IMPORTANT NOTE: This was run with ax, ay = 9.0, 9.0
(see https://github.com/mithi/Fusion-EKF-CPP/blob/master/headers/fusionekf.h)

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

0.0225 (x)	0
0	0.0255 (y)

R_RADAR

0.09 (rho)	0	0
0	0.0009 (phi)	0
0		0.09 (drho)

We get the following RMSE values:

DATASET 1	0.0661482	0.0603583	0.53316	0.544413
DATASET 2	0.185926	0.190263	0.477258	0.805505

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

0.01 (x)	0
0	0.01 (y)

R_RADAR

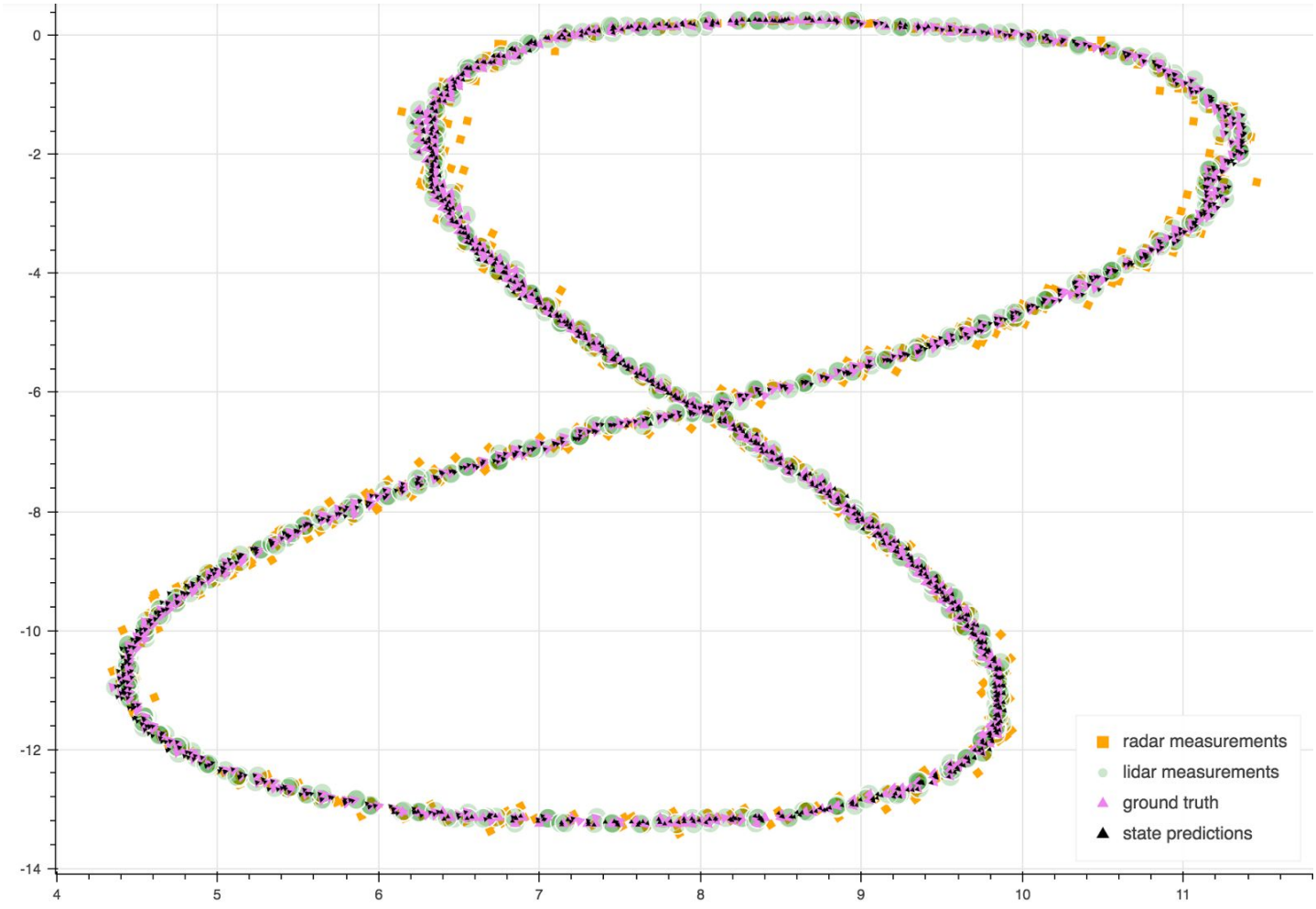
0.01 (rho)	0	0
0	1.0e-6 *(phi)	0
0	0	0.01 (drho)

