Prospective Experiment for Reinforcement Learning on Demand Response in a Social Energy Saving Game Framework

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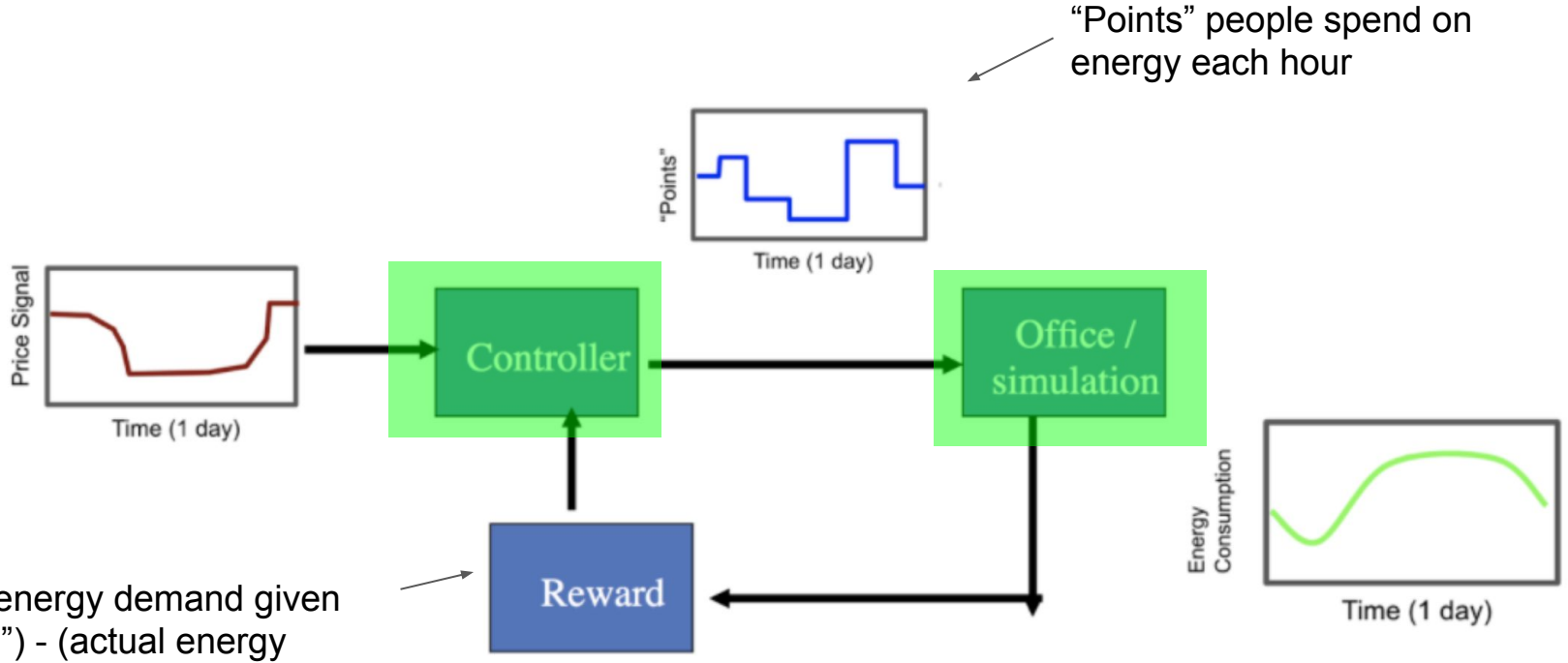
Renewable energy sometimes exceeds demand, so it’s curtailed--

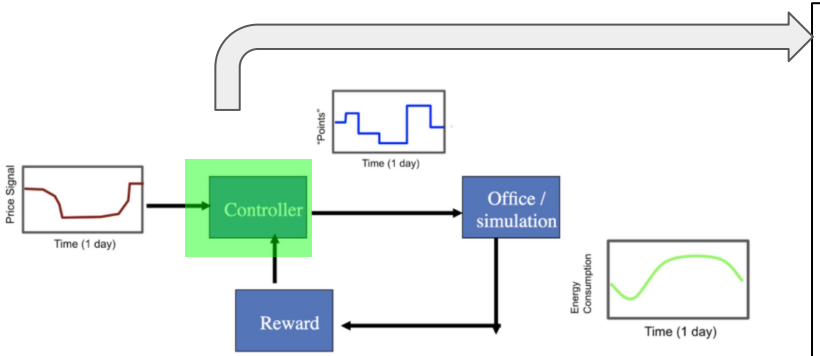
-- Grid prices reflect this but are market optimized --

