Load Hiding to Preserve Privacy from Smart Meter Measurements

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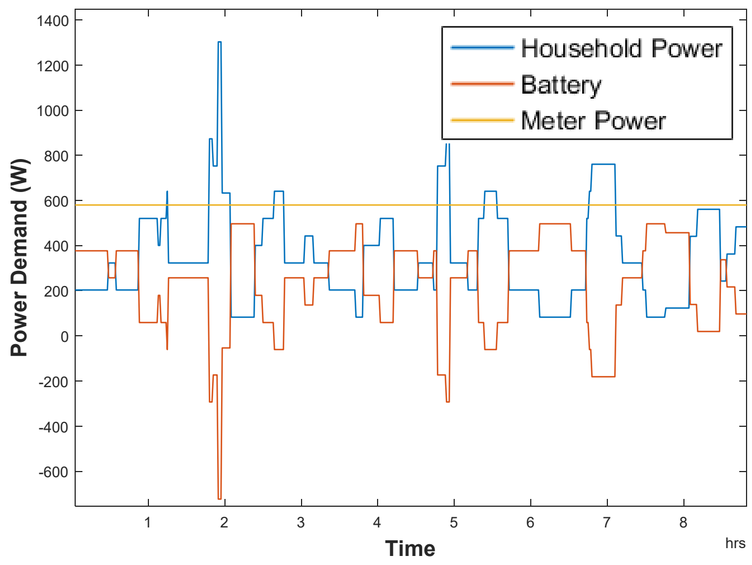
INTRODUCTION

Smart meter benefits:

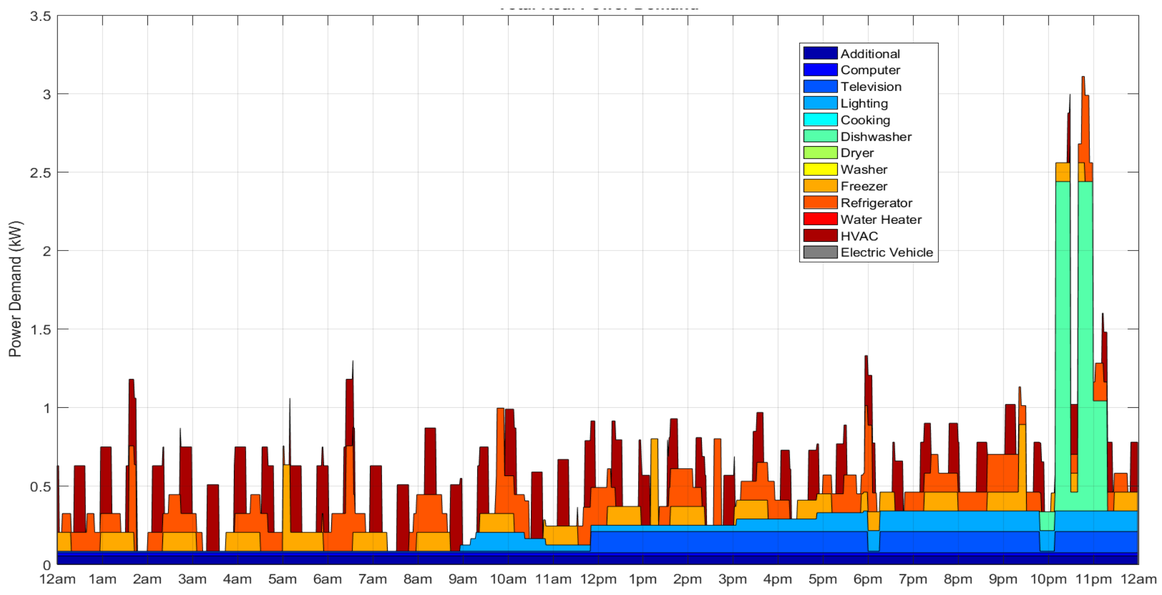
- More accurate forecasting
- Fault detection
- Increased consumer information
- Increased stability for renewables

Non-Invasive Load Monitoring (NILM) represent a serious privacy concern:

- Capable of identifying specific appliances
- Mapping behaviors of homeowners
- Impede implementation of smart meters



Example of past load hiding in previous research



NILM: Disaggregation of Load Profile

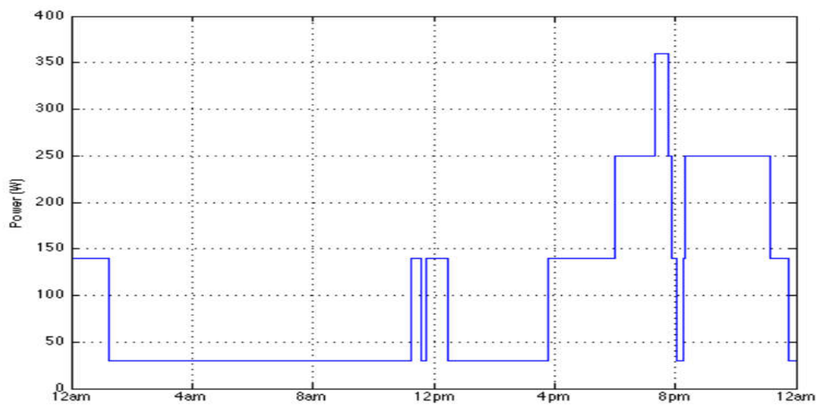
Previous research on load hiding has focused only on hiding the load profile from NILM.

This obstructs the advantages provided by smart meters.