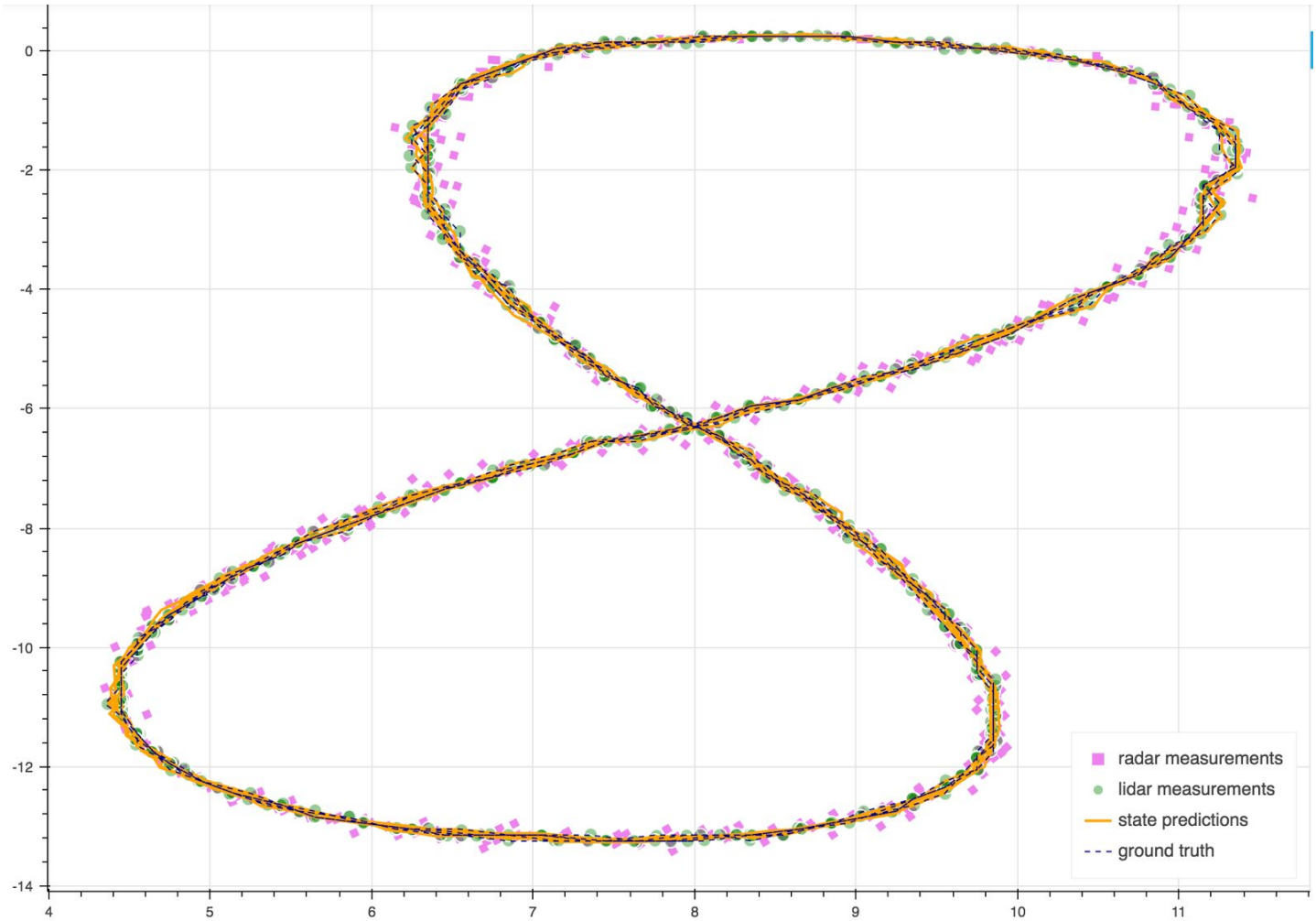
Which produces the following results that meet the required RMSE

