

# Non linear preference models: why, how?

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**Abstract.** Literature involving preferences of artificial agents or human beings often assume their preferences are linear, that is, the preference can be represented using a complete transitive antisymmetric binary relation. Much has been written however on more complex, or more interesting, models of preferences. In this article we review some of the reasons that have been put forward to justify more complex modeling, and review some of the techniques that have been proposed to obtain models of such preferences. (Optional: we connect to various related literature about argumentation, ...)

## 1 Introduction

Here are possible subjects we might want to talk about.

- reasons for rebel preferences: non transitivity; may be linear according to some other description (Sen)
- reasons for modeling rebel preferences (VS simpler approx): use the resulting undeterminacy (lability)
- descriptive VS prescriptive; preferences are complete or transitive
- why ranking  $\neq$  choice  $\neq$  sorting
- maximizing does not require transitivity
- nec and possible
- class of models by generality
- axiomatics
- computational difficulties
- argu : expliquer le modèle ; éliciter le modèle ; choix classe de fonctions

Here is a possible approach we might want to use.

Models of preferences can have (at least) two interpretations: normative or descriptive. Goals and (sometimes) tools to model preferences and reasonable hypothesis that can be postulated about the shape of the preferences vary according to these two lines.

(Reasonable) hypothesis about descriptive preferences. Why it's more difficult than can be thought naïvely.

Reasonable hypothesis about normative preferences. Why it's more difficult than can be thought naïvely. Talk about incompleteness. Applying normative approaches: talk about prescription a la Roy...

Present usual models (Savage? MAVT?) and alternative ones (belief functions? Electre?)

Links to argumentation theory: build argumentative models that explain / justify a decision.

Path to validation of normative models. Talk about empirical social choice; reflective equilibrium.