



# Energy Consumption Lifestyle Segmentation Using Hourly Electricity Data

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**becc**





- **Introduction**
- Methodology
- Segmentation results
- Conclusion and future work



# Previous customer segmentation

## *Psychographic segmentation based on survey*



### *Issues:*

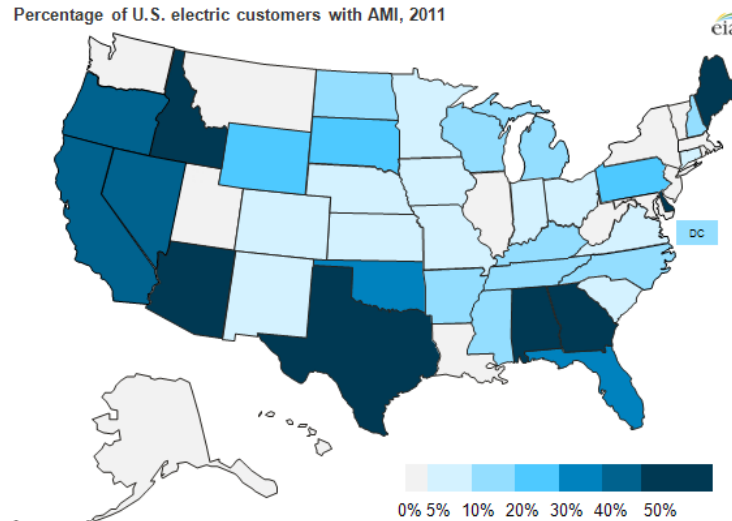
Rare actual energy usage info,

Low energy program yield (10-20%)



# New opportunity with AMI

## *Advanced metering infrastructure deployment*



### *New opportunity:*

Interval energy consumption data(1hour, 15min)

➔ New features available

ex) Peak hour, usage pattern, base consumption



1. Segment the customers with relevant features  
⇒ ***The features should represent energy consumption lifestyles well.***

2. The methodology should be

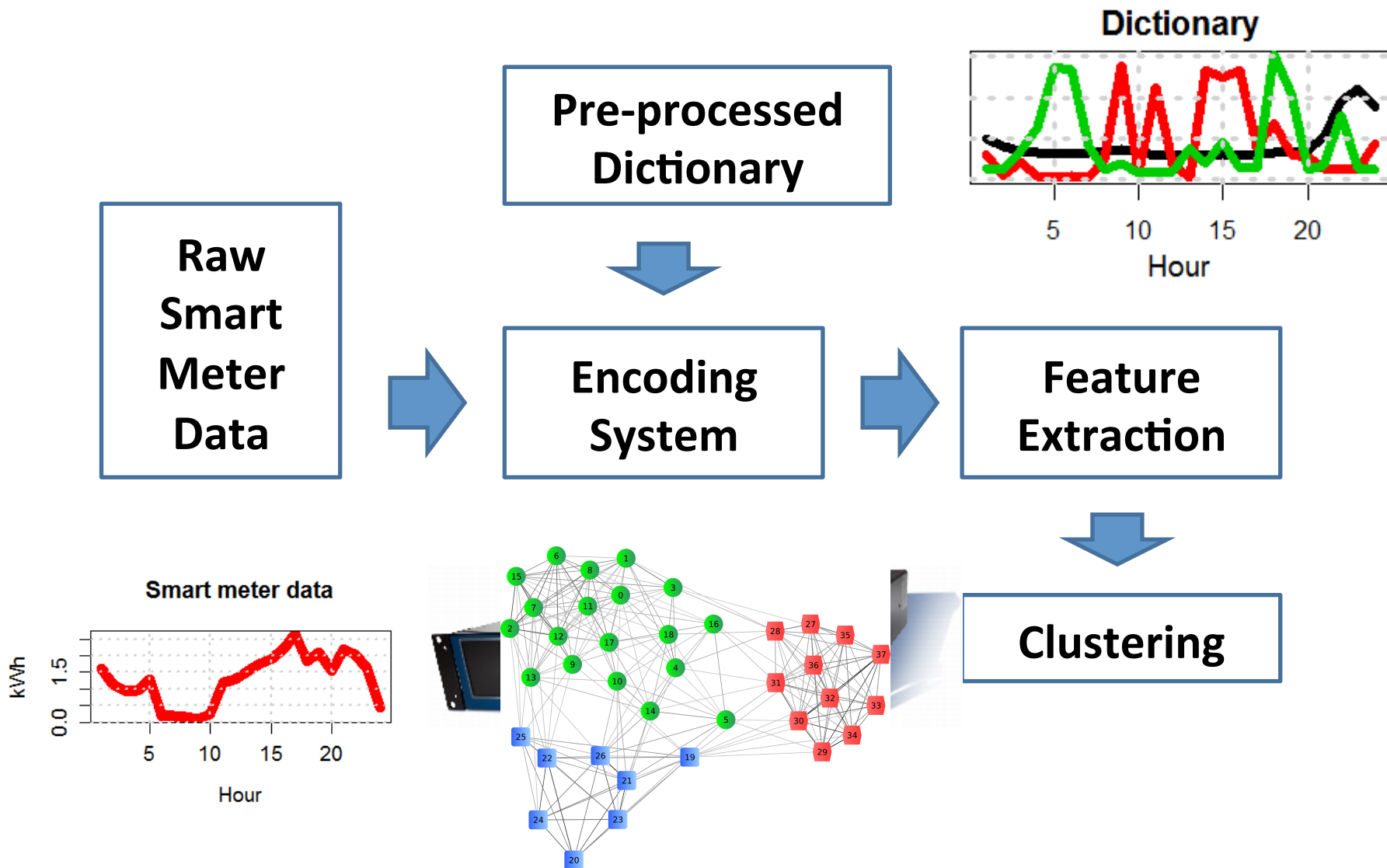
- a. ***Innovative***
- b. ***Scalable***
- c. ***Analytic***