LOAD IMITATING TO INCREASE ENTROPY

Project Goal: To design a system to improve individual household privacy while maintaining the benefits provided by smart meters

- Analyzed various time-based household loads
- Found the probability of load for any given time
- Applied new loads in order to equalize the probabilities for each time step



Model of Television Power Demand

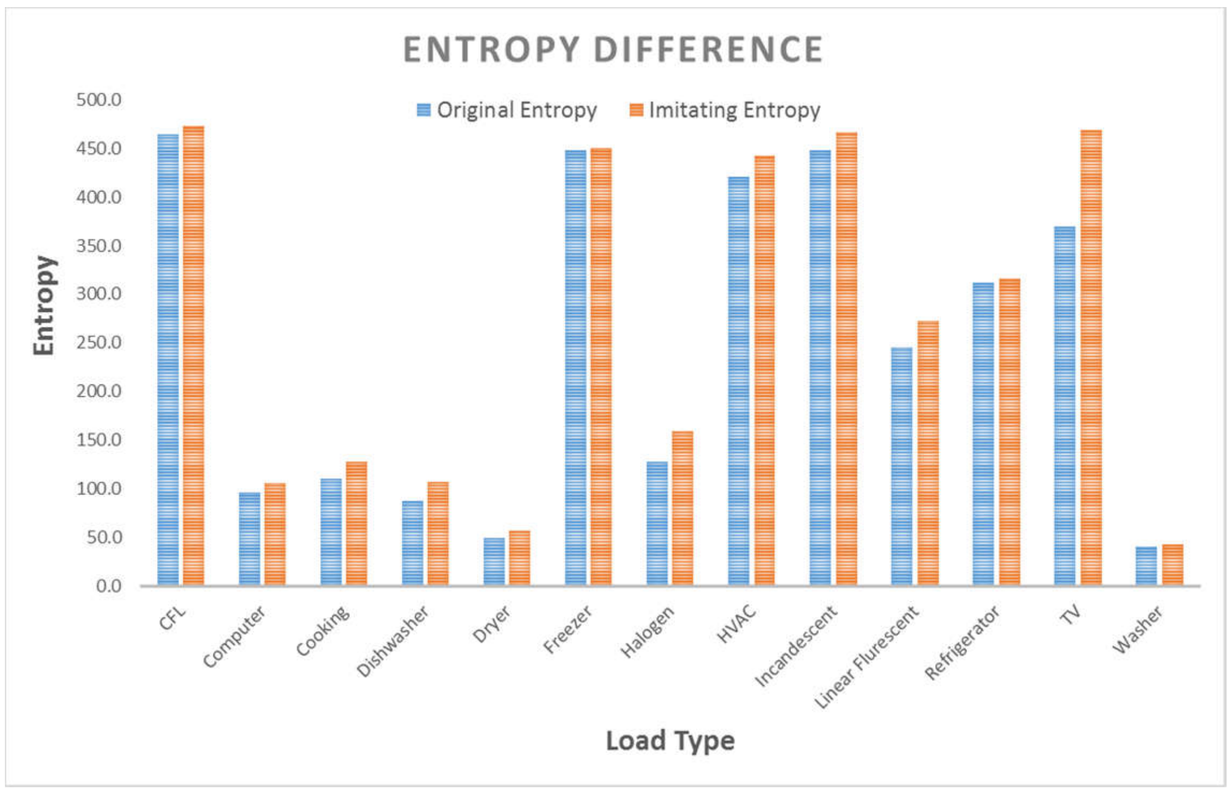
$$Entropy(X) = -\sum_{i=1}^{n} P(x_i)\log_2 P(x_i)$$

$$Entropy_{Max}:\ P(x\_i) = 1/n$$

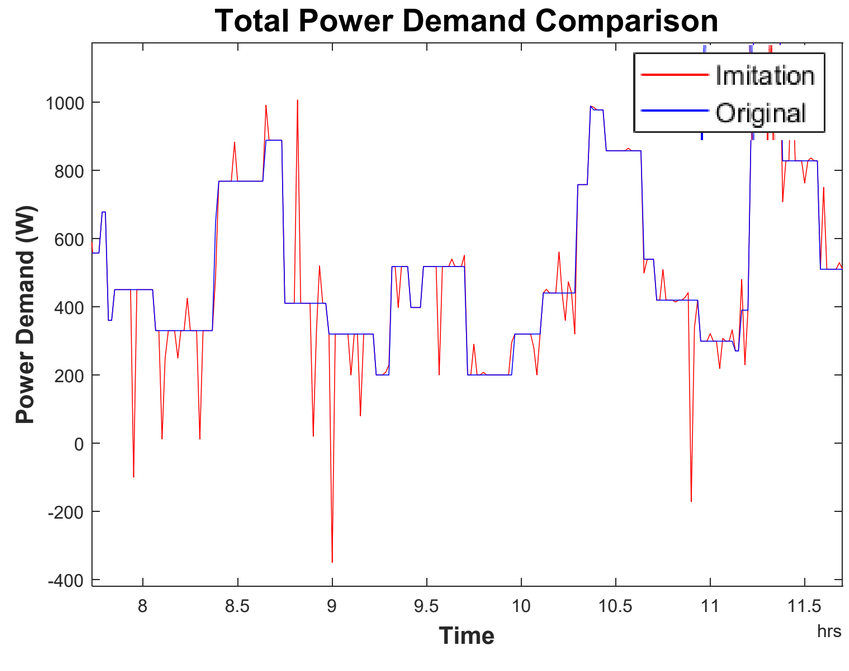
Battery Probability (B)

$$B(X) = \frac{1}{2n}\sum_{i=-n}^{n} A(t+i) - A(t)$$

RESULTS



Entropy increased an average of 11% for each load



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