MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

External Wrench Recovery using Visual-Tactile Sensors for Robotic Manipulation

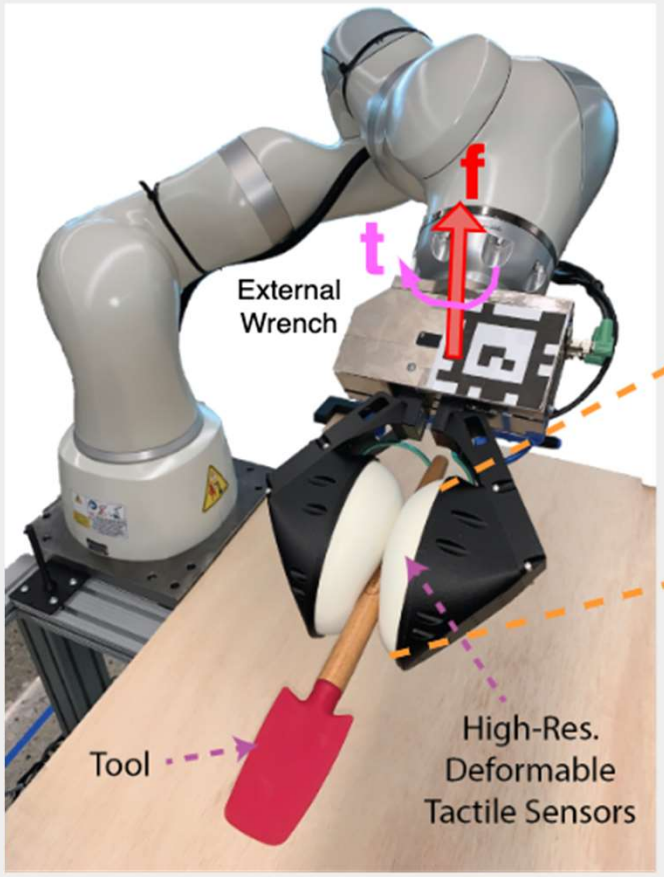
Rainier Delarosa, Miquel Oller Oliveras, Zilin Wang

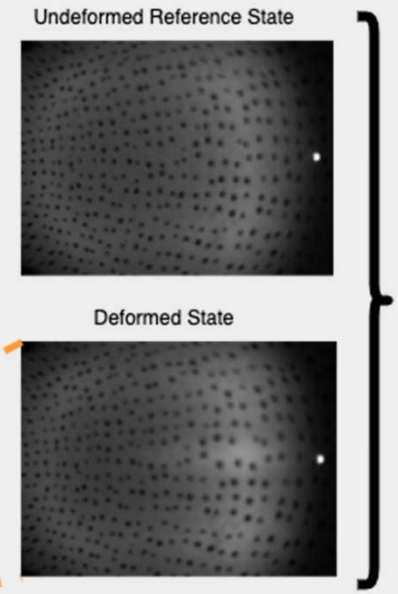
MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

