

Use The Force Luke! Learning To Predict Physical Forces By Simulating Effects

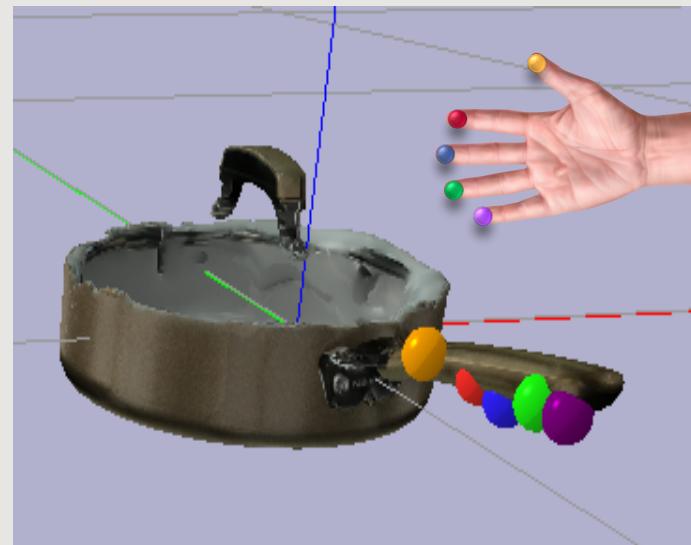
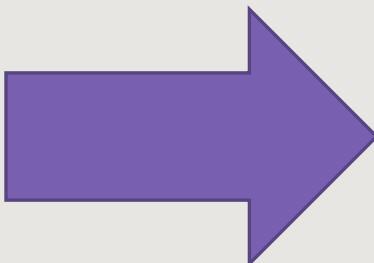
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(CVPR'20, Oral Presentation)

