



Appliance recognition from VI-trajectory images using neural nets

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NILM

Non-intrusive load monitoring:

- Detect and profile individual appliances from an aggregated stream
- Empowers users to reduce their energy consumption in an informed way

Our goal:

- Appliance recognition: given the current and voltage of a time frame, being able to recognize the active appliances

Data

PLAID dataset:

- 55 households in USA
- 11 different appliances
- sub-metered on events of the appliances (1074 total)
- Sampled at 30 kHz

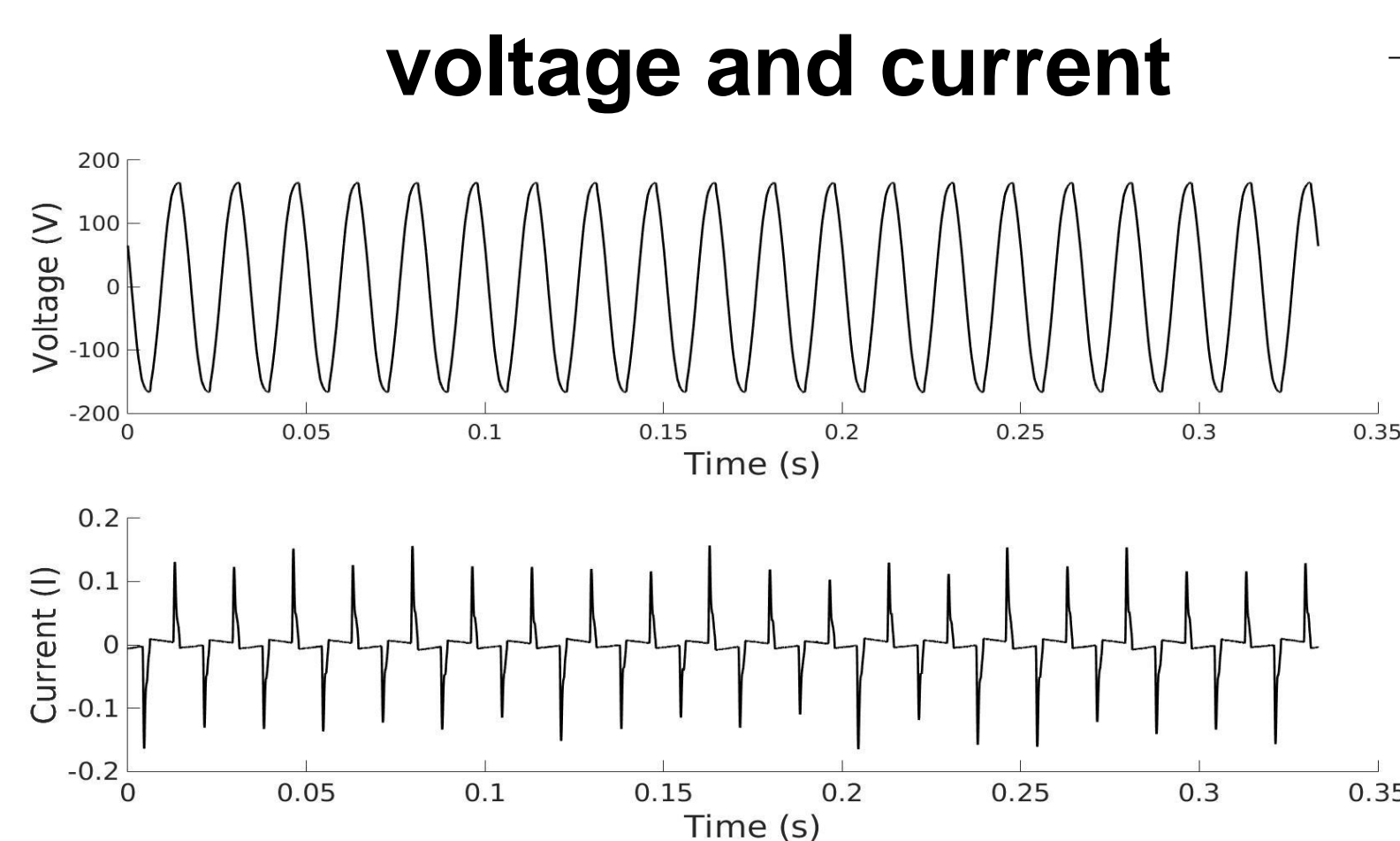
Gao, Jingkun, et al (2014). "PLAID: a public dataset of high-resolution electrical appliance measurements for load identification research: demo abstract."