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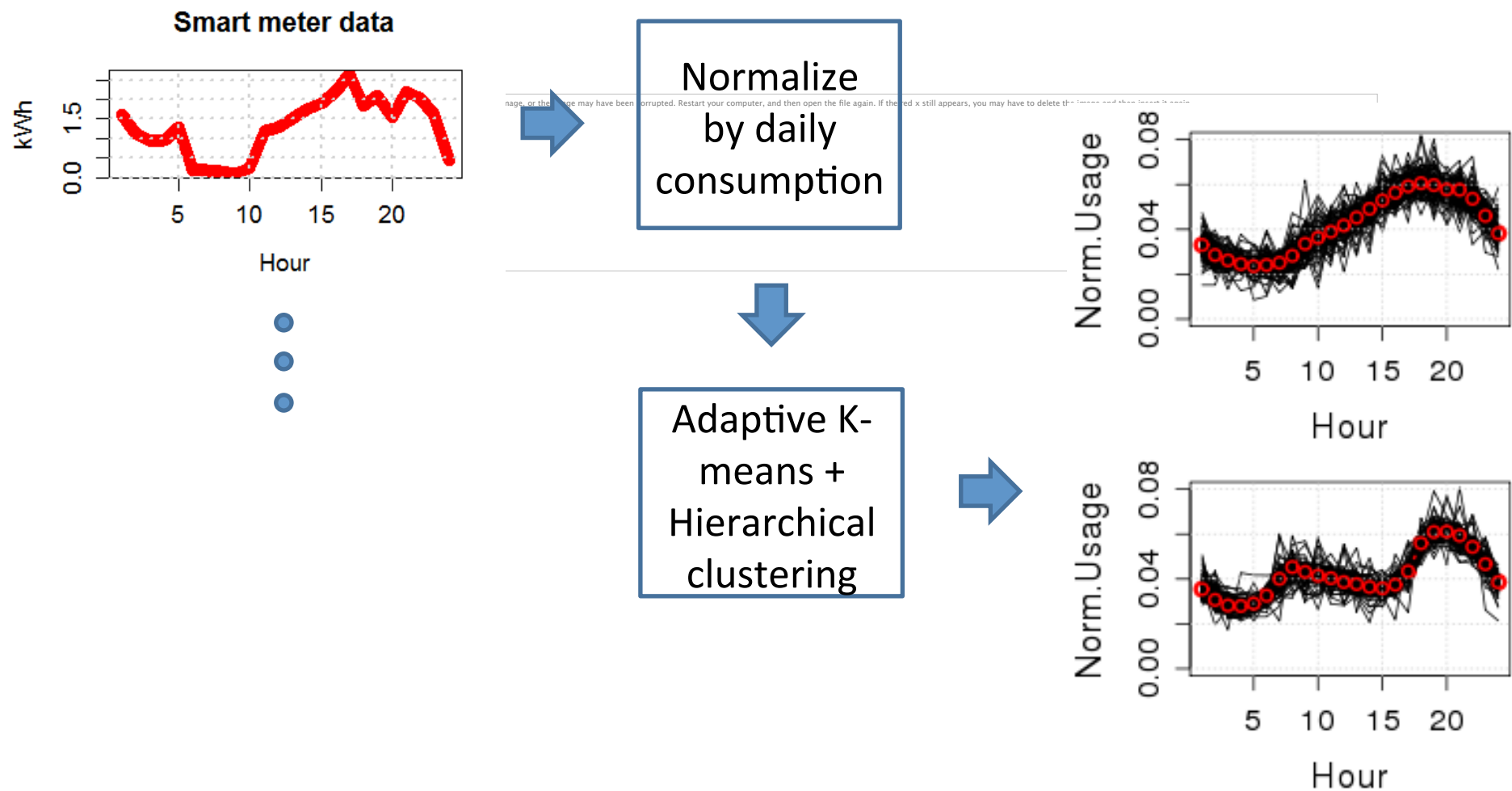
# Segmentation flow





