



NIALM using Prior Models of General Appliance Types

07.05.2012

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Hardware requirements for NIALM

Requirements:

- Monitor household electricity consumption



Solutions:

- Smart meters
 - All houses by 2020 (in UK)



- Provide feedback to household occupants

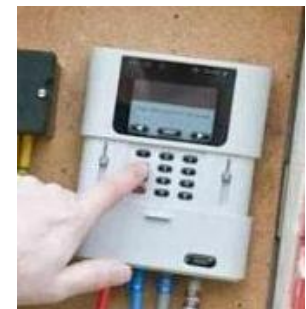
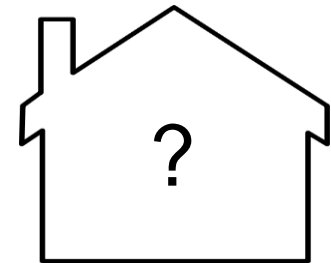


- In-home displays
 - Connected to smart meters
 - All houses by 2020 (in UK)



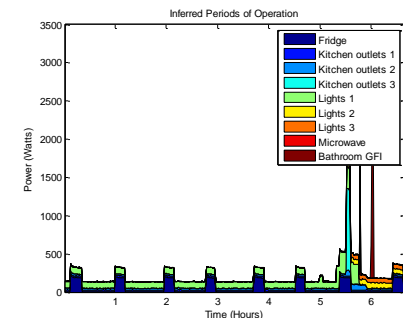
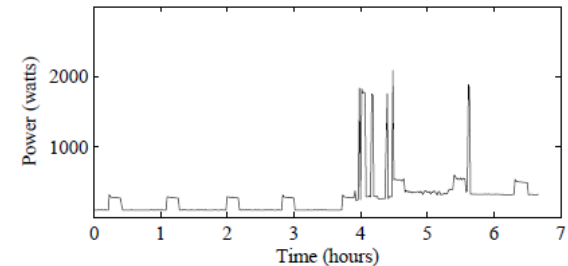
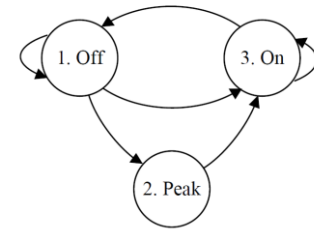
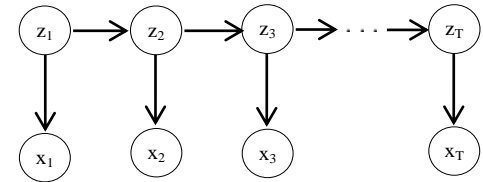
NIALM using smart meter data is a hard problem

- No training (sub-metered) data
 - Financially expensive
 - Time consuming
 - Invasive
- Unknown appliance types
 - Hard to learn models for all appliances from aggregate data
- Low sampling rate
 - Power measurements at 5 second intervals max (UK)



Our approach uses existing smart meters and no training data

1. Model appliances as hidden Markov models
2. Use prior knowledge of how common appliances behave
3. Tune to specific appliance instances using aggregate data
4. Use to disaggregate single appliances from aggregate load



Our approach performs comparably to using sub-metered training data

Appliance	Error		
	Prior with no tuning	Prior tuned with aggregate data	Prior tuned with sub-metered data
Refrigerator	38%	21%	55%
Microwave	63%	53%	38%
Clothes dryer	3469%	55%	71%
Air conditioning	57%	77%	65%

Our approach →

Data set – Reference Energy Disaggregation Data set (REDD)