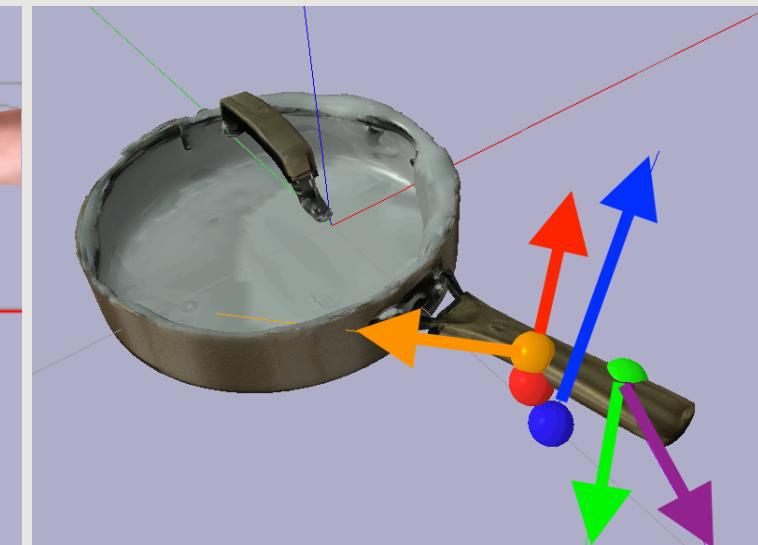
GOAL



Input Video

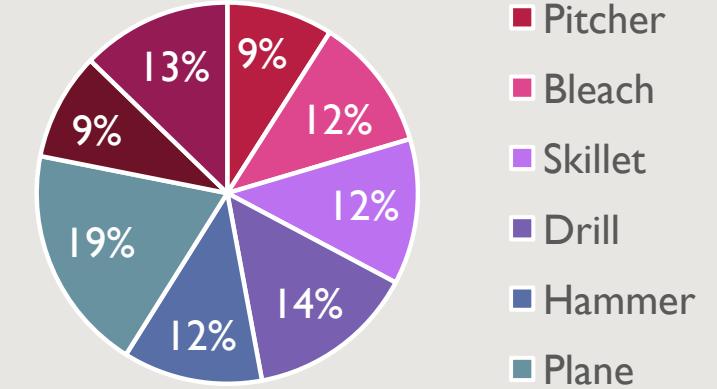


Contact Points



Forces

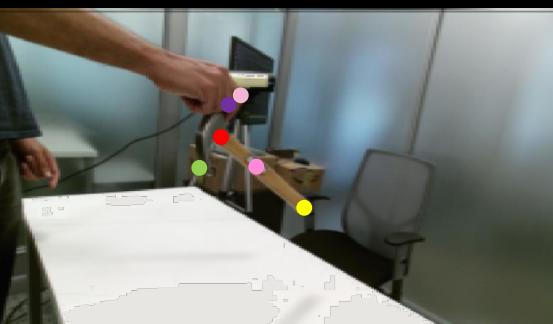
DATASET



Image



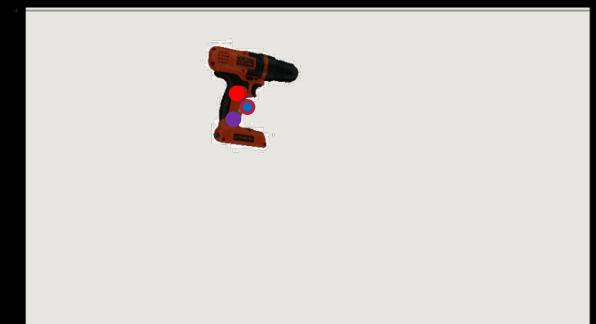
