

The following RMSE requirements should be met (less than the value given):

DATASET 1	0.08	0.08	0.60	0.60
DATA SET 2	0.20	0.20	0.50	0.85

When the following measurement covariance matrices are used as provided by udacity:

R_LIDAR		R_RADAR		
0.0225 (x)	0	0.09 (rho)	0	0
0	0.0255 (y)	0	0.0009 (phi)	0
		0		0.09 (drho)

We get the following RMSE values:

DATASET 1	0.088088	0.0789795	0.608127	0.595732
DATASET 2	0.184873	0.189381	0.449241	0.669357

Which is unacceptable. We can compute for the measurement variances comparing the measurement values and the ground truth values as written in this python code:

- <https://github.com/mithi/Fusion-EKF-Python/blob/master/variances.py>
- <https://github.com/mithi/Fusion-EKF-Python/blob/master/Fusion-EKF-Variances.ipynb>

We get the following values:

Covariances of	Using data1 only	Using data2 only	Both data1 and data2
x	0.0030318456883	0.0432845677688	0.00872031903422
y	0.00232796032072	0.0478147050908	0.00871732038878
vx	1.75231650122	0.0225024900134	1.51063829744
vy	2.81928216089	0.290537073523	2.46571865544
rho	0.0103696181683	0.0391404813605	0.0144125890908
phi	1.0680397691e-06	3.15121868185e-06	1.36108366223e-06
drho	0.011294795278	0.00970452550137	0.0110733569443

Let's use the rounded values from these covariances instead to form our measurement covariance matrices

R_LIDAR		R_RADAR		
0.01 (x)	0	0.01 (rho)	0	0
0	0.01 (y)	0	1.0e-6 *(phi)	0
		0	0	0.01 (drho)