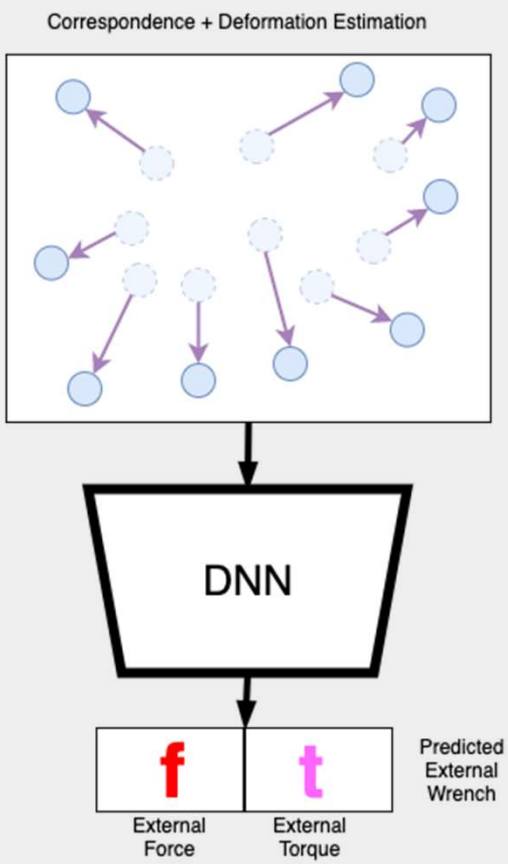
Overview

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

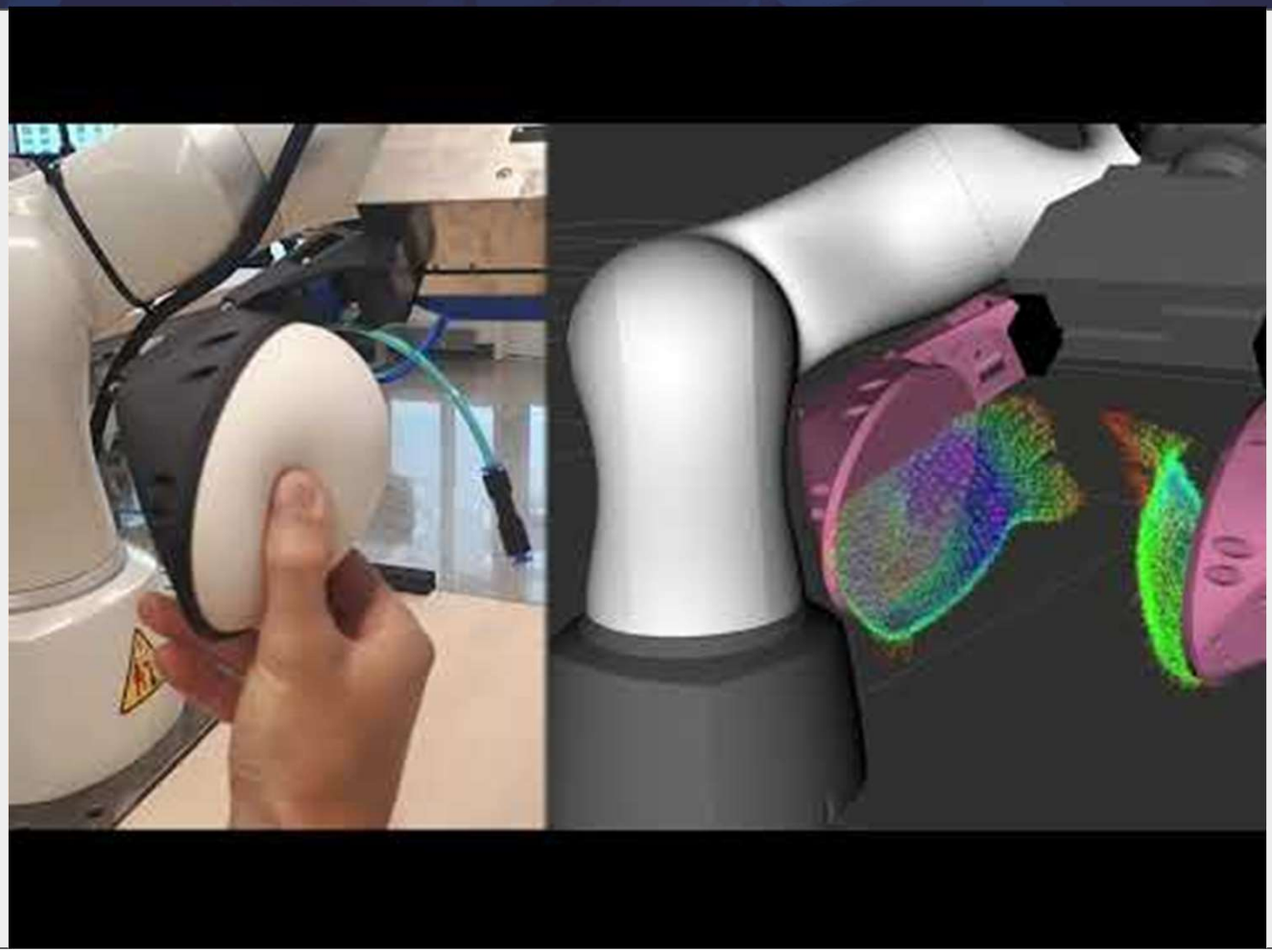
Overview







Overview

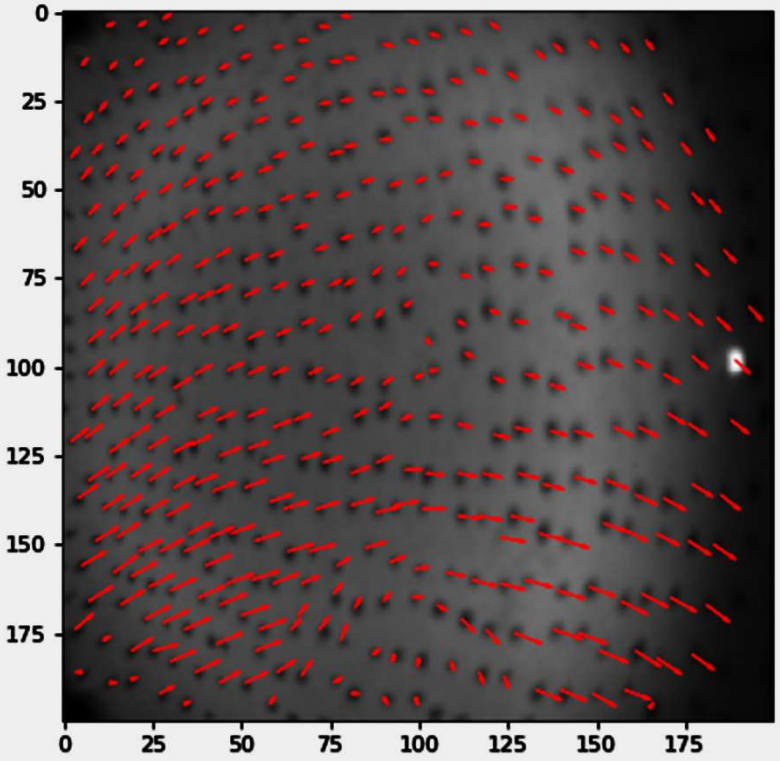


MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

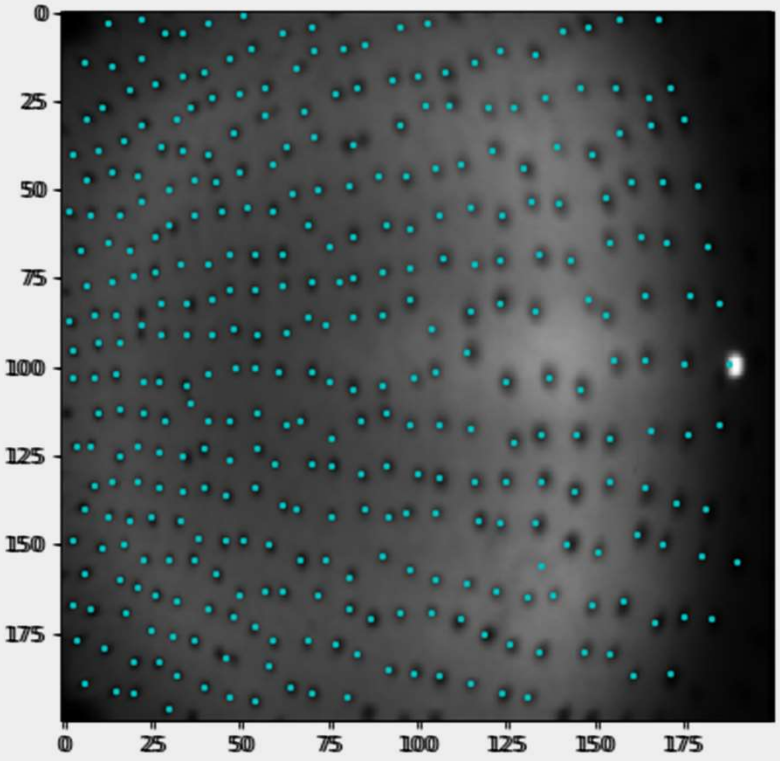
Proposed Methods