Keypoints annotations



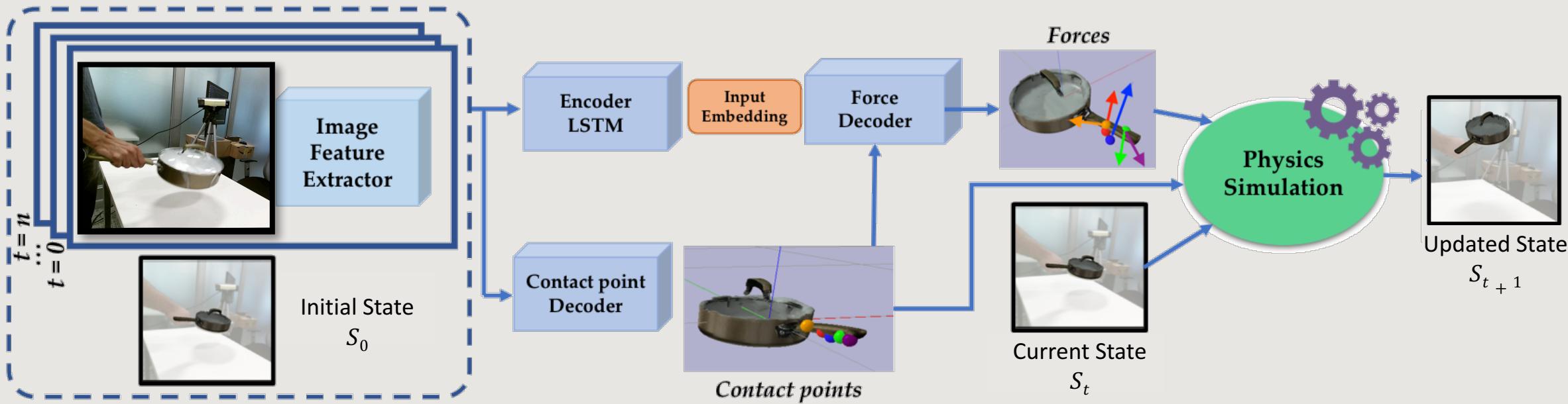
Object pose



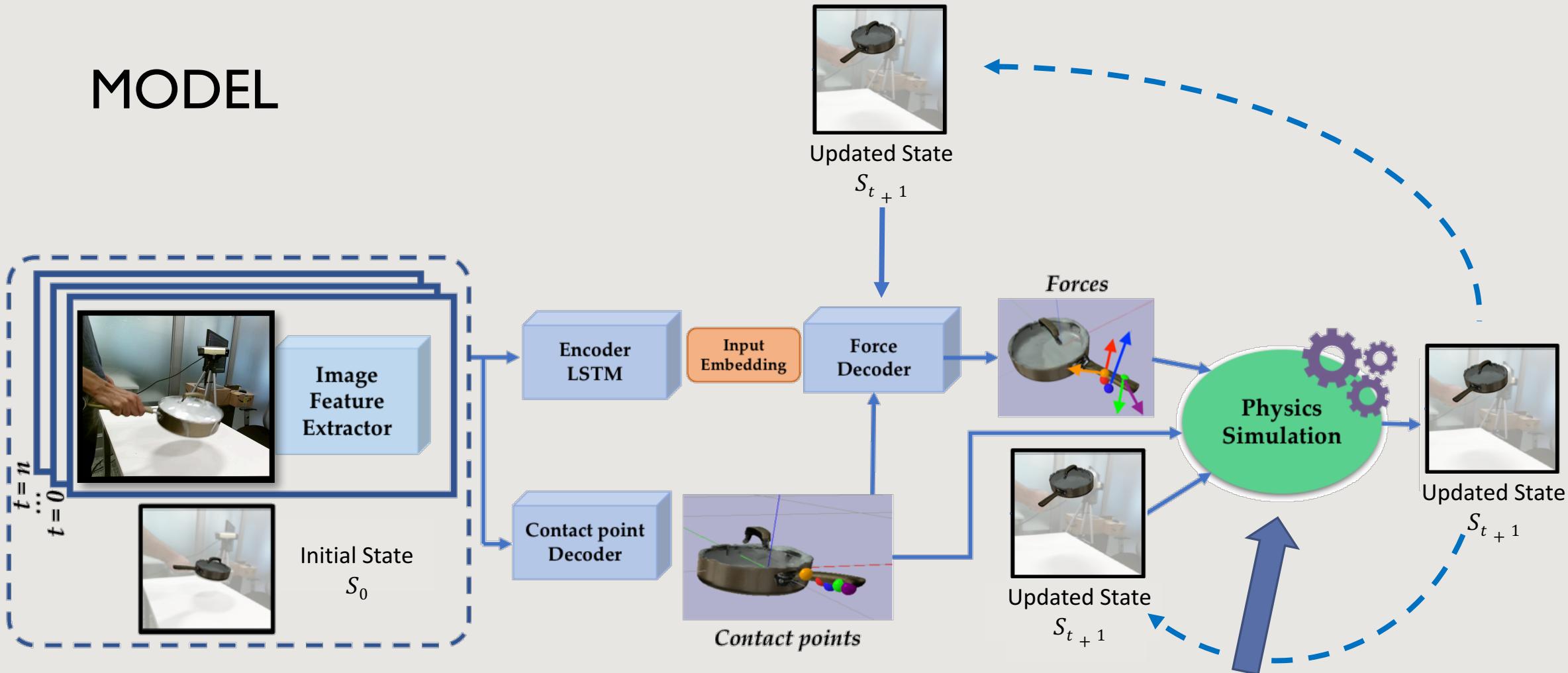
Contact points



MODEL



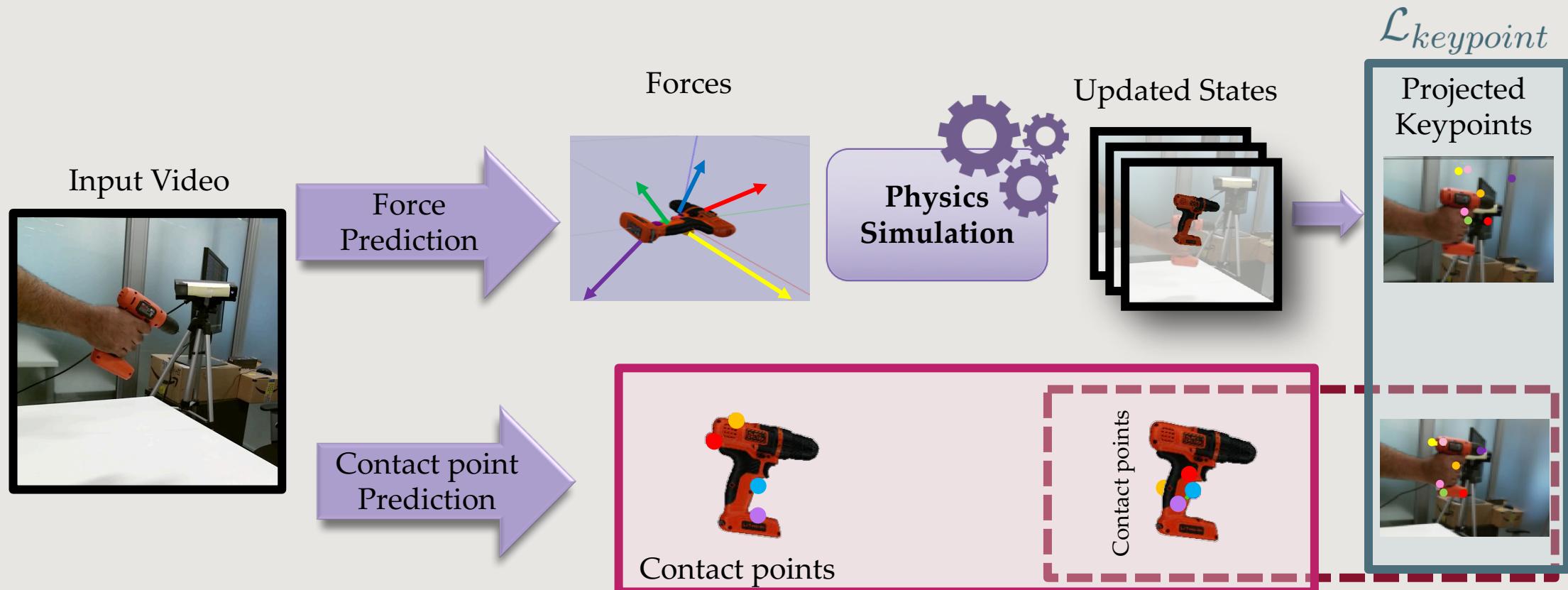
MODEL



$$\frac{df}{dx} \approx \frac{f(x + h) - f(x - h)}{2h}$$