DATASET 1	0.0240485	0.0222132	0.318218	0.350317
DATASET 2	0.174746	0.165281	0.404066	0.811121

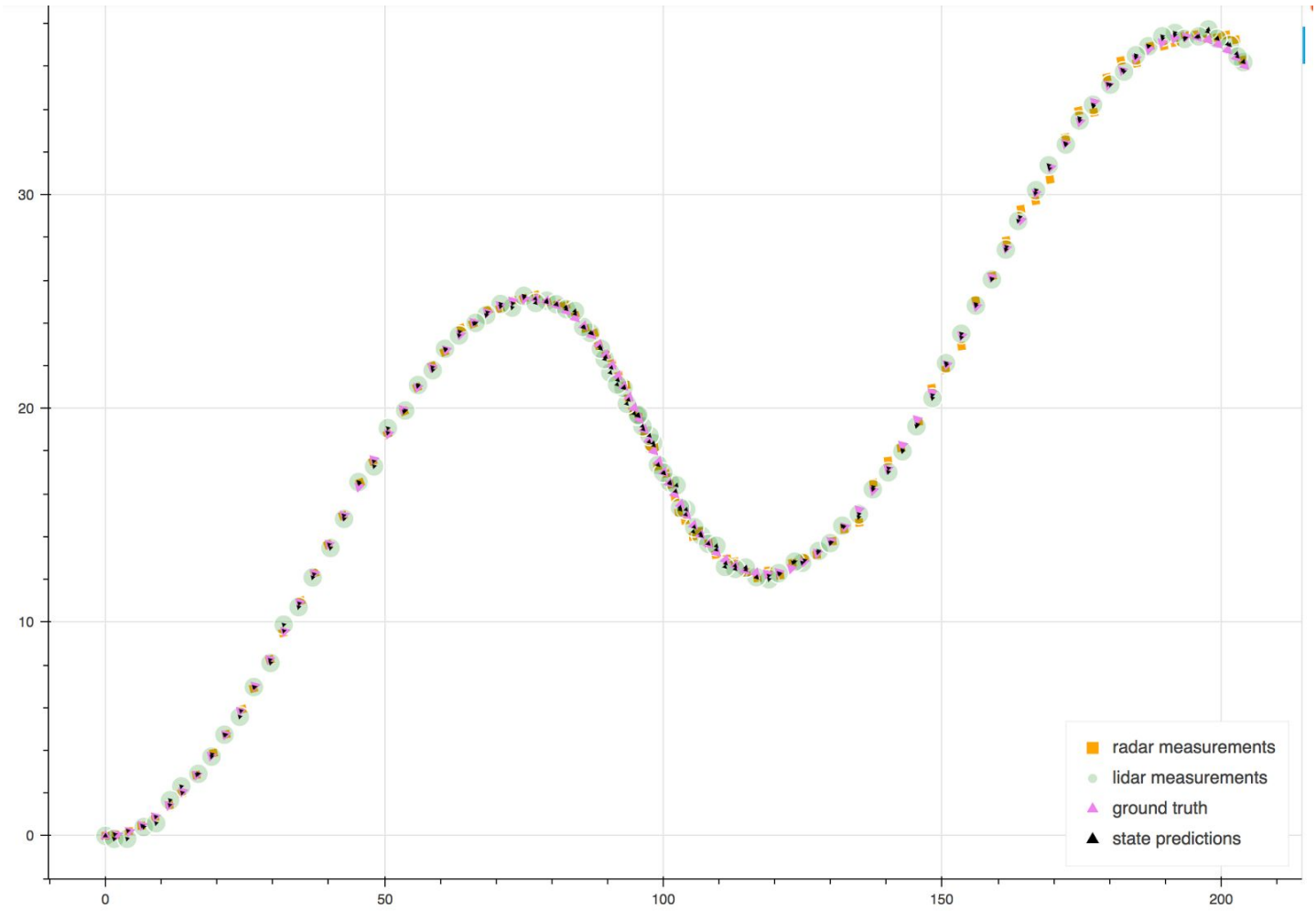
Here are some visualizations (with Jupyter Notebook and Bokeh)
See – https://github.com/mithi/Fusion-EKF-Python/blob/master/Fusion-EKF-Sample-Visualization-3-B.ipynb
See – https://github.com/mithi/Fusion-EKF-Python/blob/master/Fusion-EKF-Sample-Visualization-3.ipynb

