Applying Feature Selection Algorithms to Selecting Relevant Context Attributes for Context-Aware Adaptations

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Context information is constituted of a number of context attributes (e.g., time, location, and weather). Context-aware systems adapt their behaviours based on context information. However, not all attributes of context information contribute equally to making adaptations. A particular behaviour of a system may only be triggered to adapt to relevant context attributes. For example, in the case of a restaurant recommendation system, a user tends to choose a restaurant based on several context attributes such as date of week, time of day, weather, budget, and companions. But generally, how does the system know what context attributes are relevant for making a decision (e.g., making a recommendation in the previous example) and what is the contribution of each context attribute in making a decision (e.g., if weather impacts the most in the previous example)?

The problem here is that how to compute the contribution weight of a context attribute against a behaviour's adaptation? In other words, how to measure the relevance degree of a context attribute when making an adaptation? A trivial approach to this problem is to manually define adaptation rules. An adaptation rule specifies the context attributes and their contribution weights. For example, a rule to turn a heater on can be specified as "someone presents in the room and the room's temperature is below 12 Celsius degrees". There are two context attributes which contributes equally in this adaptation rule: the presence of someone and the temperature. Whenever the system detects that the current context matches with the condition of this rule, the associated behaviour will be triggered. Specifying adaptation rules manually is time consuming, cumbersome, and inflexible. Different users may have different preferences. The same sometime prefers differently over time.

Our approach is that we extract adaptation rules based on a user' past behaviours and preferences. We are also concerned that the number of contextual attributes can be massive, resulting in an adaptation model that is too massive to making decisions of adaptations efficiently.

We define $relevant(a, r)$, a predicate stating that the context attribute a is relevant at some degree (in the range from 0 to 1)for the adaptation rule r. Let us call RAS_r a set of context attributes which defines the Relevant Attribute Set for the adaptation rule r: $RAS_r = \{a|relevant(a, r) > 0\}$.

We call V_a a space of possible values of the attribute a.

References