OBJECTIVES

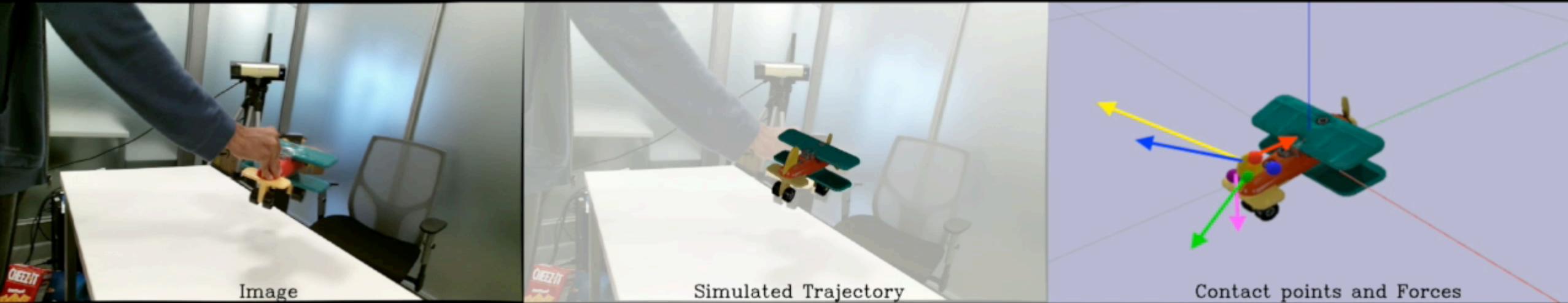
$$\mathcal{L}_{keypoint}(l_t^{kp}, s_t) := \|l_t^{kp} - \pi(R_t, T_t)\|^2$$



$$\mathcal{L}_{cp}(C_t, \hat{C}_t) := \sum_{i=0, \dots, k} \|c_i - \hat{c}_i\|^2$$

