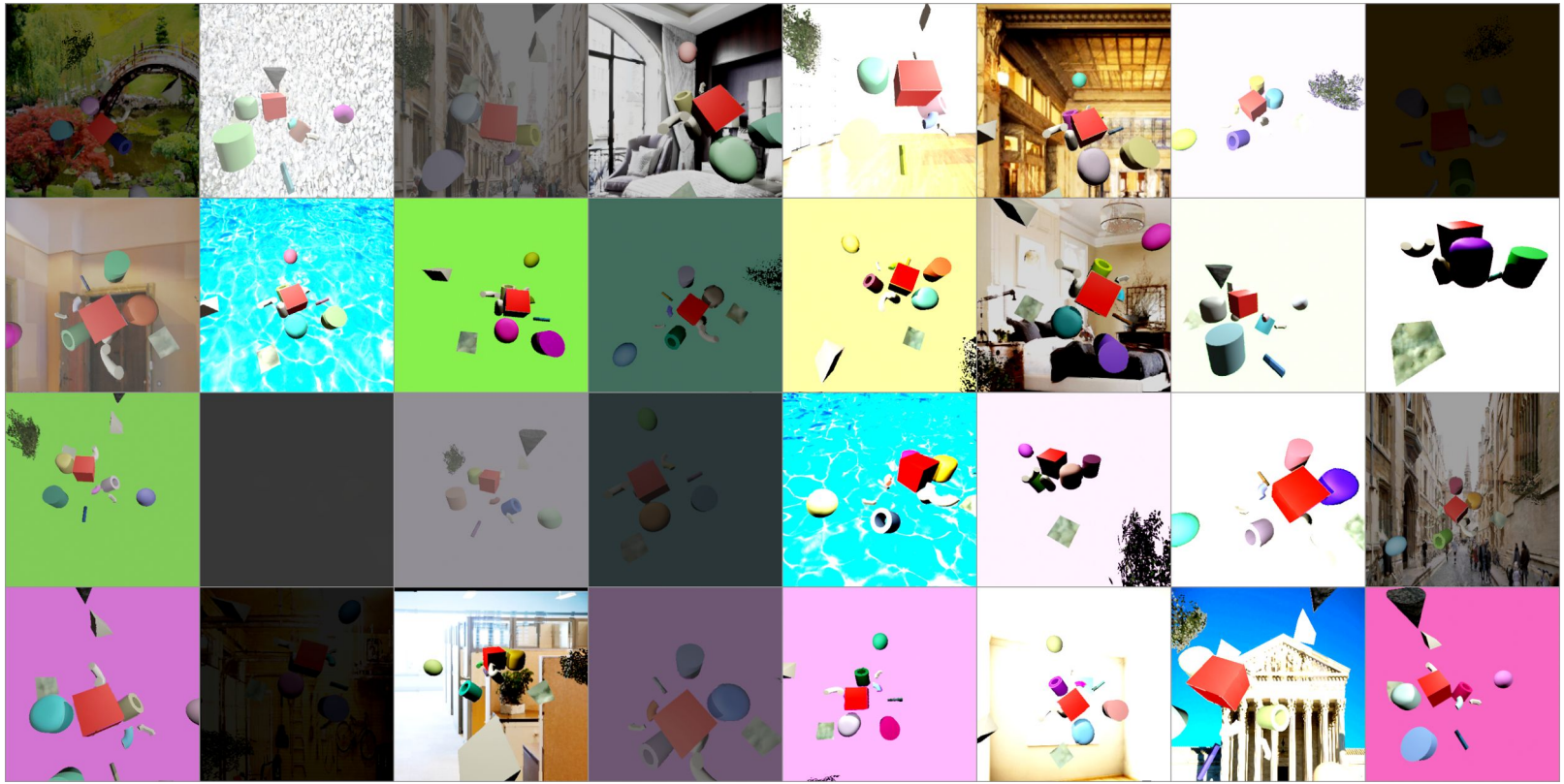
Find Point Locations

- Find local maximum using a sliding window
- Cluster local minimum using DBSCAN
- Select most probable point location