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Proposed Methods

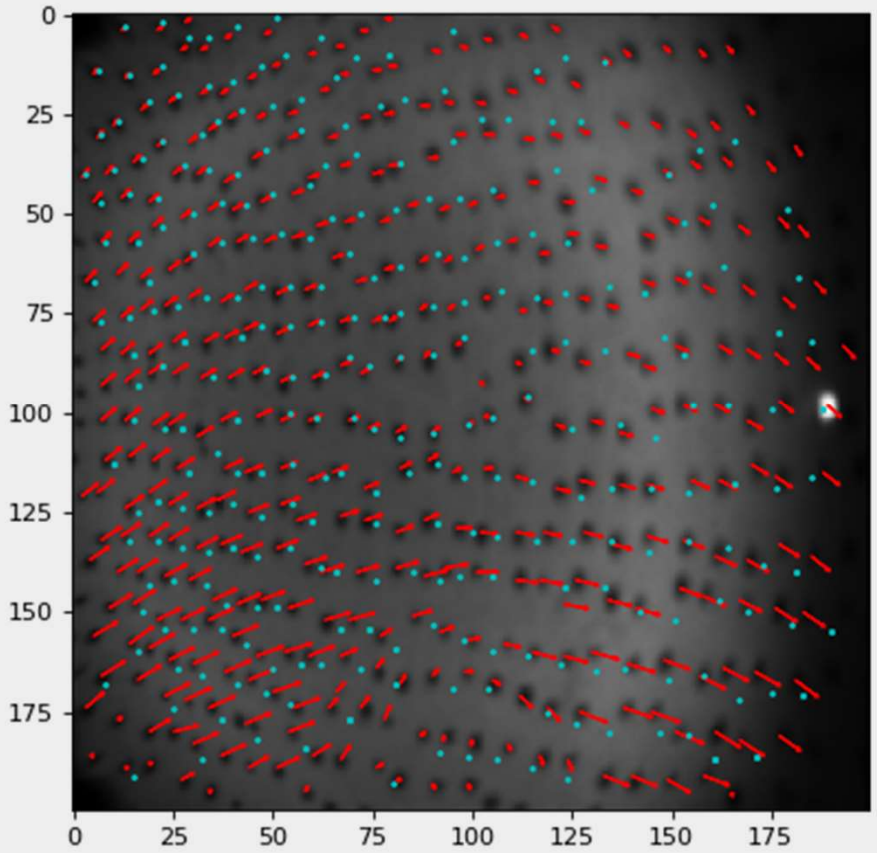


Undeformed Image



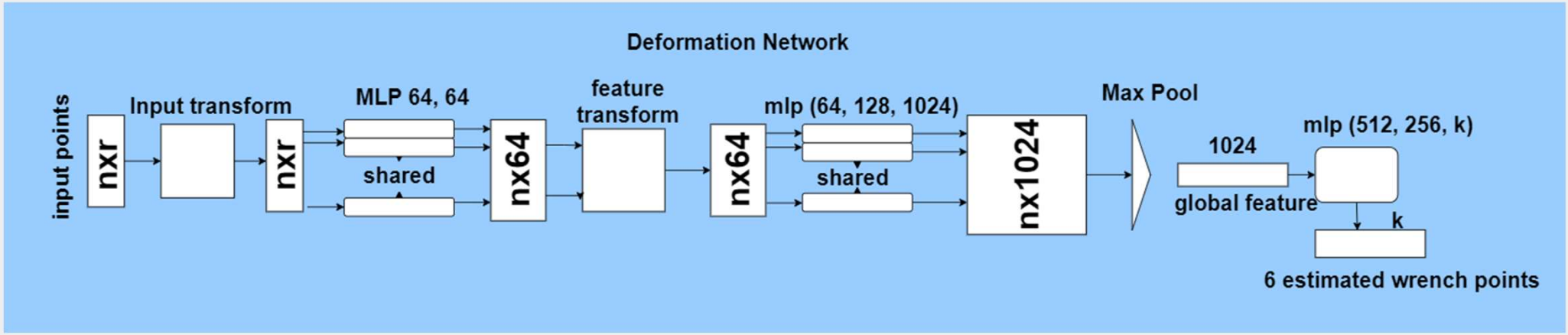
Deformed Image

Proposed Methods



MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

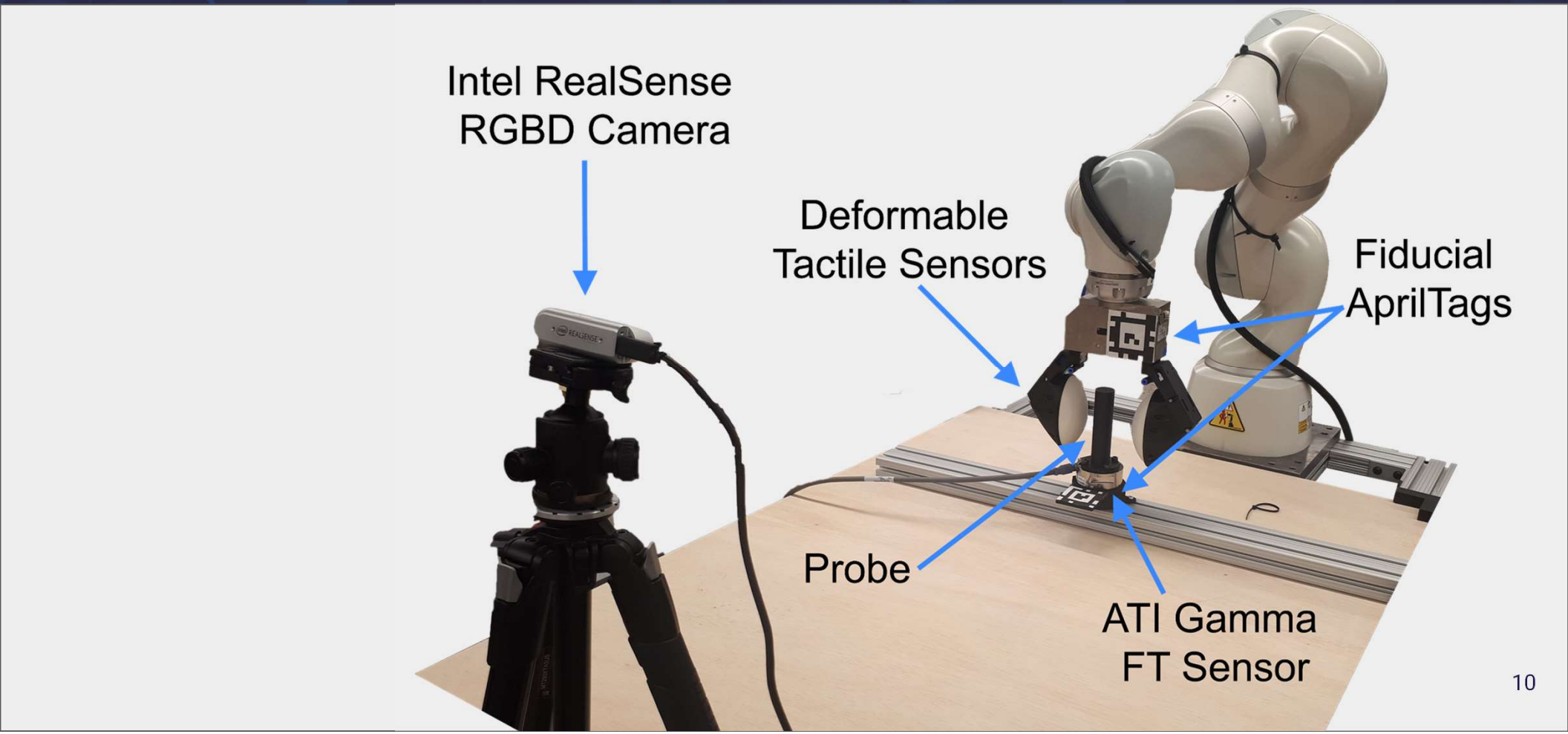
Proposed Methods



MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