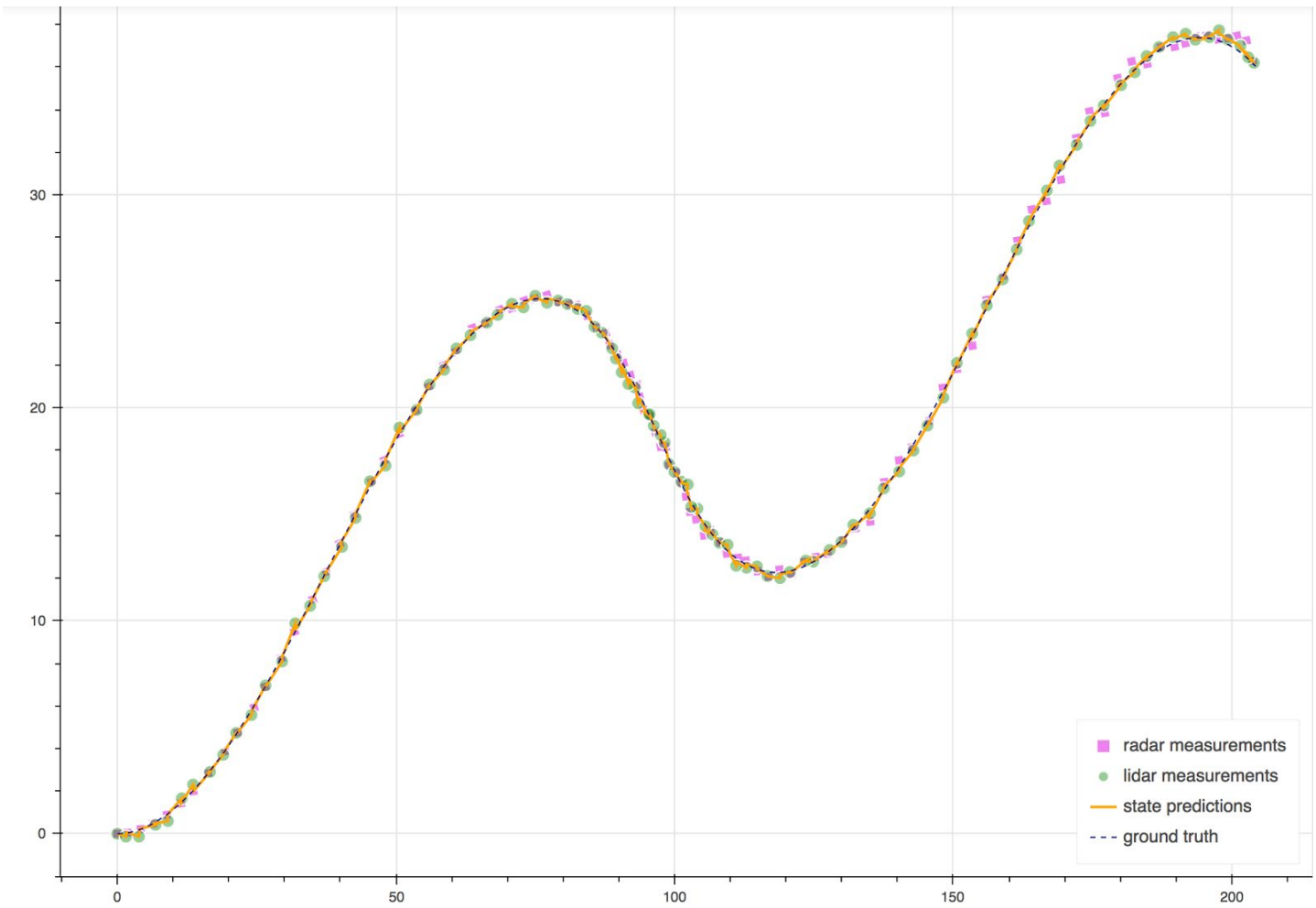
Visualization of predictions using measurement covariance matrices as computed