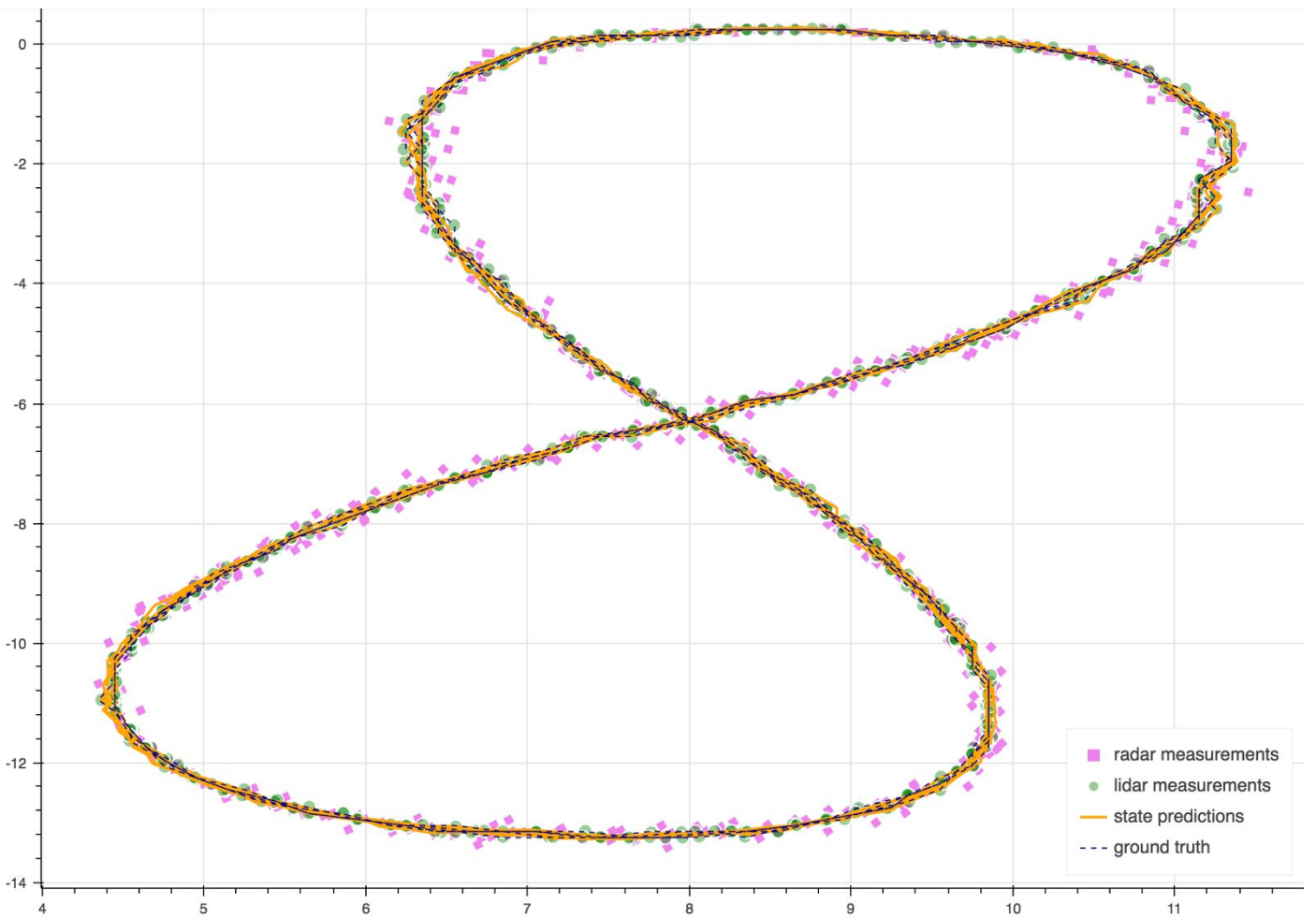
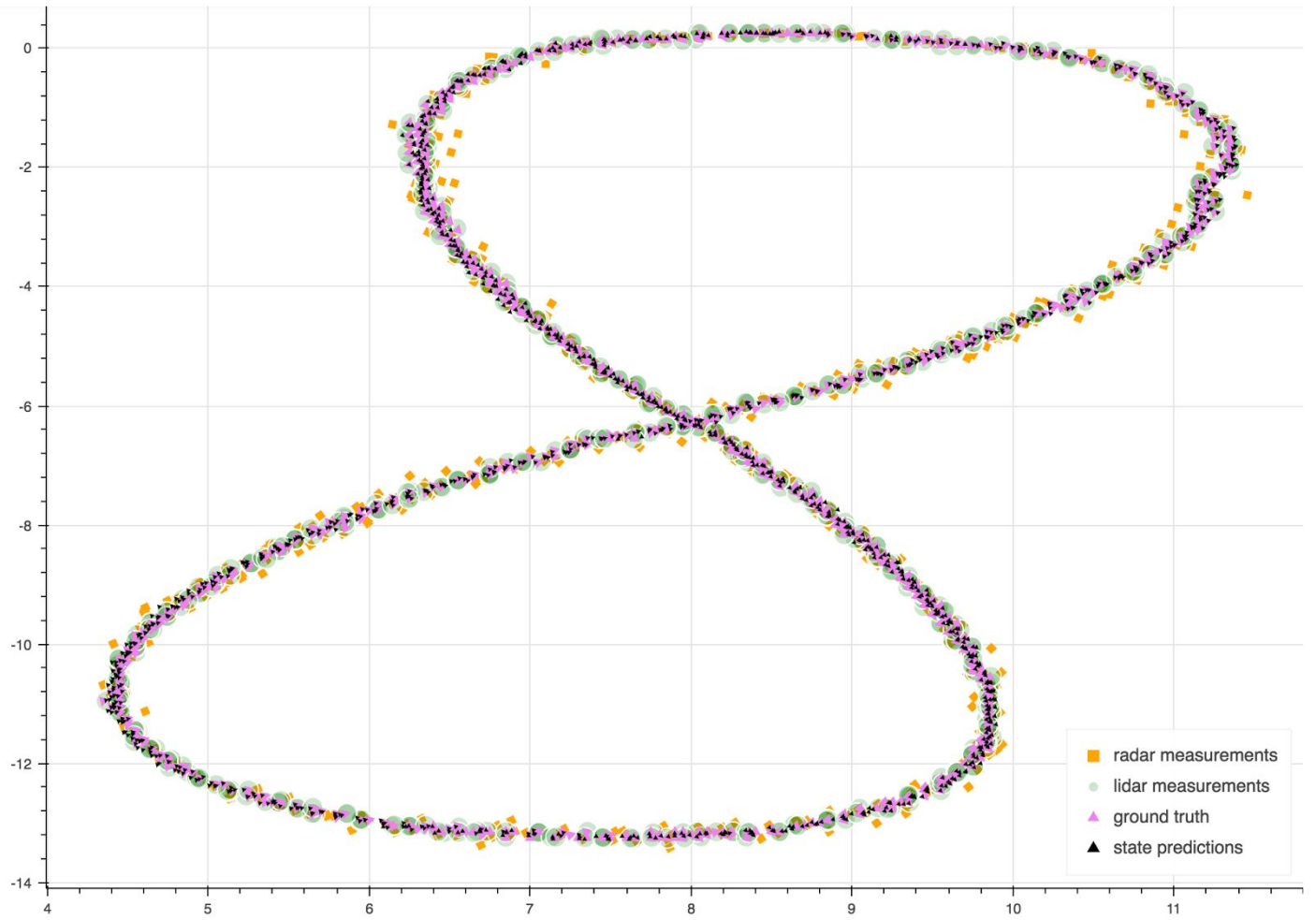
Which produces the following results that meet the required RMSE

