

End-use detection models

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ESTEREL: A model to estimate electric space heating consumption in the commercial market segments

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End-use detection models

- ☞ Why detection ?
 - Provides useful information to
 - propose offers that meet customer requirements
 - Customer Relationship Management
- ☞ Two research tools (implemented by SAS programs)
 - Segmentation method from invoice records : “regression tree”
 - Analysis of Load Curve (annual with a daily step) : Esterel

CART method (commercial customers)

Modeling

- The CART method models the relationship between a response variable (e.g. space heating vs no space heating) and a set of explanatory variables (consumption ratios, load factors, subscribed powers) by recursive partitioning

Results

- ⇒ high winter/ summer consumption ratio
- ⇒ High off-peak / peak consumption ratio
- ⇒ High subscribed power for the winter period

→ Electric Space heating

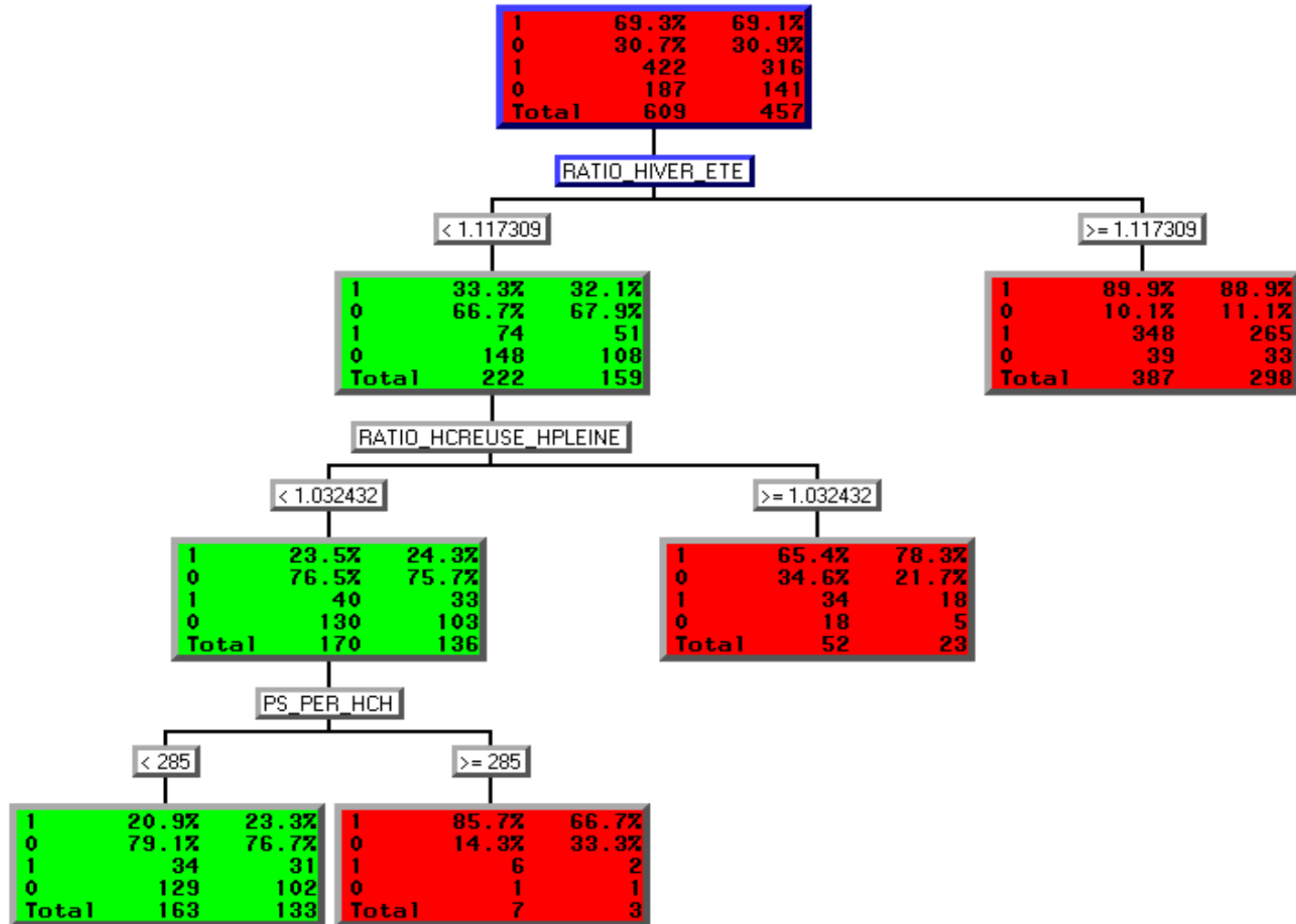
- ⇒ Low winter/ summer consumption ratio
- ⇒ high percentage of consumption for peak period in summer
- ⇒ High subscribed power for the peak period in summer
- ⇒ high load factor for the peak period in summer

→ Air-conditioning

Decision rule

- A customer is appointed to the class which is majority within its terminal node.

Example : regression tree for electric space heating (commercial customers)



Validation phase (underway)

Electric Space heating

- right estimation rate : 85 %
- An “over-detection” problem : 30 % of customers who do not own electric space heating are appointed to the space heating class.