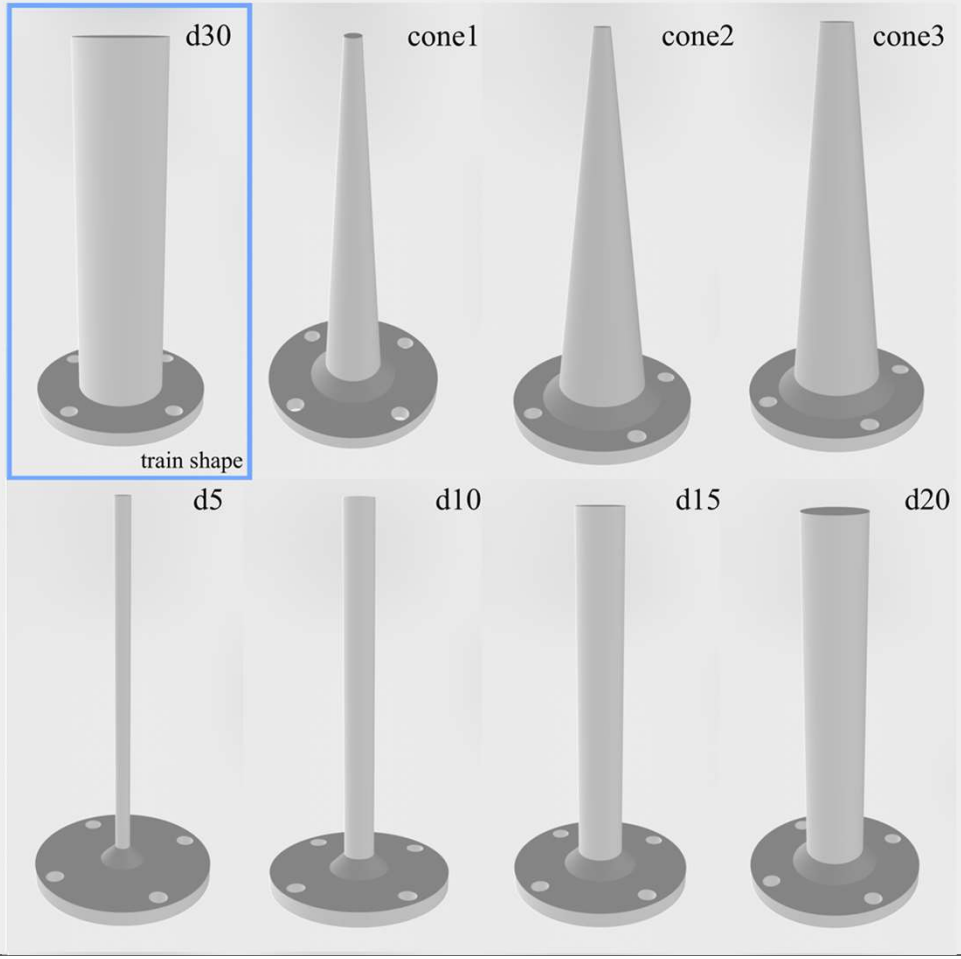
Experiments

Experiments

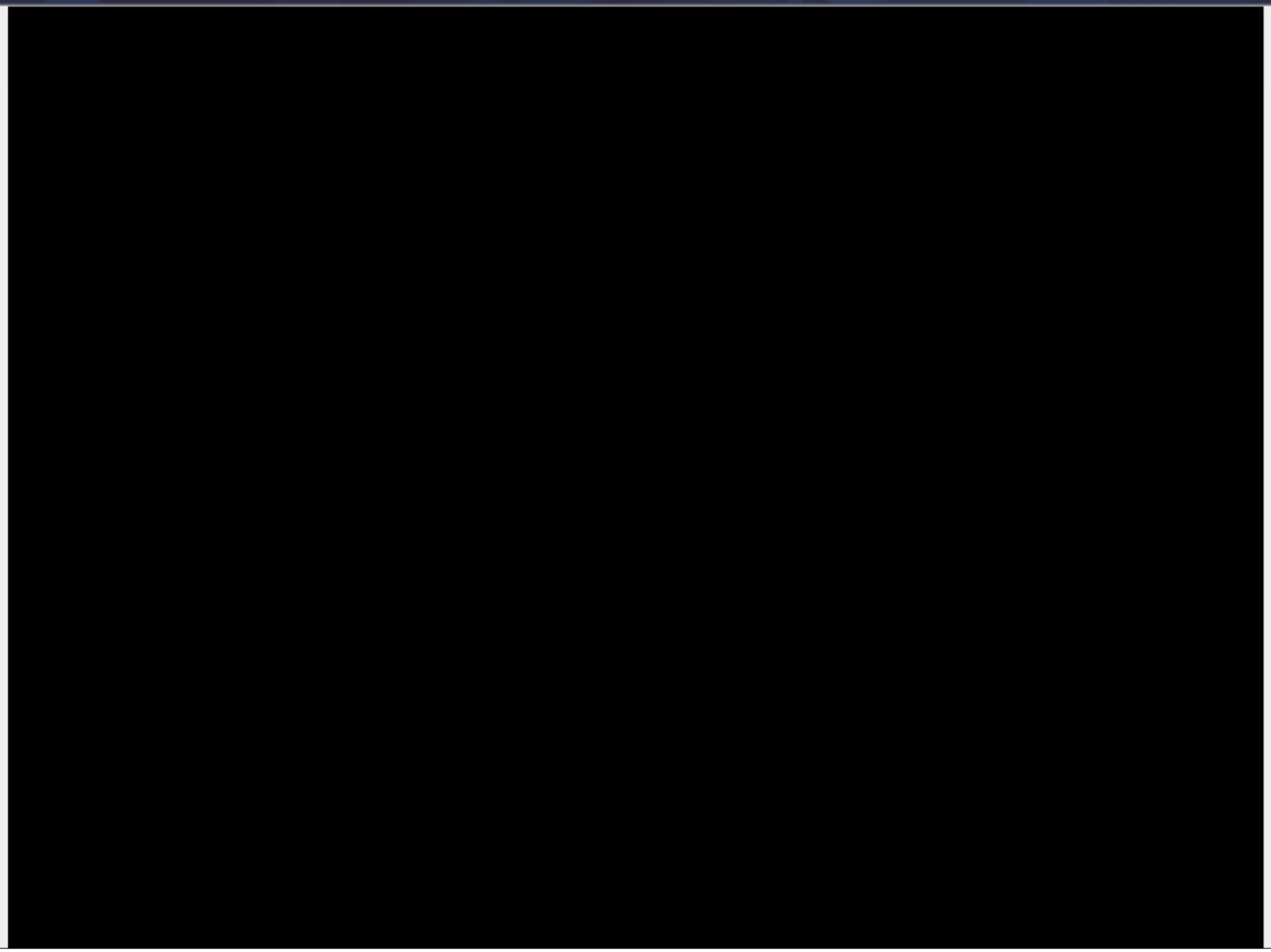


MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Experiments



Experiments



MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Results

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Results