Baxter’s camera



Data - Contrast and Brightness

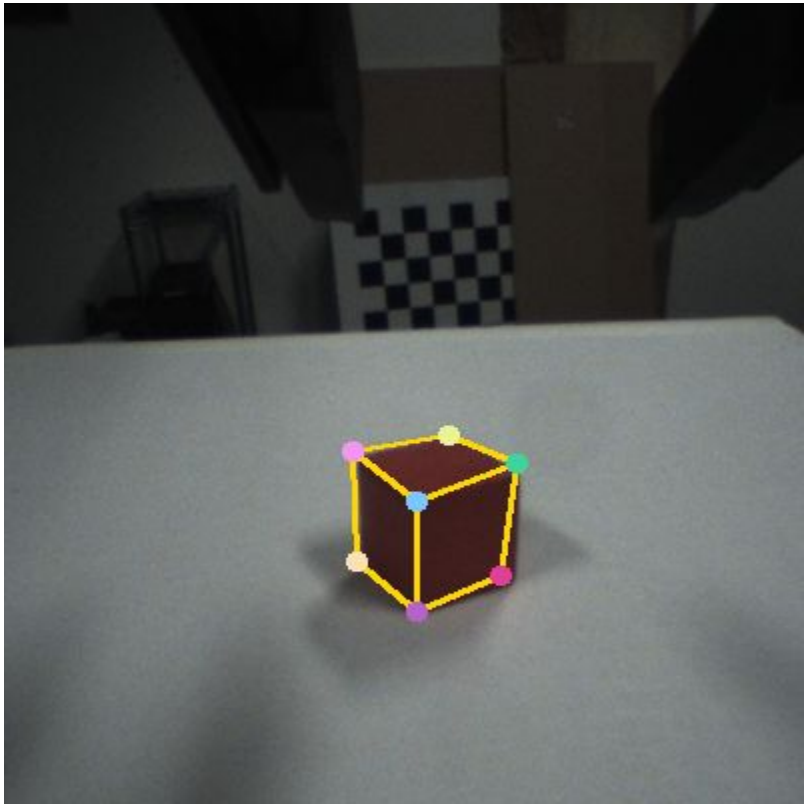


Regularizing Neural Networks by Penalizing Confident Output Distributions

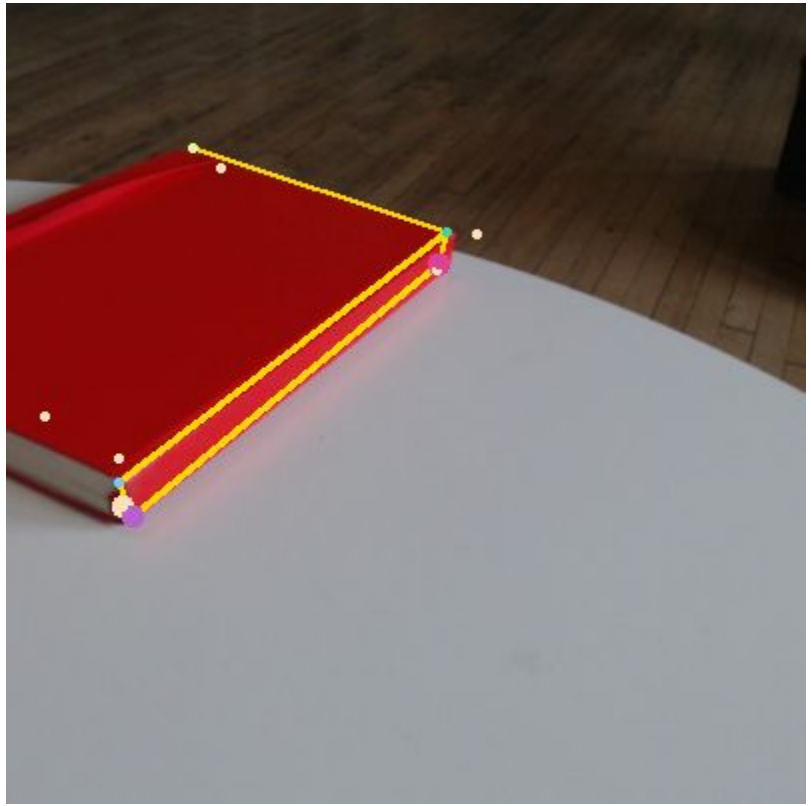
$$H(p_\theta(\boldsymbol{y}|\boldsymbol{x})) = -\sum_i p_\theta(\boldsymbol{y}_i|\boldsymbol{x}) \log(p_\theta(\boldsymbol{y}_i|\boldsymbol{x})).$$