Air-conditioning

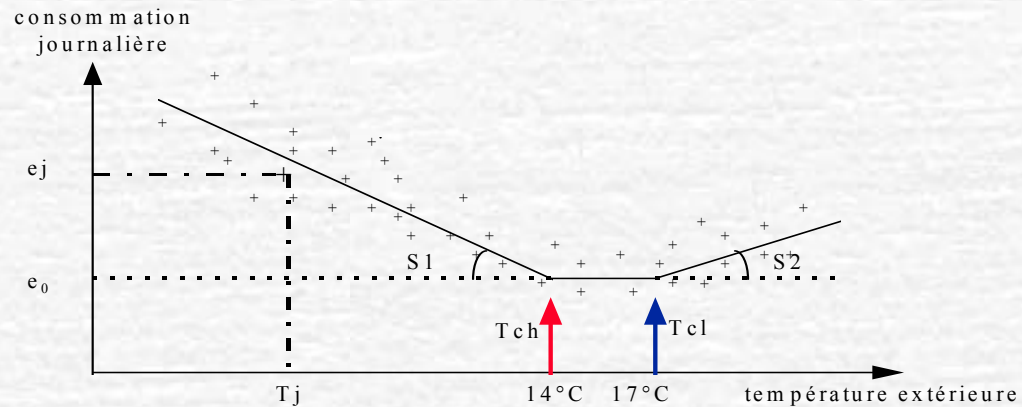
- right estimation rate : 90 %
- An “under-detection” problem : 60 % of customers owning air-conditioning are appointed to the “air-conditioning” class

- Hence the need to use climatic variables and extern variables (such as seasonality) in the modeling.

Esterel model

Modeling

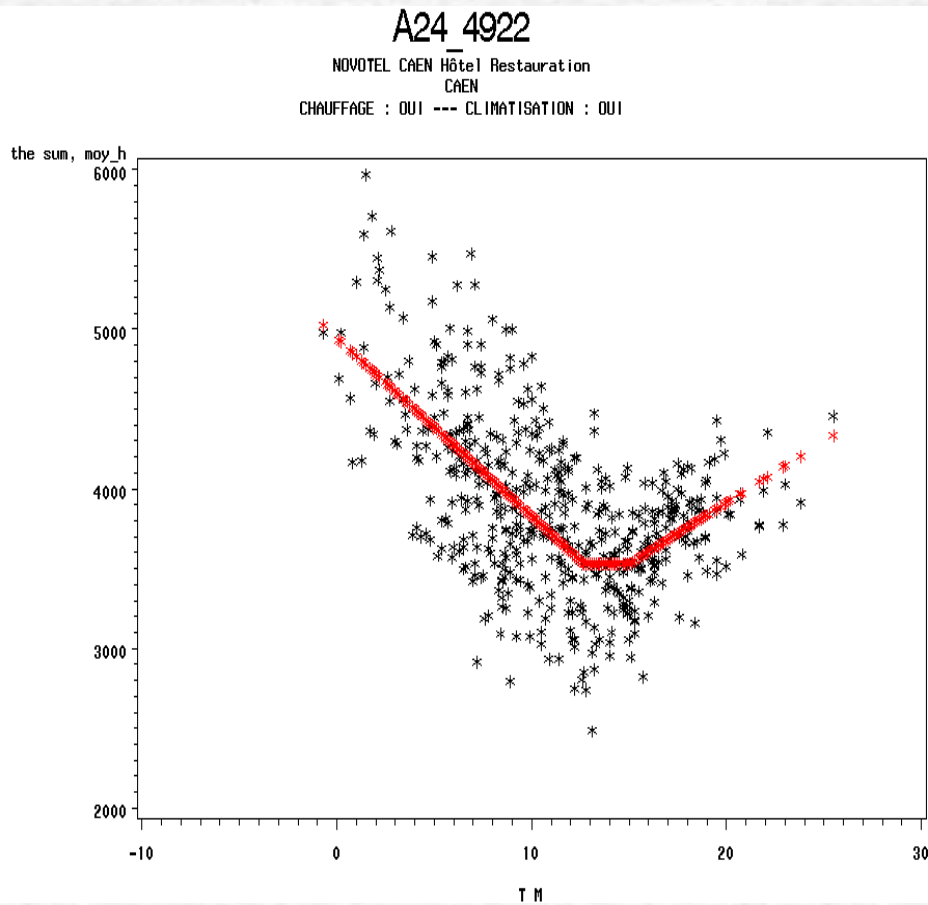
- daily consumption is supposed to be a linear function of the outside temperature (with two slopes).



Data

- annual load curve defined with a daily step.
- Temperatures fitted to the load curve analyzed.

Results



Graphic results

For each customer

- quality indicators
- annual space heating and air-conditioning consumption (if they exist)

Decision rule

- end-uses are detected if the quality indicators are good enough and coherent.

Validation

	Rightly detection	Wrongly detection
Space heating	80 %	18 %
Air-conditioning	42 %	10 %

- Some sectors have features that make them hard to handle with that method (e.g. Agriculture)
- lighting induces an indirect correlation between consumption and temperature
- Air-conditioning is an end-use much more difficult to detect with that method.