VI trajectory

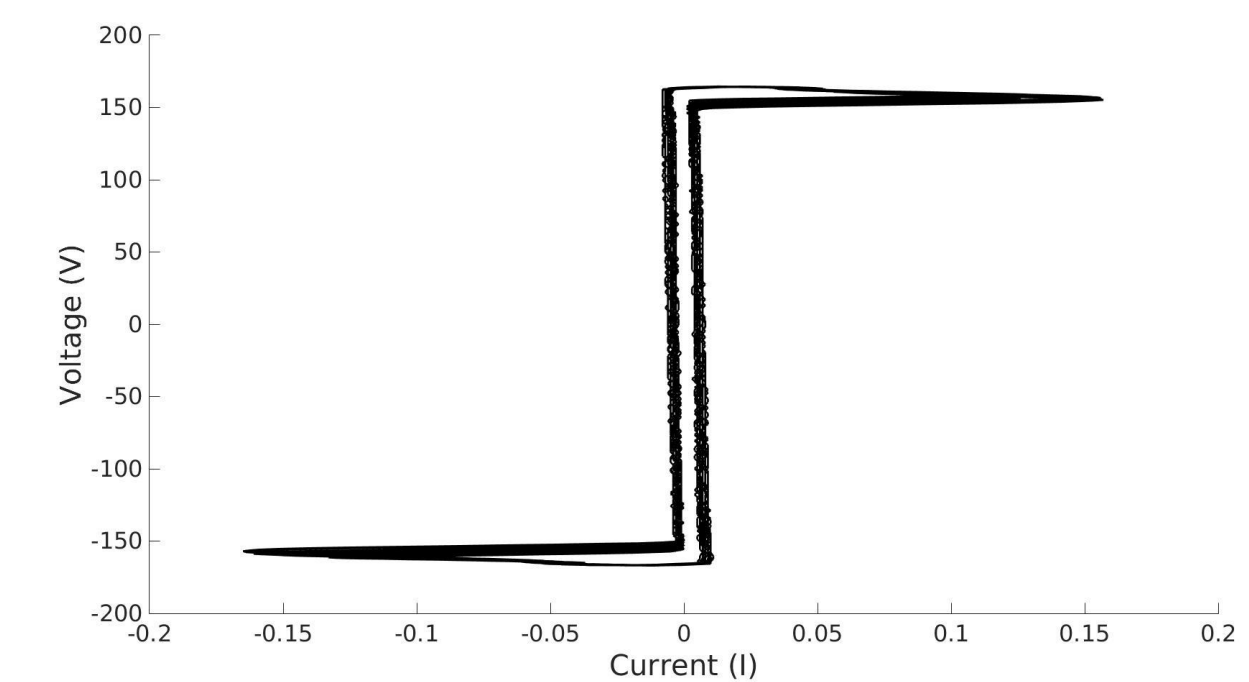
VI trajectory:

- Plots the current and voltage of a time period (here 0.33 seconds) on respectively the x- and y-axis of the same plot