# Load shape dictionary generation

- Load shape dictionary generation flow

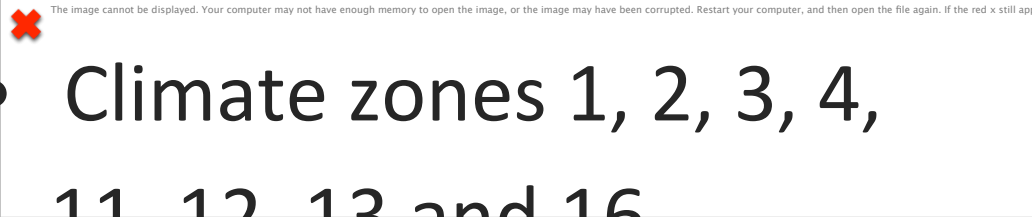




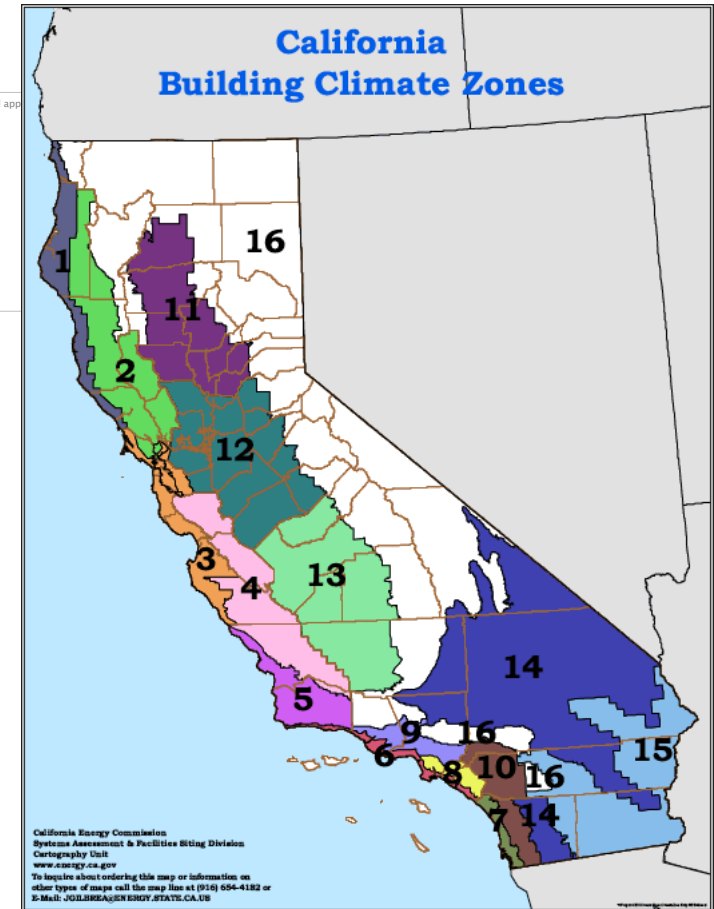


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- **Anonymized smart meter data** provided by Pacific Gas and Electric Company (PG&E)