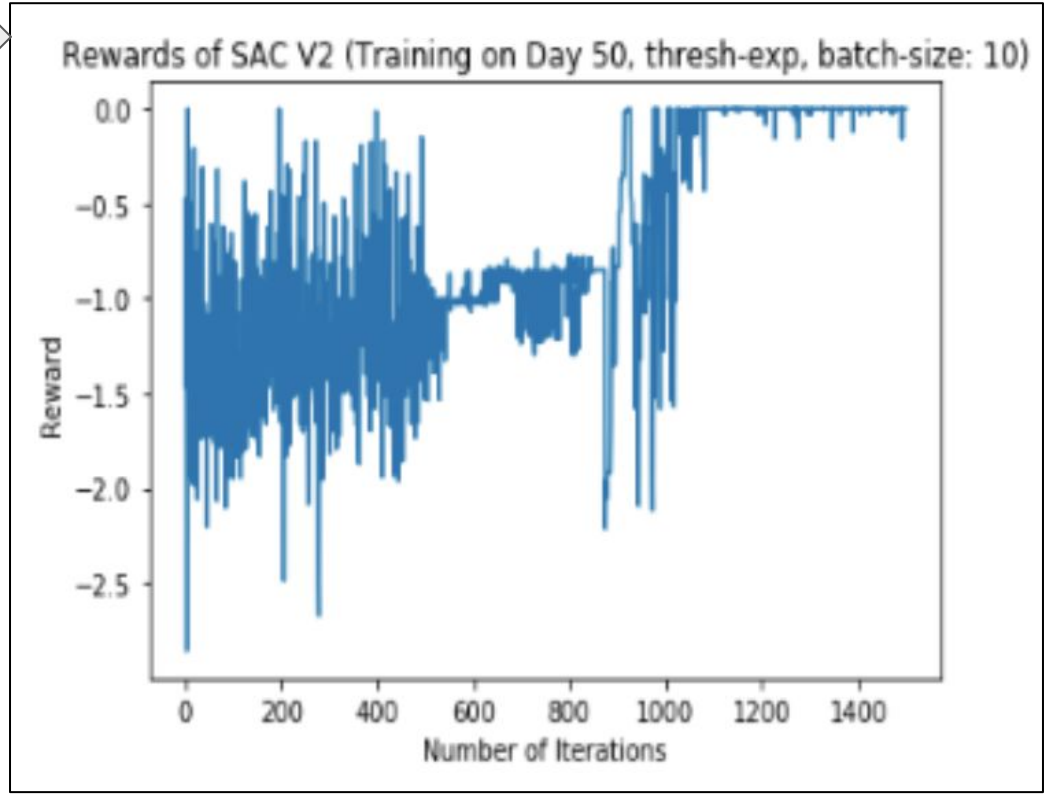
-- Can we design an RL agent that translates grid prices into human-optimized demand response prices?

We will attempt to implement the following flow of actions

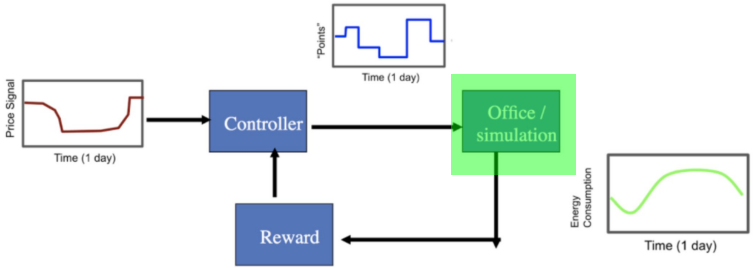


1. RL Agents: Soft Actor Critic v2





2. Planning models can help augment AI training



Prediction models we evaluated:

- Social Cognitive Theory model (trainable dynamic system)
- Vanilla LSTM
- OLS Regression
- GPyOpt autoML regression

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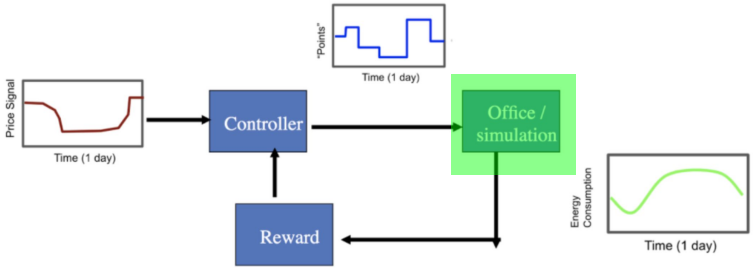
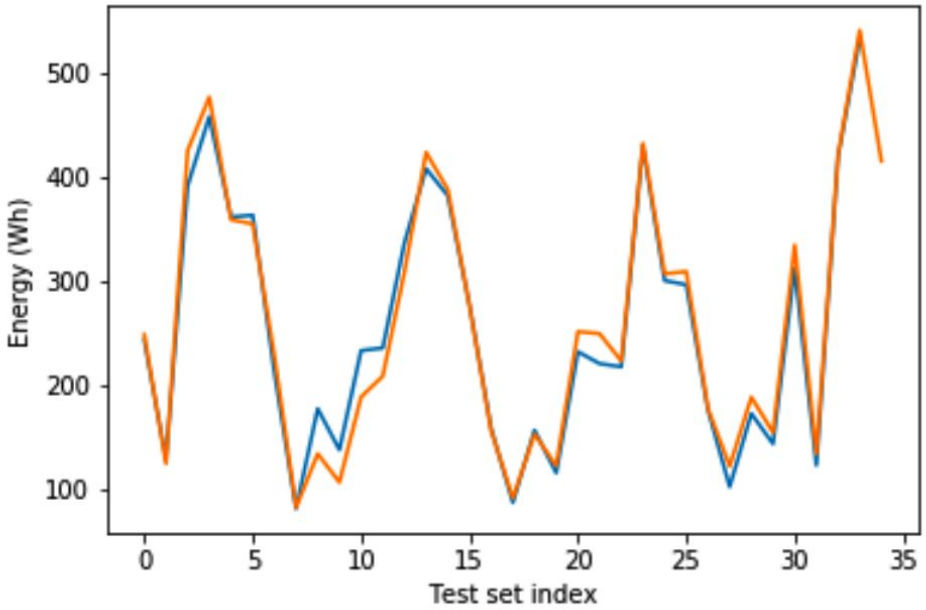


GPyOpt LSTM accurately predicts energy in simulation: RMSE = 28



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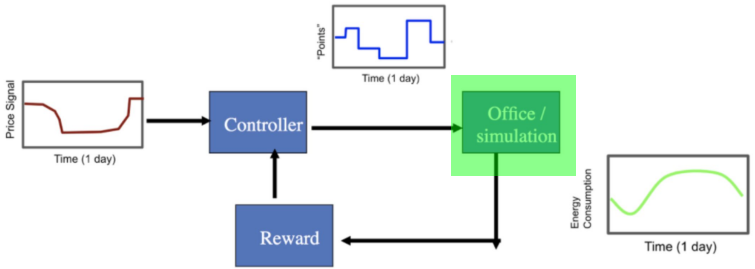

Next goal is to test the RL controller in conjunction with the planning model:

Repeat:

- 1 step in the environment
- Updated Planning model and RL policy
- 1000 steps with the planning model

We hope to validate the simulation in experiment occurring in a Singapore office building when Singapore reopens to business.

Month	Group 1	Group 2	Control
July	— System ID —		
August	RL_2	RL_1 + plan	
September	RL_1	RL_2 + plan	

Table Experimental Timeline in which we compare two different RL architectures and the effect of a planning model.

Stay tuned for the experiment!

Any comments on:

- Experience with these RL architectures
- Advice on our experimental setup
- Planning models

Most welcome! Please send to: lucas_spangher@berkeley.edu