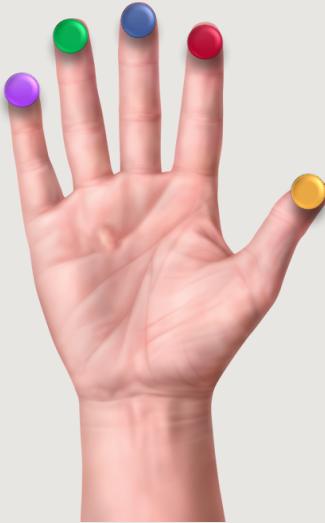
$$\mathcal{L}_{cp}$$

Ground-truth labels



PLANE

RESULTS



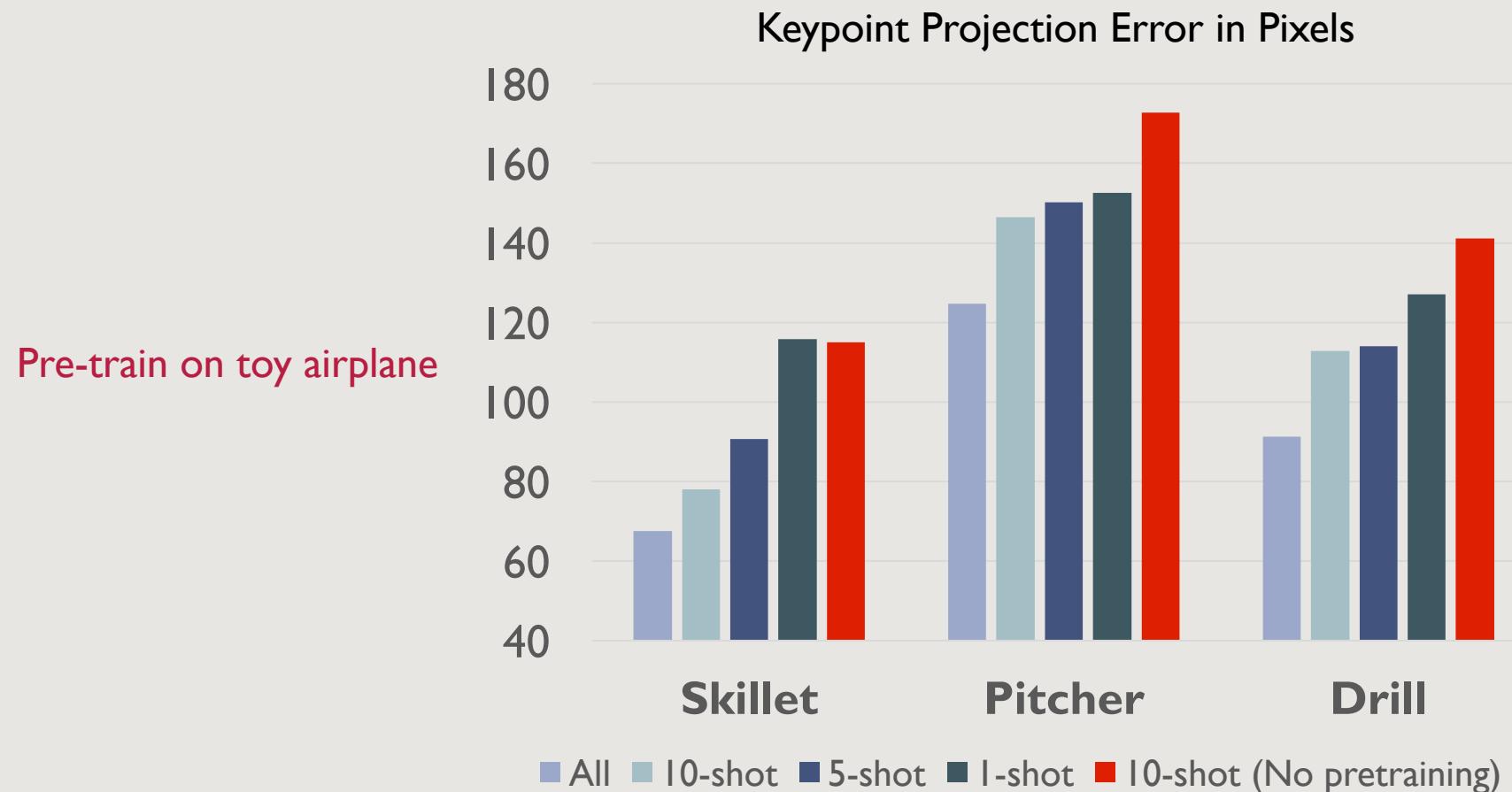
Image

Trained with \mathcal{L}_{cp}

Trained with
 $\mathcal{L}_{cp} + \mathcal{L}_{keypoint}$

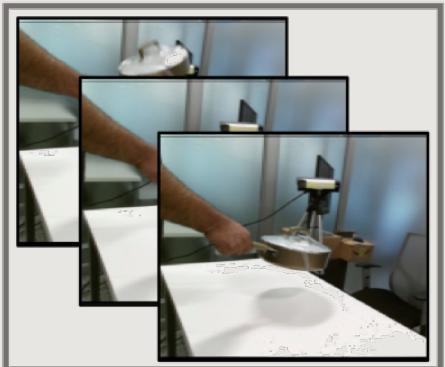


FEW SHOT RESULTS

