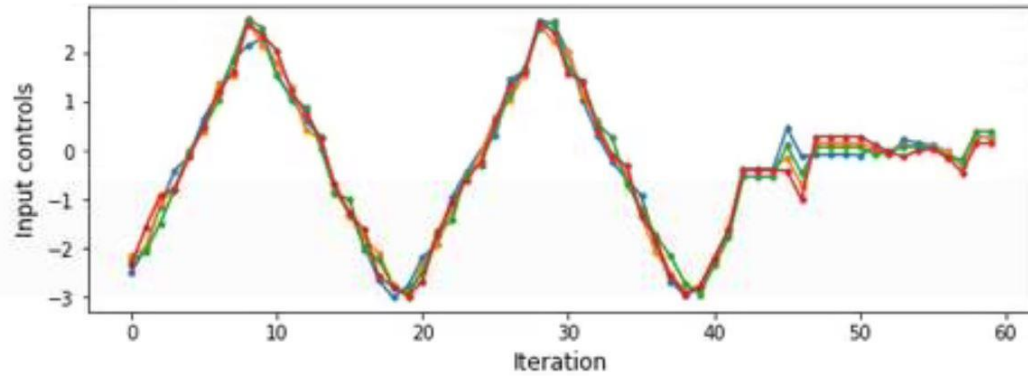


APEX Machine Learning Test (10.5 hours) Summary

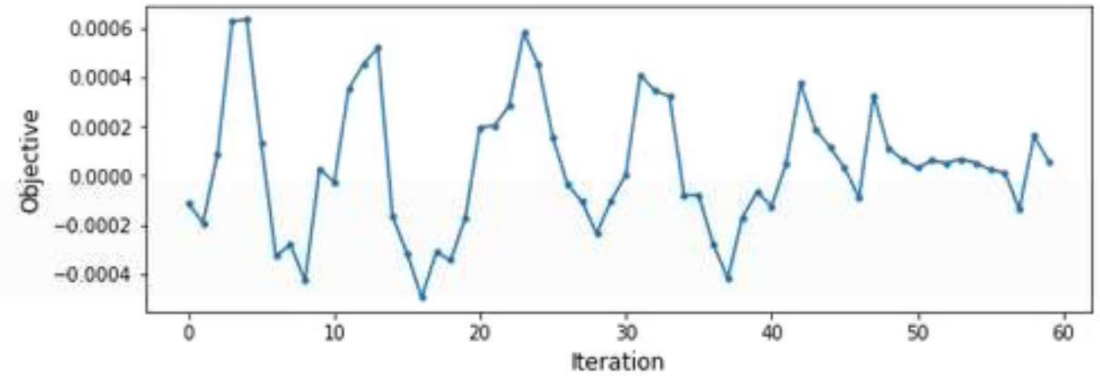
(APEX date: 6.11, 6.18, 6.25/2021)