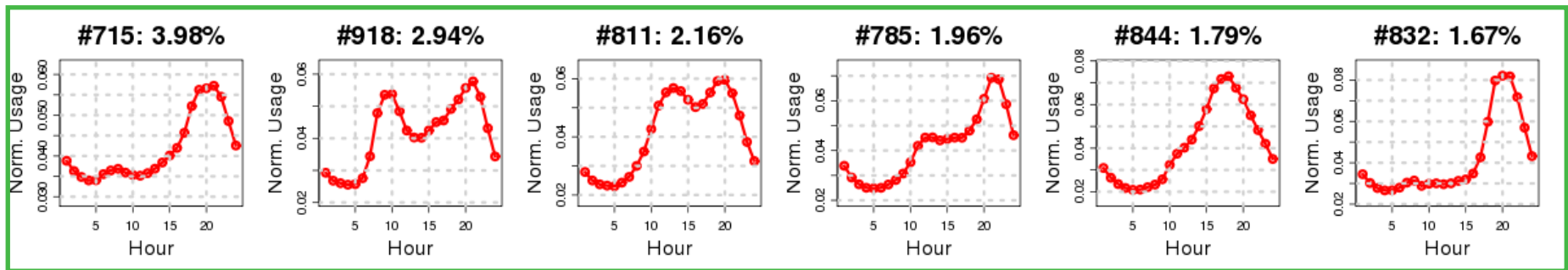
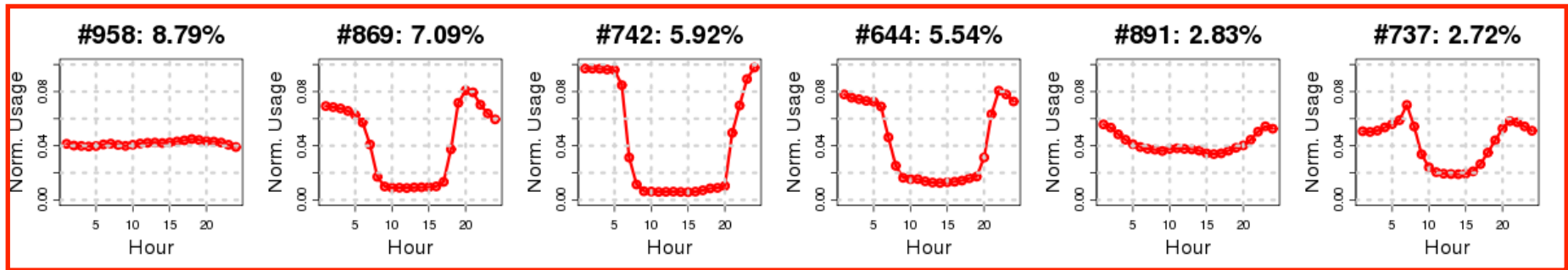
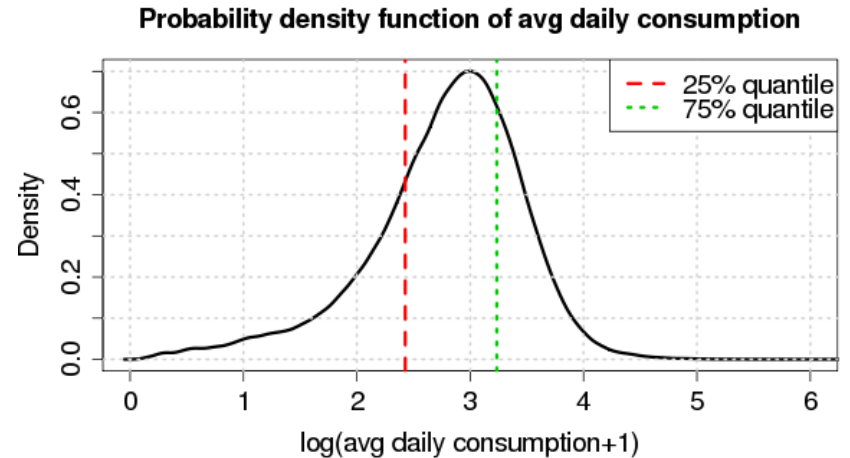
- Climate zones 1, 2, 3, 4, 11, 12, 13 and 16
- 123,150 households of 1 year data:  
45MM daily profiles  
(Aug 2010 – July 2011)