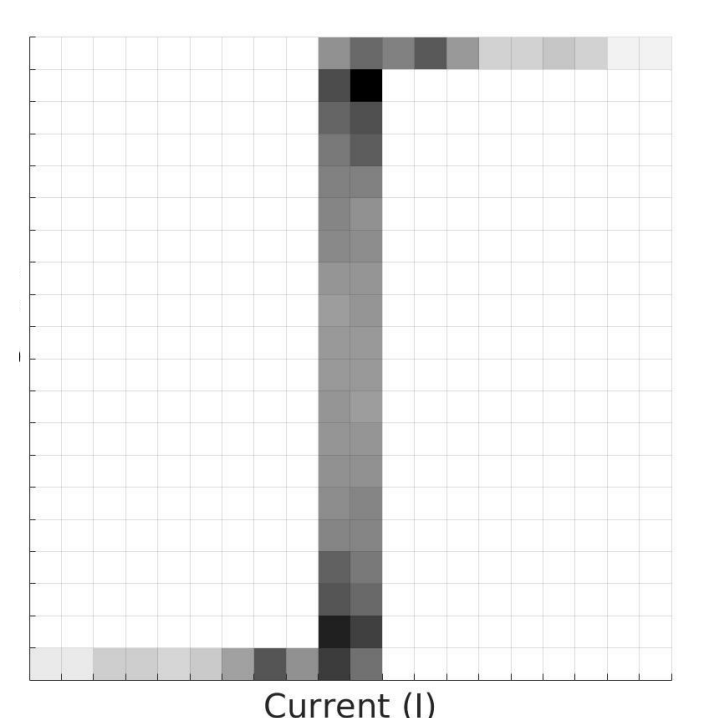
Laptop



VI trajectory



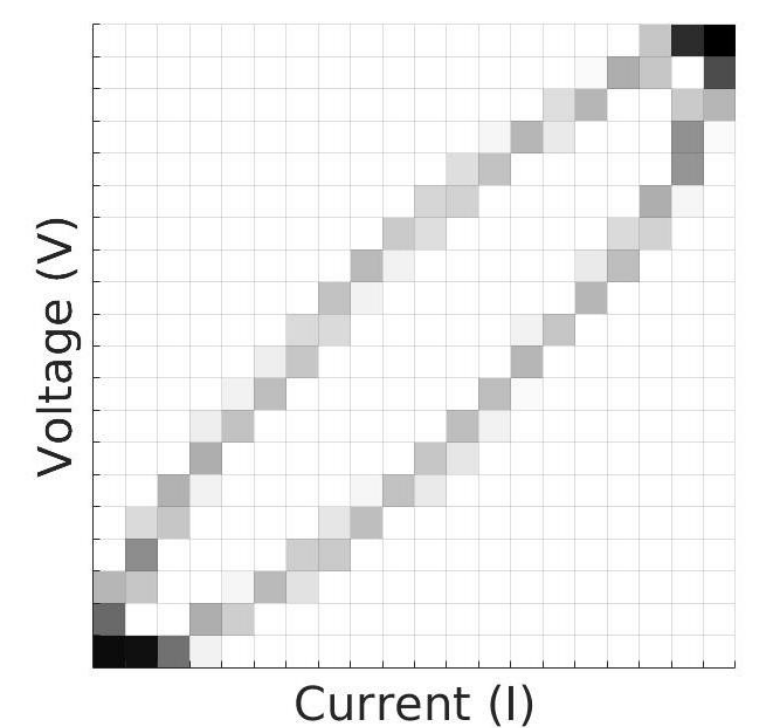