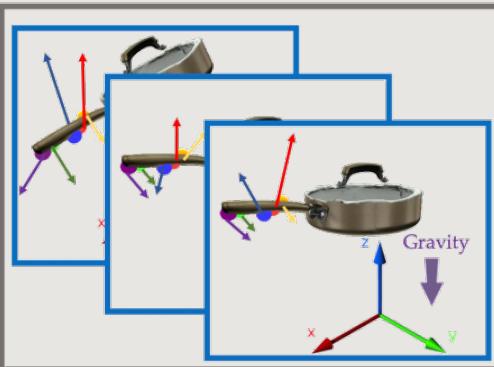


CODE AND DATA AVAILABLE AT:

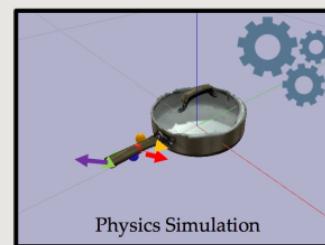
<https://ehsanik.github.io/forcecvpr2020/>



Input
Videos



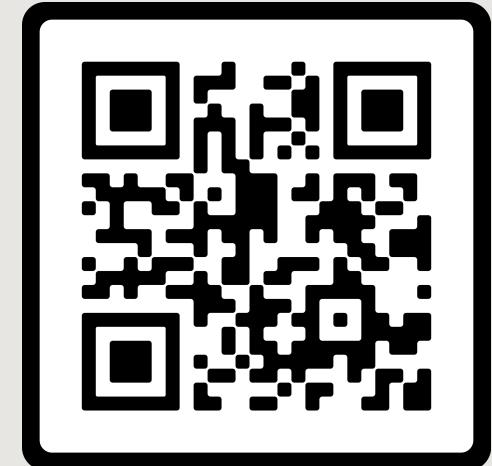
Output
Contact points + Forces



Applying
Forces



Simulated
Result



SCAN ME