DATASET 1	0.0251817	0.0228512	0.339001	0.369616
DATASET 2	0.174266	0.164838	0.394556	0.703697

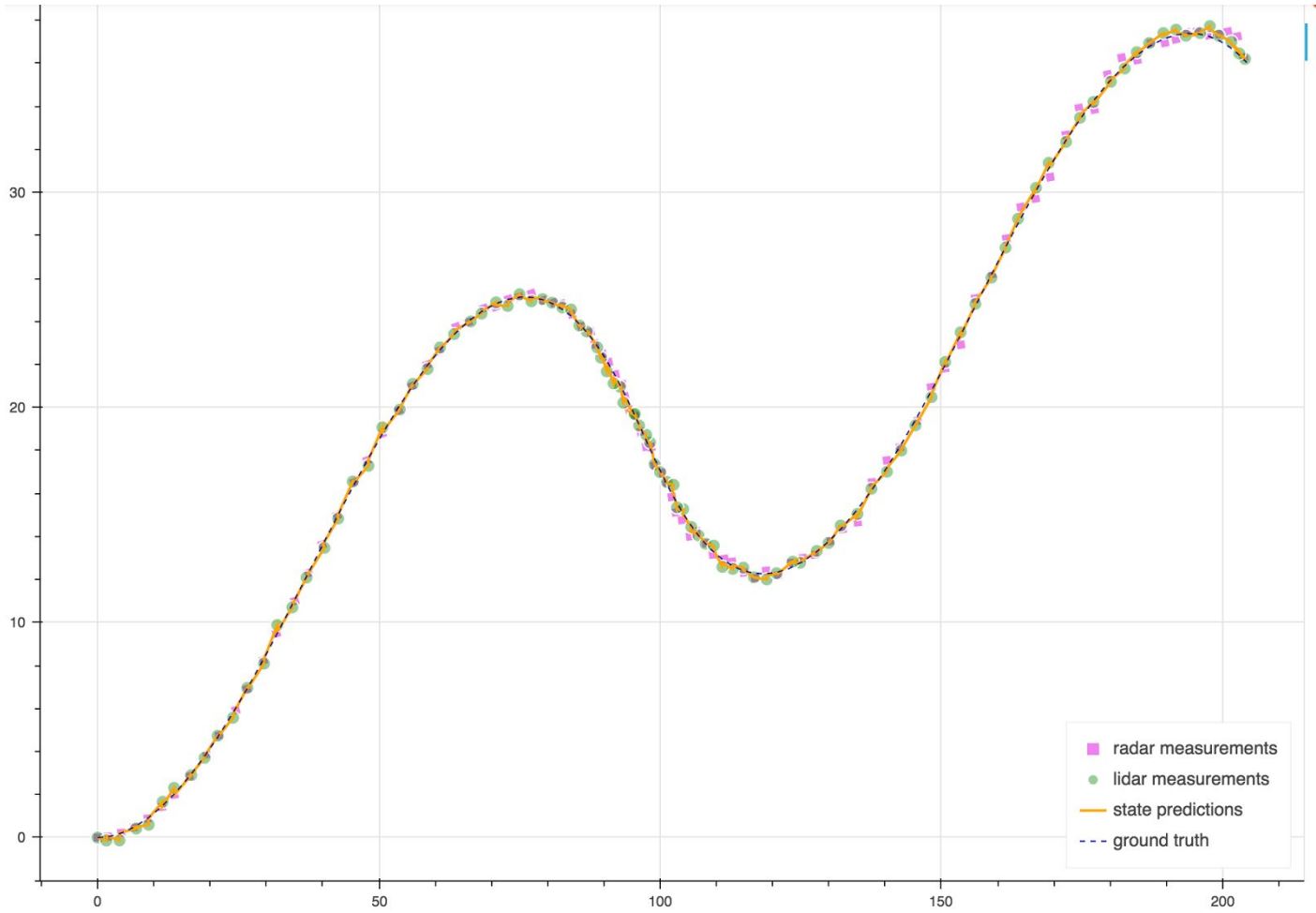
