Learning argumentative recommenders

Olivier Cailloux

LAMSADE, Université Paris-Dauphine

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https://github.com/oliviercailloux/CLut

A new goal

- Recommender systems: what's appropriate for i?
- Appropriate, classically: among top-preferred
- Appropriate, here: among the Deliberated Preference of i

Deliberated Preference (DP)

Choice behavior when i has taken all arguments into account to form a deliberated opinion

Outline

1. Motivation

2. Deliberated Preference

3. Argumentative Recommenders

4. Convergence with Decision Analysis

Outline

1 **Motivation**

2 Deliberated Preference

3 Argumentative Recommenders

4 Convergence with Decision Analysis

Two sorts of preference

Intuitive preference

- Preference as an "immediate sensation" [von Neumann and Morgenstern, 1944]
- i knows what's best by introspection
- Recommend a movie: i knows how good it feels
- "There is, of course, an important sense in which preferences, being entirely subjective, cannot be in error" [Savage, 1972]

Deliberated preference

- ... "but in a different, more subtle sense they can be."
- On reflection, I change my mind
- Relates to "slow thinking" [Kahneman, 2013]

Relevance

Appropriate when desired to help i deliberate

- Can't try out the items (non repeatable choice)
- Finding best requires careful consideration of all arguments

Examples:

- Choice of place of study
- Which smartphone / house to buy?
- How to distribute a prize or revenue? (Fairness?)
- To which cause should I donate money?

Example: A decision procedure for credit requests in a bank

- Fairness (unconscious discrimination?)
- Go beyond reflecting some expert's intuition

Outline

Context

$\mathcal{J}$ The possible items

S^* All arguments

$s \in S^*$ An argument (a text in English)

Example argument

Item j is better than item j' because j has a good performance on criteria 'price' and 'speed' while item j' has a good performance only on criterion 'aspect', which you do not consider important

Attitude towards arguments and Deliberated Preference

- Given s in favor of j; s' in favor of j'
- Does i prefer j or j'?
- $\rhd$ binary relation over $\mathcal{J} \times S^*$: $(j, s) \rhd (j', s')$ iff i strictly prefers j to j', given s and s'
- $J_i \subseteq \mathcal{J}$, the items in the DP of i: having no items strictly preferred to them, *all arguments considered*

Deliberated Preference

$j \in J_i$ iff

$$\forall (j', s') \in \mathcal{J} \times S^*, \exists s \in S^* \mid (j', s') \not\rhd (j, s)$$

Outline

Argumentative Recommender

Goal of an Argumentative Recommender (AR)

- Exhibit some items $j \in J_i$ and some $j' \notin J_i$
- Argue for those claims

Given i, AR η produces:

$$J_\eta \subseteq \mathcal{J} \text{ items that } \eta \text{ claims are in } J_i$$

$f_\eta^{\text{def}} : J_\eta \times \mathcal{J} \to S^*$ to defend items in J_η

$\quad\quad R_\eta \subseteq \mathcal{J} \times \mathcal{J}$ pairs (j, j') such that η claims that i
$\quad\quad\quad\quad$ deliberately prefers j to j'

$\quad\quad f_\eta^{\text{att}} : R_\eta \to S^*$ to support the claims represented by R_η

Permits to compare ARs!

Outline

Relationship with Decision Analysis

- Decision Analysis (DA) has a similar goal: help user deliberate
- DA use preference models based on sound principles
- Models not perfectly accurate to describe everyday behavior
- But might better describe thoughtful behavior
- Prospect theory [Wakker, 2010] VS Utility theory

Build Argumentative Recommenders with Decision Analysis models

- Search models of DP within a class of models proposed in DA
- Use and extend work producing arguments given DA models

EU maximizer facing Allais's problem
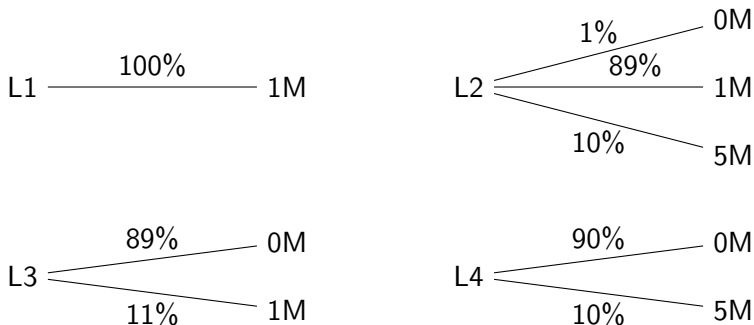
- i could be intuitively attracted by L1 $\succ$ L2 and L3 $\succ$ L4
- Expected Utility principles could help
- ... if i is a utility maximizer
- Prescription useful to Savage himself

Conclusion

- To help i decide
- Build Argumentative Recommenders
- Still a prediction problem:
- predict her Deliberated Preference
- To be done using Decision Analysis principles or otherwise!

Thank you for your attention!

References I

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L. J. Savage. *The foundations of statistics*. Dover Publications, New York, second revised edition, 1972. ISBN 978-0-486-62349-8.

J. von Neumann and O. Morgenstern. *Theory of games and economic behavior*. Princeton university press, 1944.

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Thierry's problem

Thierry wants to choose a car!

Example recommendation

- Like speed? Pick *A*
- Like comfort? Pick *B*
- Don't take *C*: bad tradeoff

Good advice?

- Wrt DP
- Empirical question
- Uses psychology of Thierry or of humans (Consumers Report strategy)

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