Yuan Gao, Xiaofeng Gu, Lucy Lin, John Morris

Use Bayesian optimization to control 4 BPMs in the center

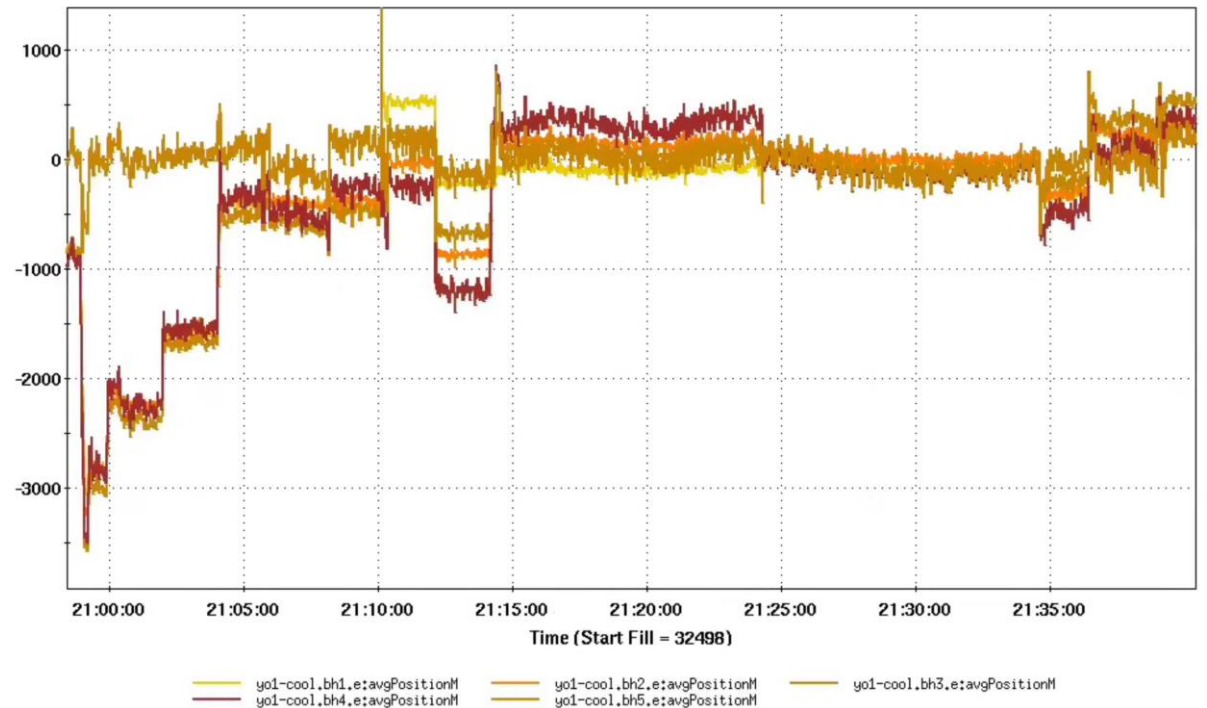


BPMs trajectories

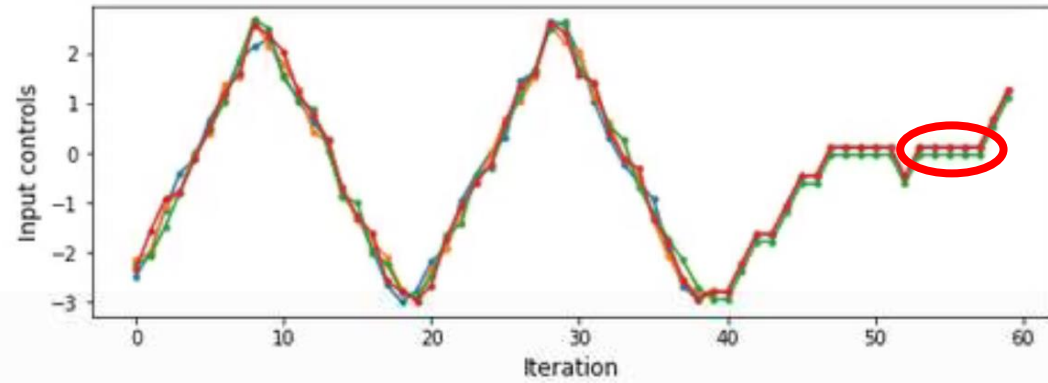


Objective trajectories

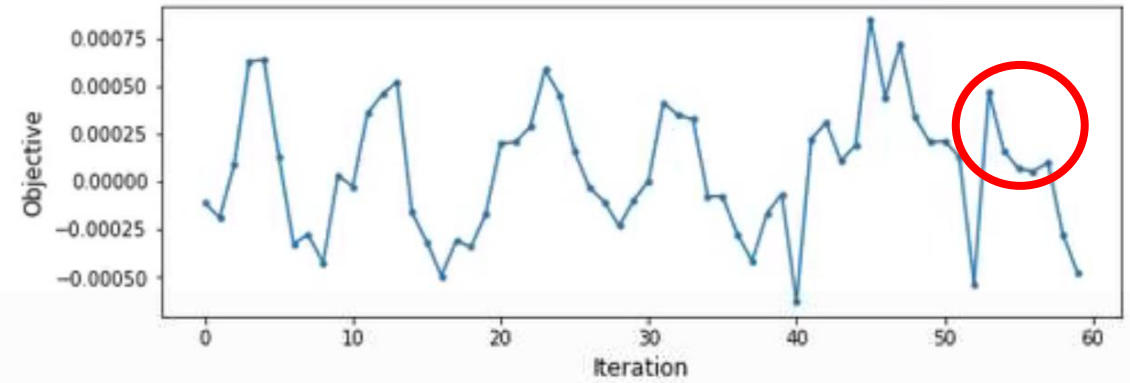
- The first 40 points are initial samples used to train the algorithm.
- The algorithm can converge and hold the BPMs positions around the center.