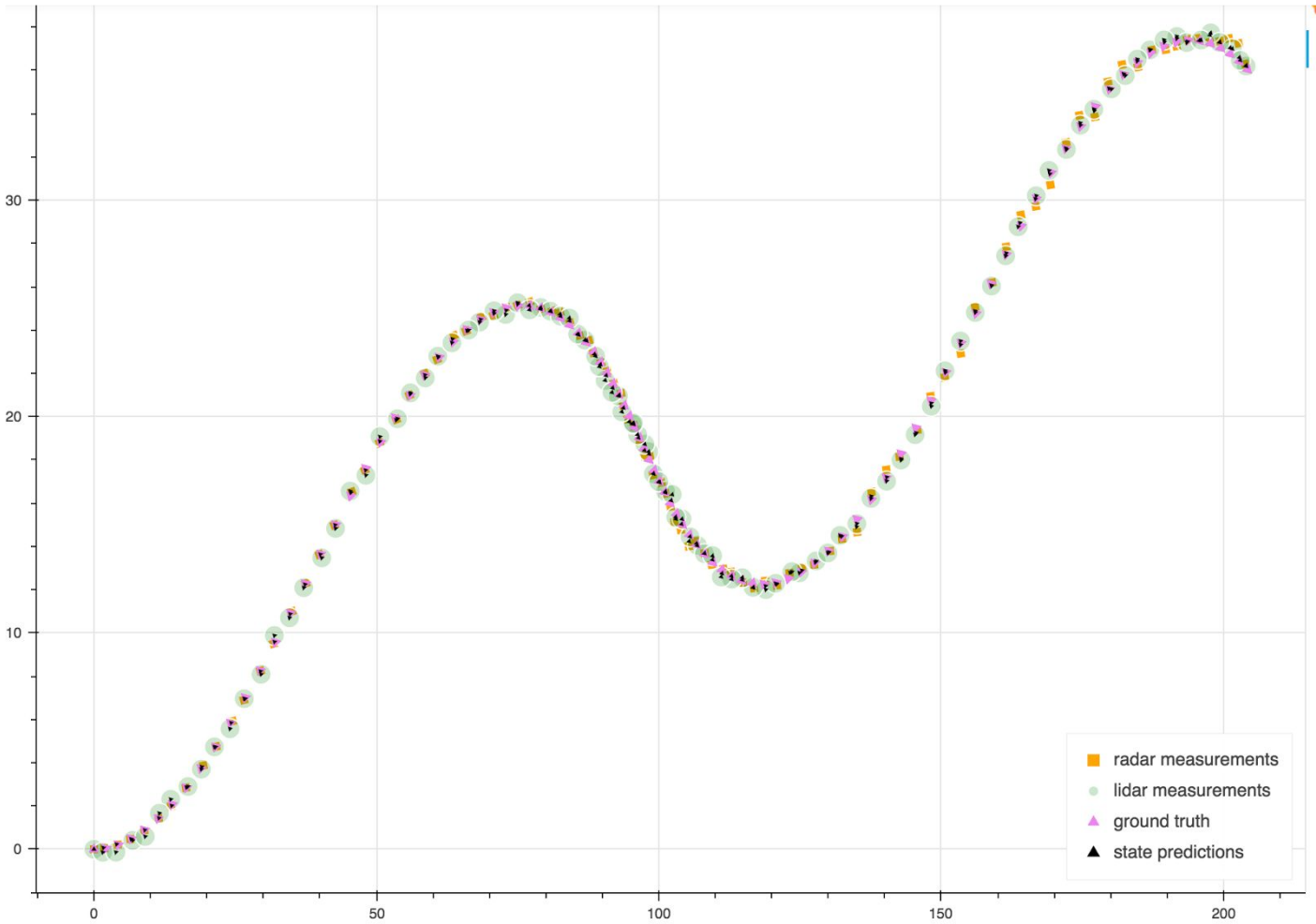
Here are some visualizations (with Jupyter Notebook and Bokeh)