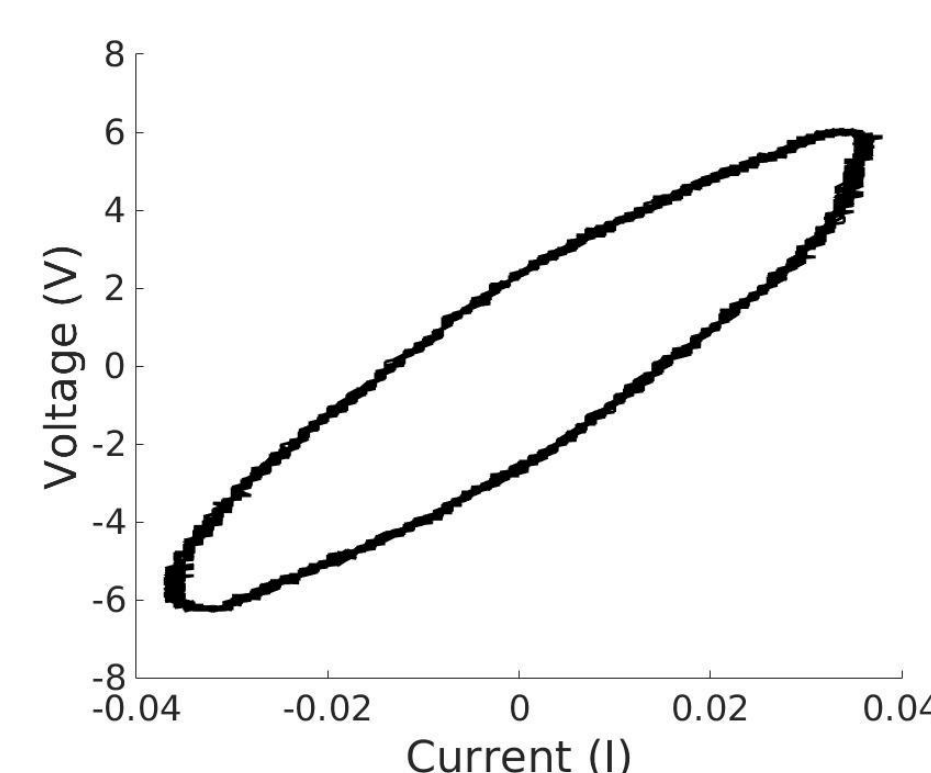
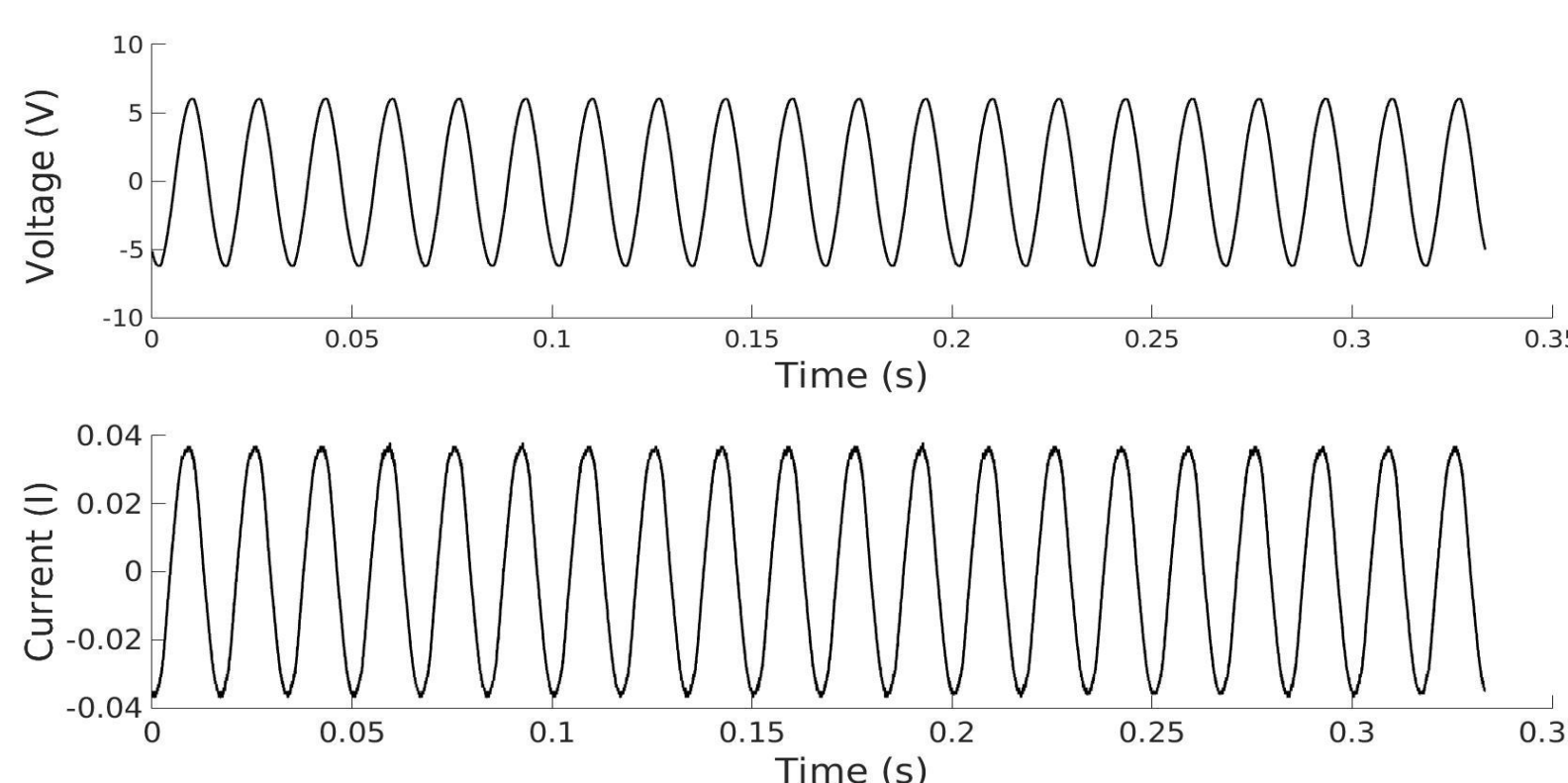
binary VI trajectory