Pereyra et al.
ICLR 2017

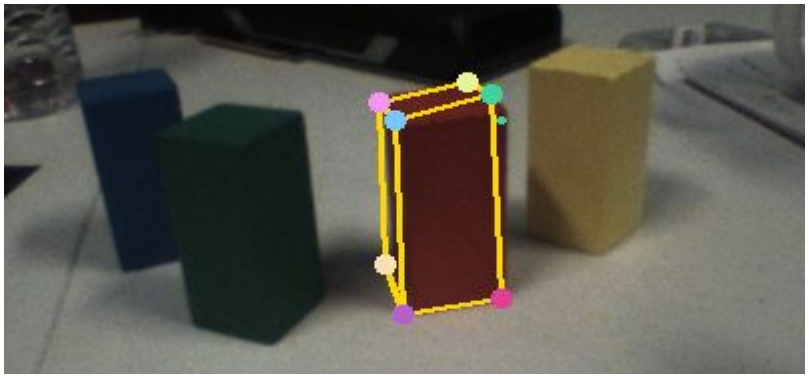
Baxter’s camera

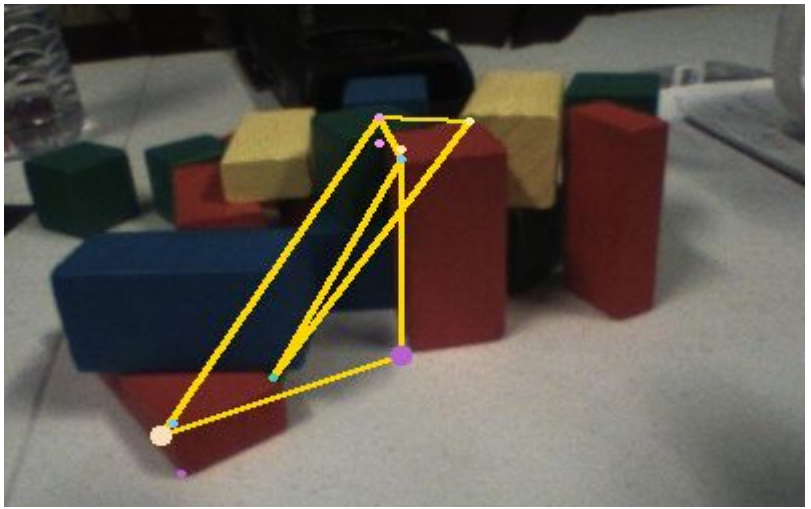


Surprising Result



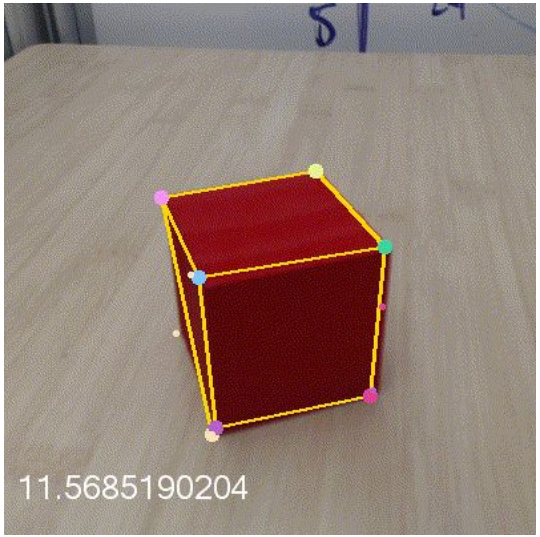
Baxter’s camera





Let’s go further

- Using a neural network to output the points pixel location
- Deal with multiple objects
- Working with real world objects
- Why is domain randomization working?



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Domain Randomization