# Segmentation by usage volume

**Avg daily consumption**  
~ the size of household

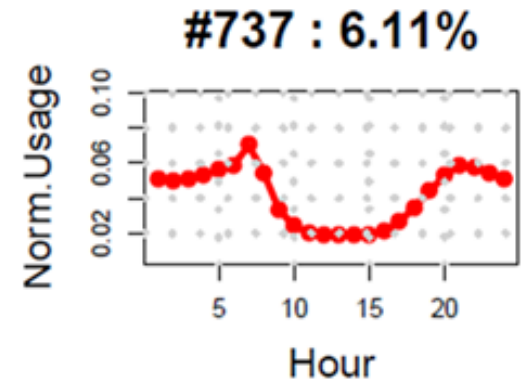
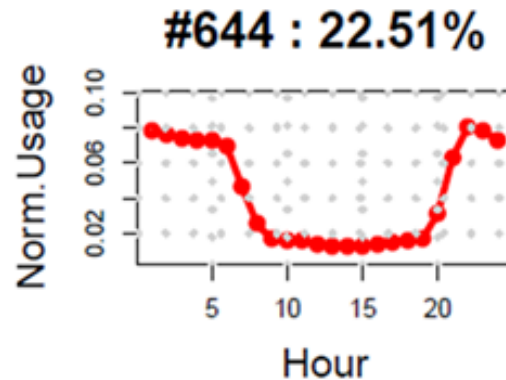
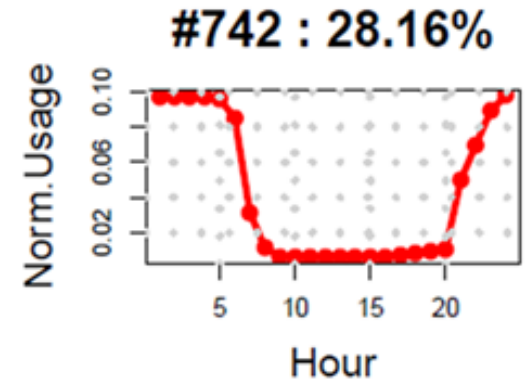
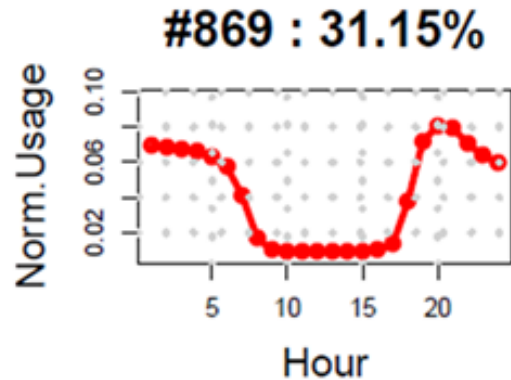
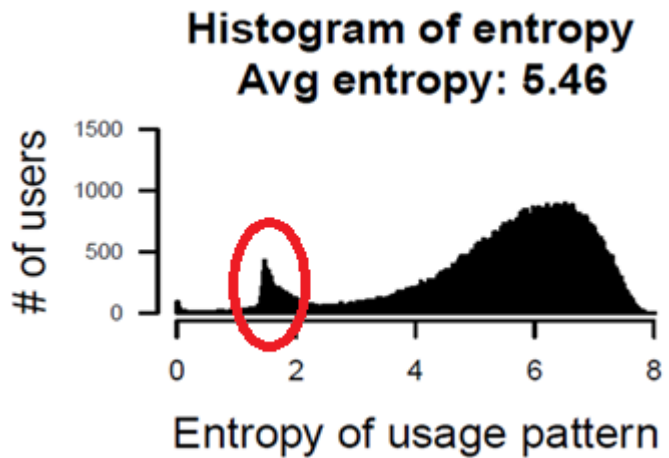