Binary VI trajectory:

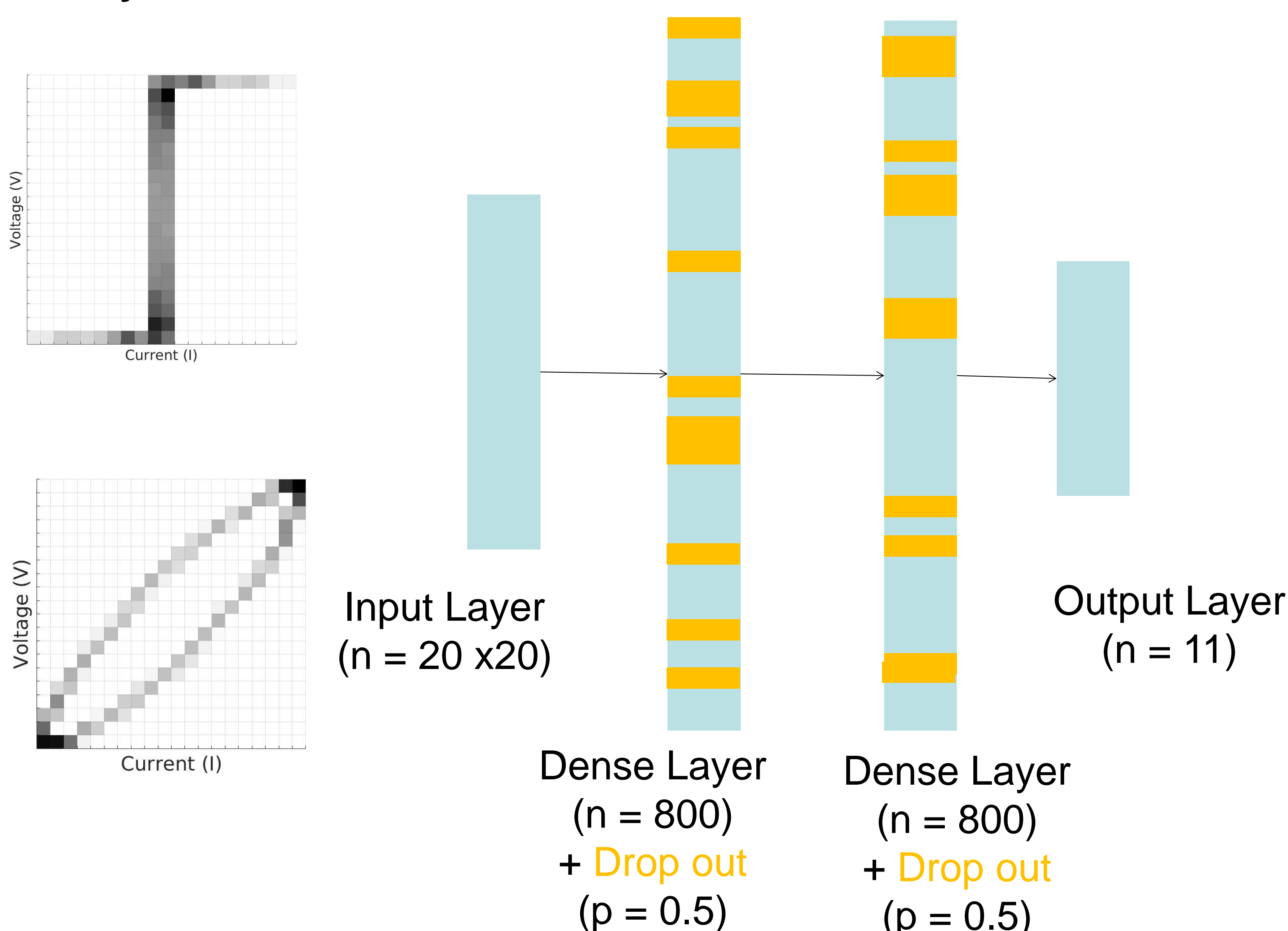
- Set up a 20 x 20 mesh on the VI trajectory
- For each cell, count how many times the trajectory crosses it
- Scale such that maximum of cells = 1

