Matrix Factorisation for Scalable Energy Breakdown

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Goal

To create an energy breakdown for million homes. Can save up to 15% on energy bills.

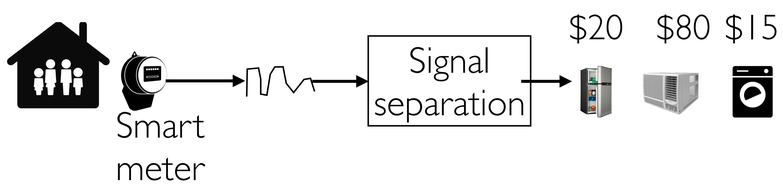
Alternative approaches

Existing solutions require hardware in every home, so cost scales linearly with the number of homes.

I. Appliance submetering

	$80	$10	$40 ← Appliance sensor
	$70	$60	$10
	$20	$30	$80
...	...	...	...
	$30	$40	$50

II. Source separation



Approach

Our approach can produce an energy breakdown without installing new hardware in every home

Key insight: Much of the variation in energy data across buildings occurs along a relatively small number of dimensions

Step I: Add easy to collect monthly bills in the matrix. Historical bills add more value.

Step II: Submeter small #homes (train) to create matrix X

Monthly bill

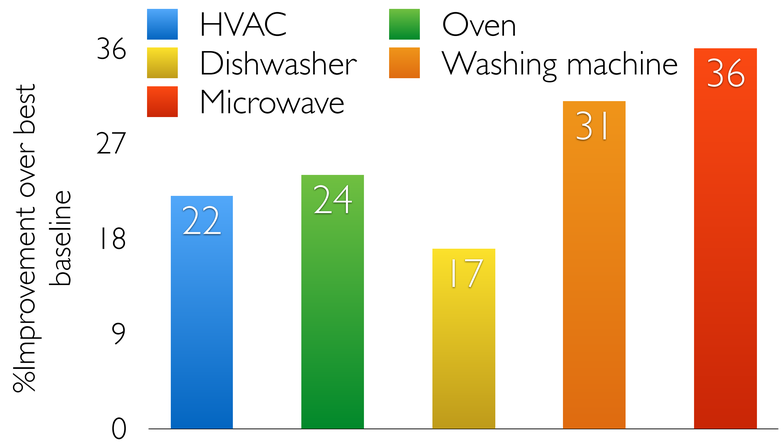
Train	$40	$10	$40	$500
Train	$70	$60	$10	$400
Test	?	?	?	$300
Test	...	...	...	...
Test	?	?	?	$500

Step III: Perform non-negative matrix factorisation. X~AB. Include static information, such as area of homes, to guide factorisation.

Step IV: Predict energy breakdown from factors.

Results

Our approach can be more accurate than alternatives, with lower cost. Thus, more scalable.



Web application

Our web application can potentially provide energy breakdown to 60 million homes