# Segmentation by variability

## *Entropy of load shape codes*

~ consumption pattern variability





# Segmentation by load shape segment

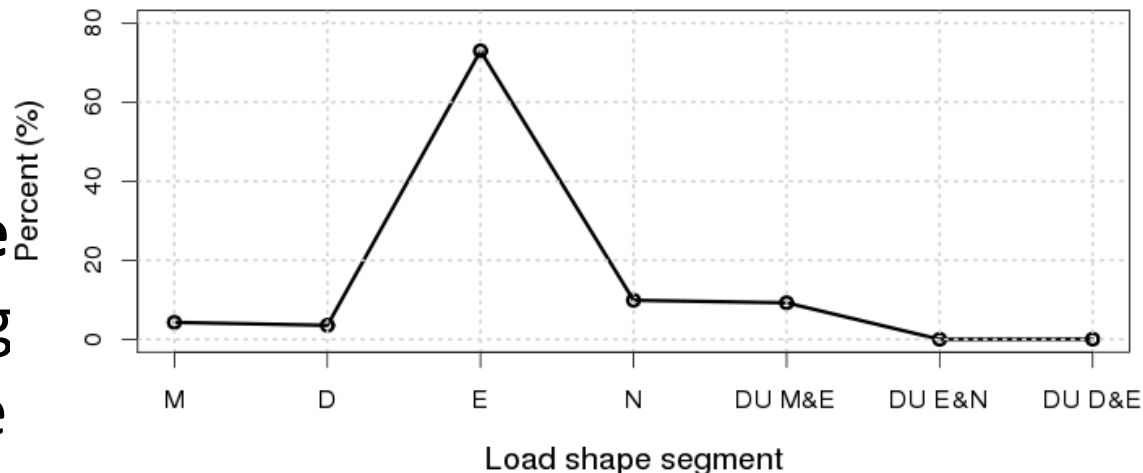
## Load shape segment ~ peak hours

7 segments

Morning

Daytime

Evening peak (E: 16:00-22:00)



Night peak (N: 0:00-4:00 and 22:00-24:00)

Dual peak Morning & Evening (DU M&E)

Dual peak Evening & Night (DU E&N)

Dual peak Daytime & Evening (DU D&E)

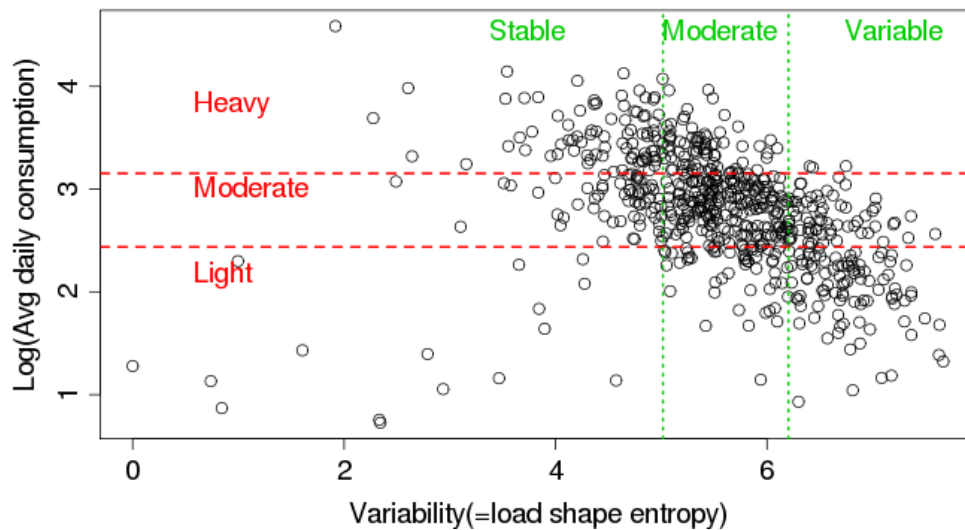
	Morning peak	Daytime peak	Evening peak	Night peak	Dual peak M&E	Dual peak E&N	Dual peak D&E
Avg daily consumption (kWh)	20.73	24.05	19.73	10.78	15.81	11.23	24.49
Proportion households	4.29%	3.55%	72.98%	9.89%	9.24%	0.01%	0.04%



# Segmentation by multiple features

## *Multiple features*

Ex) usage volume and variability



	Stable	Moderate	Light	Total
Heavy	13.03%	11.62%	0.47%	25.11%
Moderate	9.42%	30.46%	10.05%	49.93%
Light	2.51%	7.85%	14.60%	24.96%



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- Check the goal again
- ➔ Provided segmentation examples with **relevant features.**
- ➔ The methodology is **innovative, scalable, analytic.**





- **Try other features that can represent household lifestyles**



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- **Various applications**  
ex) load shape prediction, load prediction
- **With feedback data, test the implications**



Q & A

Thanks!!!

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