Fan



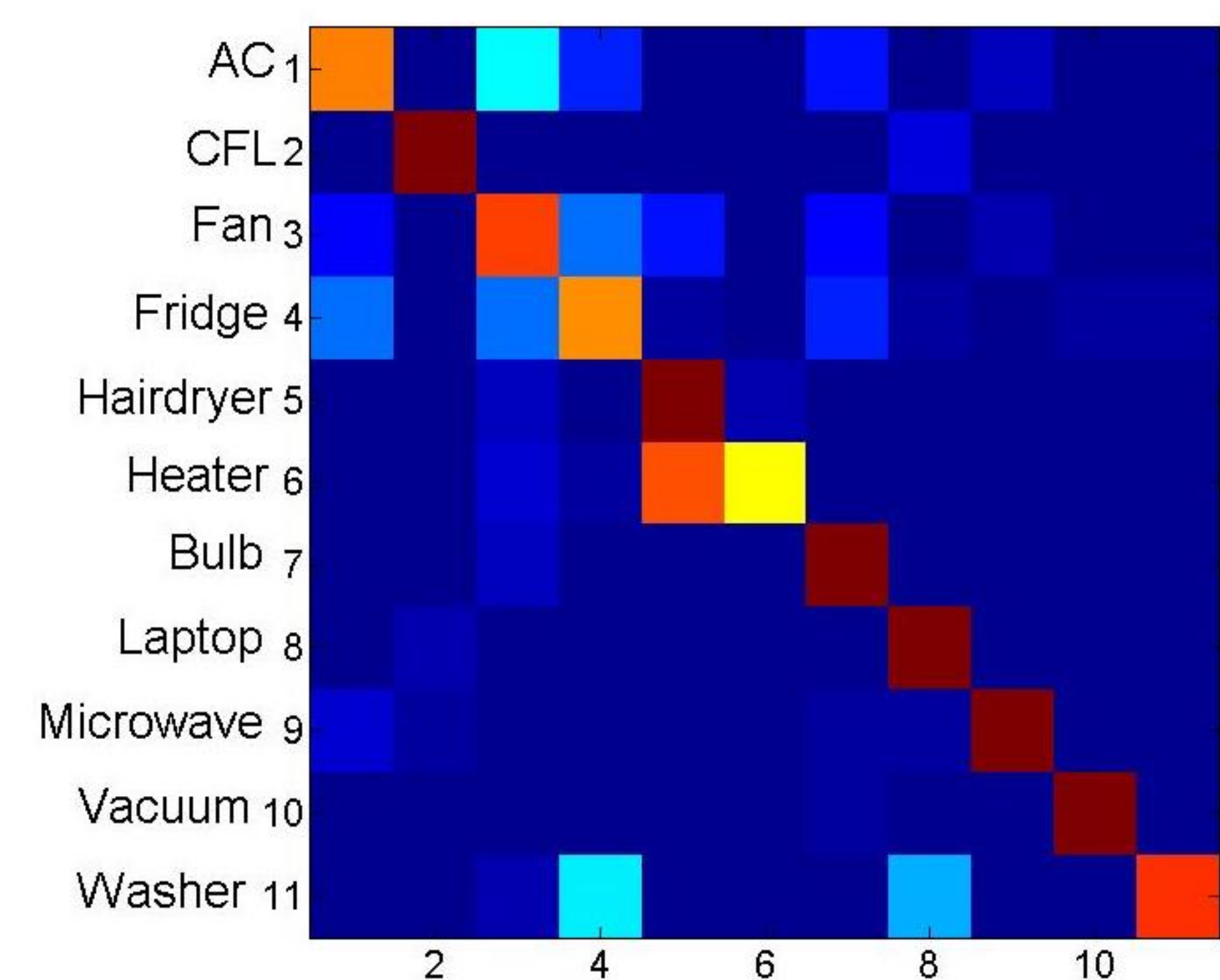
Neural Networks

Two layer neural network:



Results:

- Leave one house out cross validation
- 84 % accuracy



Random Forest on VI image:

- 81.4% accuracy
- Gao, Jingkun, et al (2015). "A feasibility study of automated plug-load identification from high-frequency measurements."

Based on: Hinton, et al (2012). "Improving neural networks by preventing co-adaptation of feature detectors."