- See - <https://github.com/mithi/Fusion-EKF-Python/blob/master/Fusion-EKF-Sample-Visualization-3-B.ipynb>
 See - <https://github.com/mithi/Fusion-EKF-Python/blob/master/Fusion-EKF-Sample-Visualization-3.ipynb>

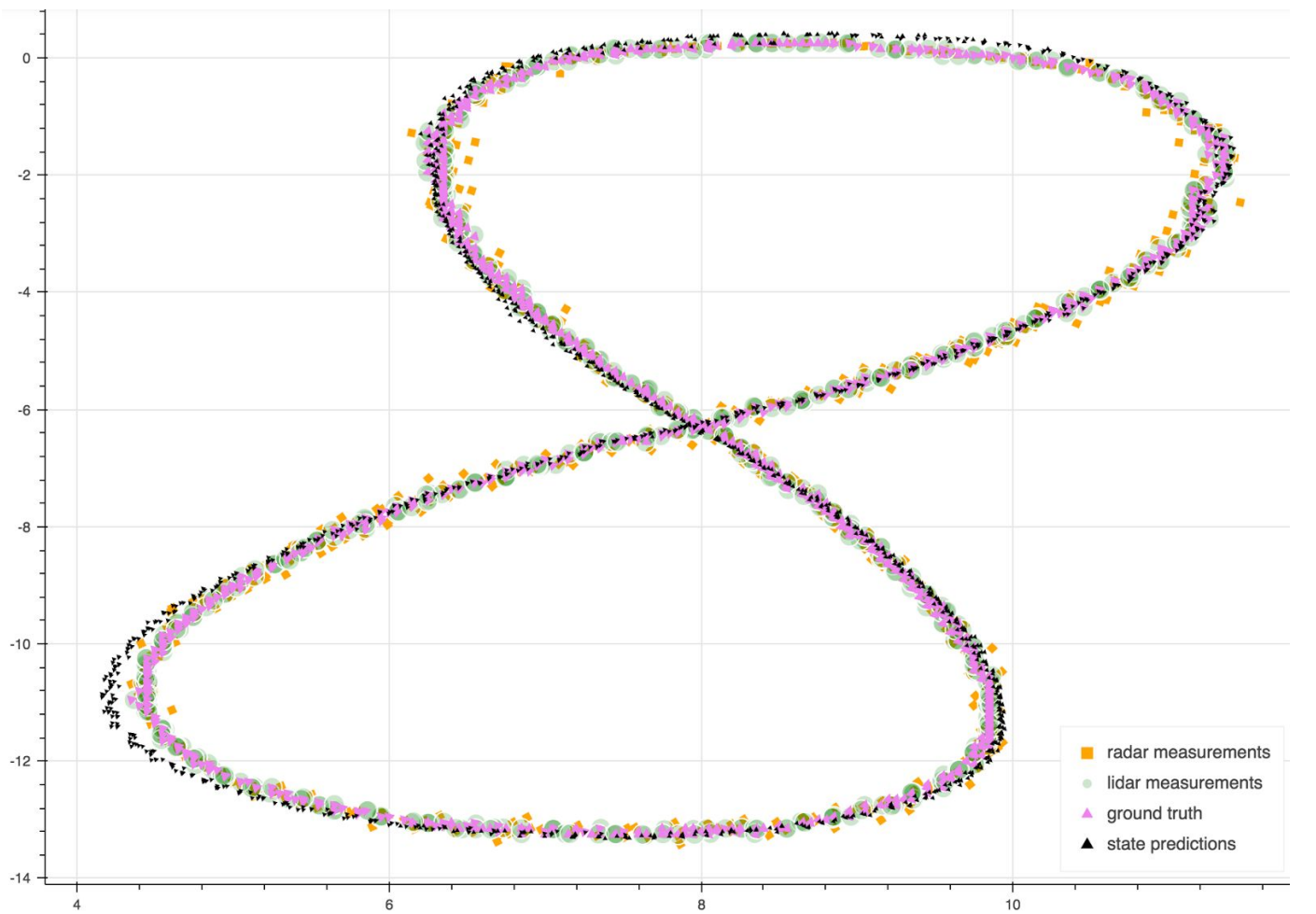
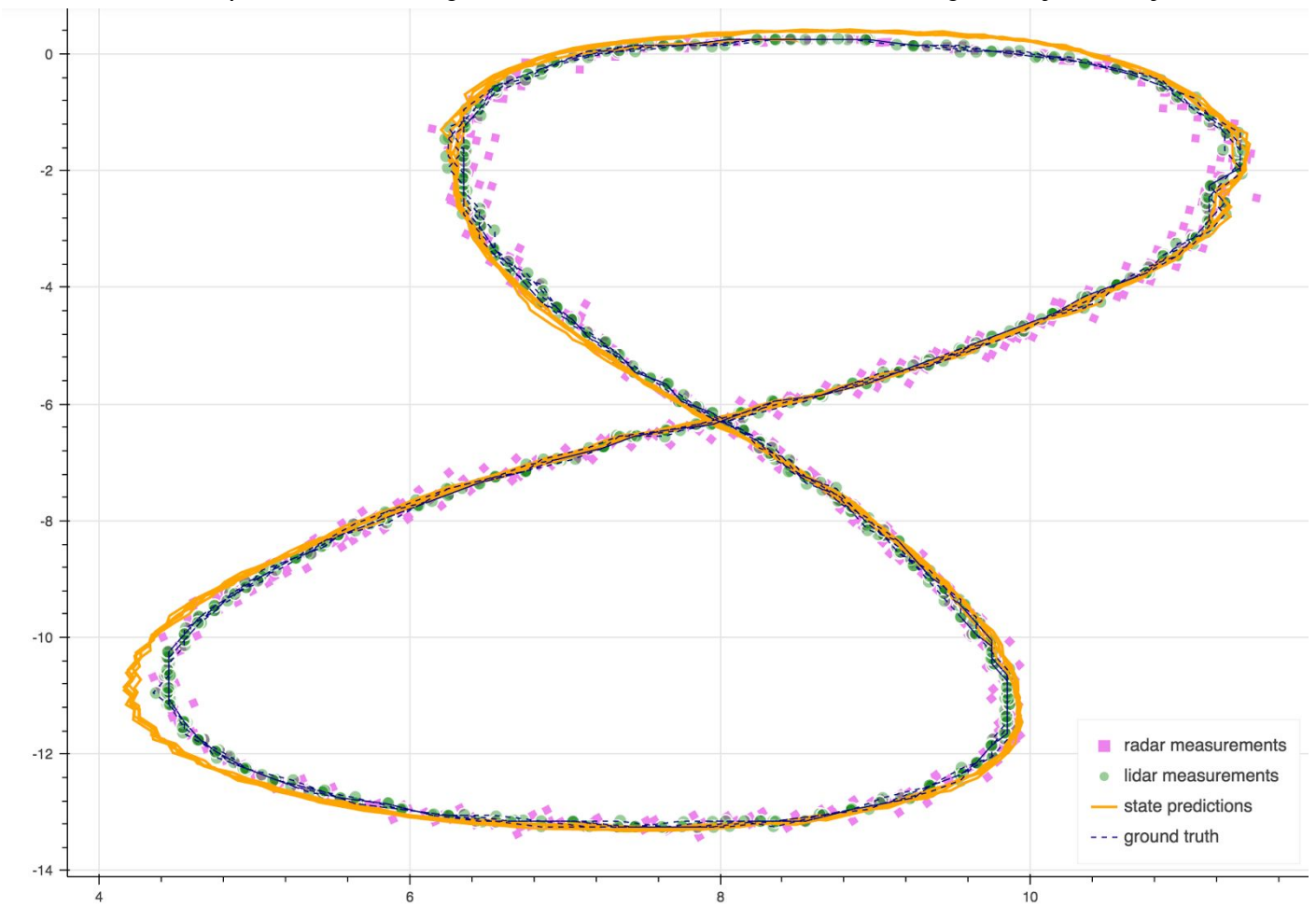
Visualization of predictions using measurement covariance matrices as computed



Visualization of predictions using measurement covariance matrix as computed



Visualization of predictions using measurement covariance matrices as given by udacity



Visualization of predictions using measurement covariances as given by udacity