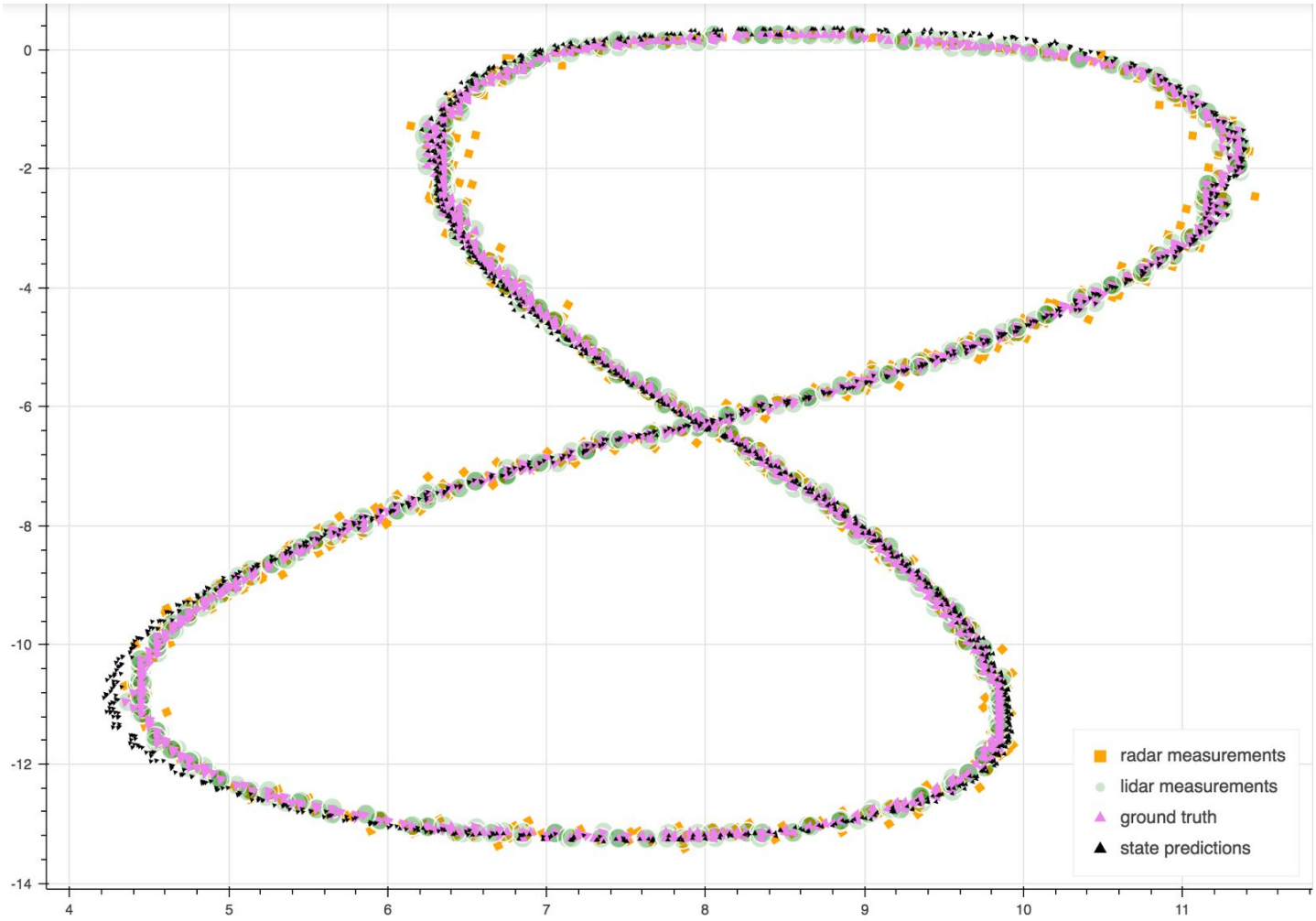


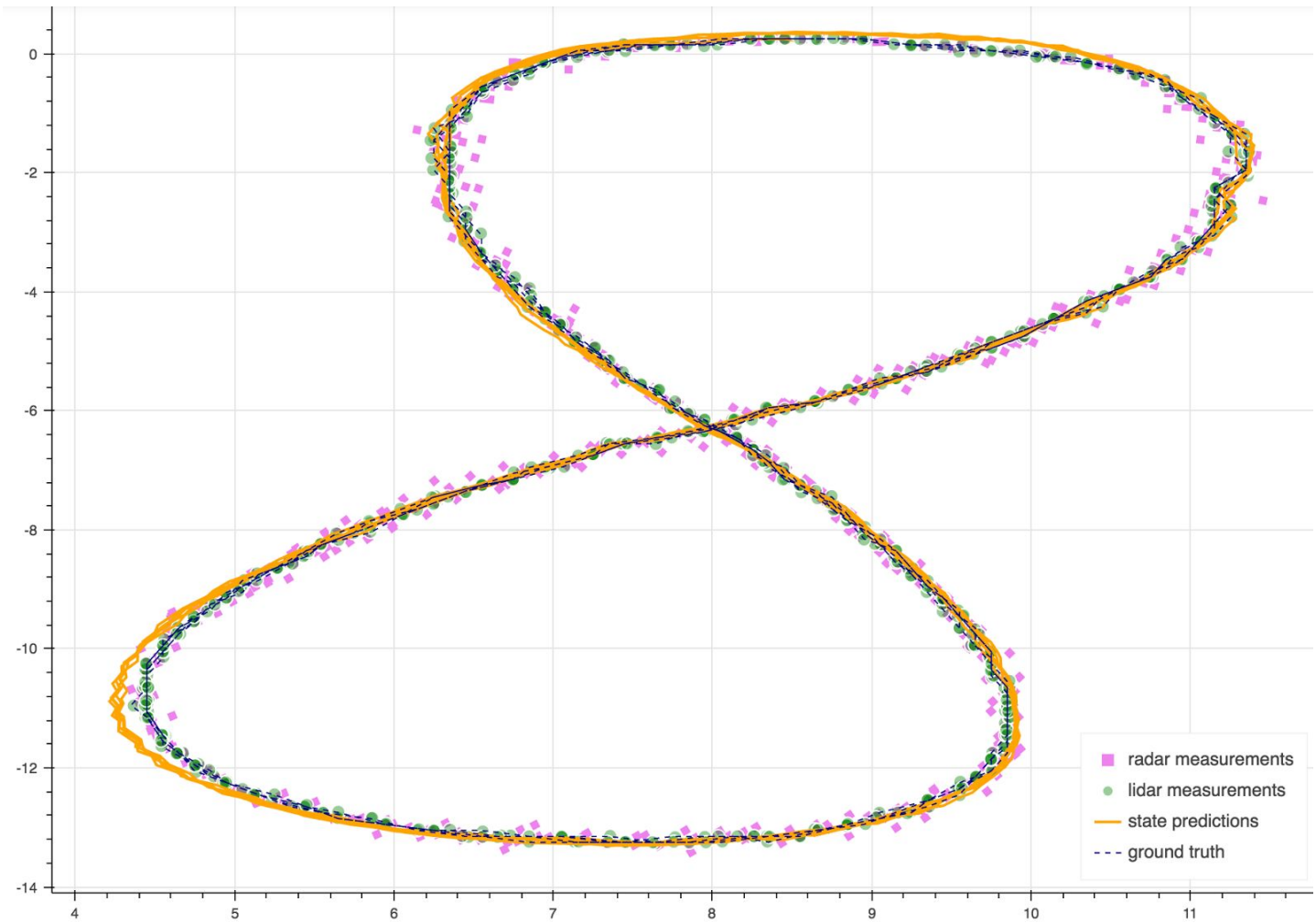
Visualization of predictions using measurement covariance matrix as computed





Visualization of predictions using measurement covariance matrices as given by Udacity





Visualization of predictions using measurement covariances as given by Udacity