MSE Model Predictive Score (lower is better)								
Model \ Probe	**d30**	d20	d15	d10	d5	cone1	cone2	cone3
Depth to Wrench	2.207	2.1549	2.0558	2.6445	1.4375	2.4085	2.7711	3.0258
Mean Optical Flow	0.3524	0.2963	0.2679	0.2590	0.11	0.1680	0.2064	0.2591
Optical Flow	**0.0507**	**0.1384**	**0.1163**	**0.1442**	**0.0705**	**0.1067**	**0.1086**	**0.1469**
Mean Deformation	1.31	0.8636	0.8779	0.9245	0.5624	0.8066	1.2093	1.3278
PointNet Deformation Only	0.4729	0.6141	0.6954	0.7496	0.7533	0.7084	0.5497	0.7083
PointNet Deformation Grounded	0.62	0.7442	0.8215	0.7919	0.5870	0.8075	0.6399	0.9001
PointNet Deformation Origin and Final	0.6369	1.0746	1.1765	1.0234	0.9119	0.9125	0.7911	1.0886

Train Probe

Cylindrical

Conical

Generalization Probes

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

Thanks for your Attention

MICHIGAN ENGINEERING
UNIVERSITY OF MICHIGAN

External Wrench Recovery using Visual-Tactile Sensors for Robotic Manipulation

EECS 542 - Final Project Presentation

Rainier Delarosa, Miquel Oller Oliveras, Zilin Wang