Objective function sensitivity



BPMs trajectories

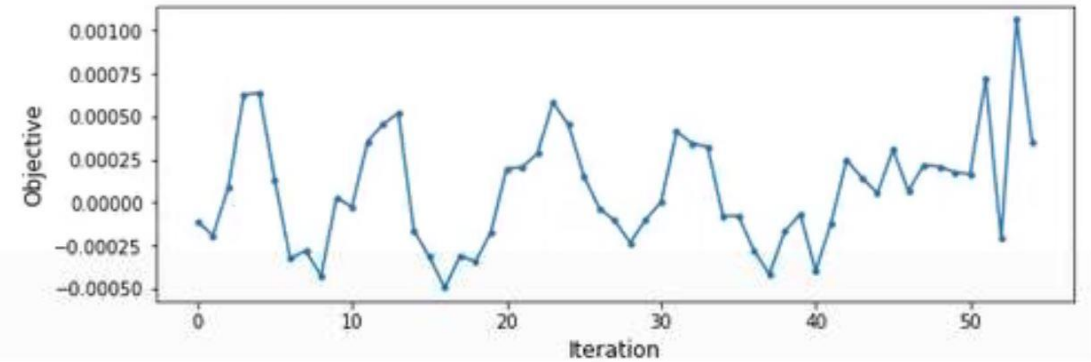
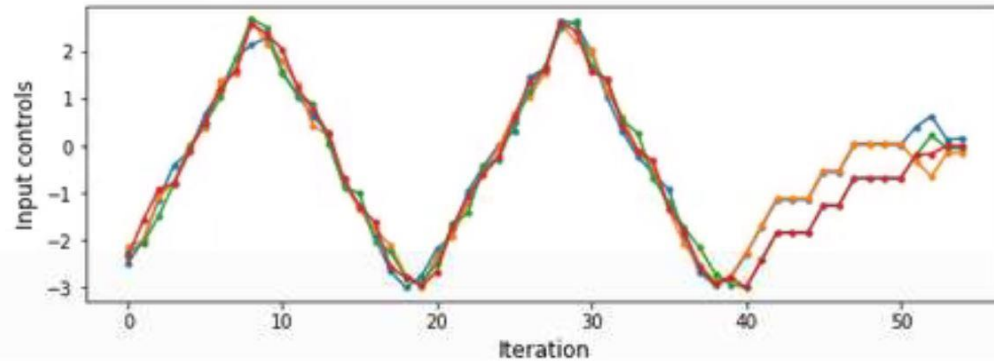


Objective trajectories

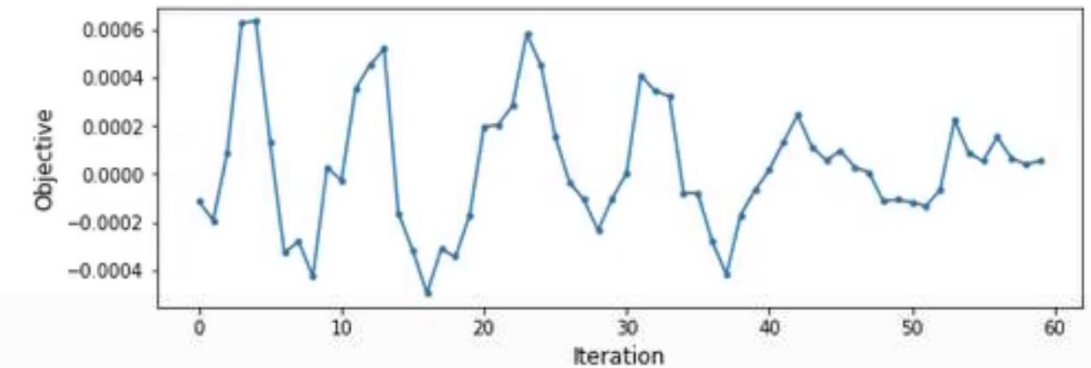
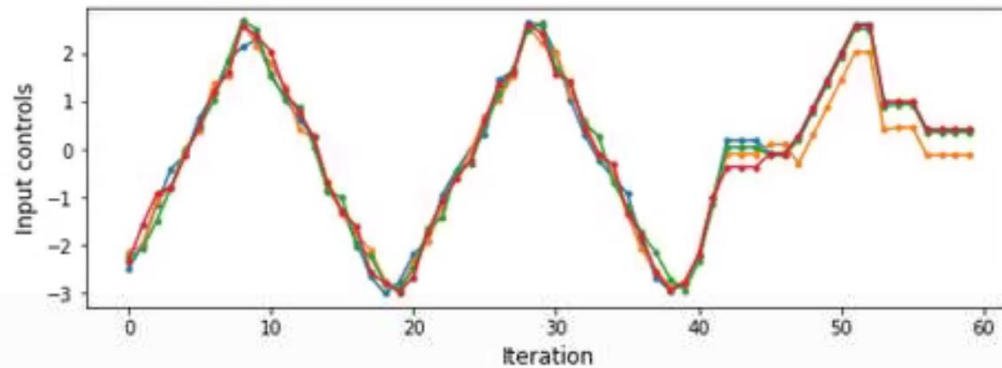
- The original objective is constructed by using division of two point values, which makes it very sensitive to the noise in the system.
- So, the original objective is modified so that instead of using point values, it uses the average values around the points.
- Then we get a parameter to control the objective function's sensitivity, which further affects how the algorithm behaves.

Tuning the sensitivity by a parameter

Too sensitive



Too insensitive



BPMs trajectories

Objective trajectories

- The parameter should be set so that the sensitivity is not too high or too low.

Acknowledgement