Multi-user Privacy

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96% of the participants to a large-scale study reported a Multi-user Privacy Conflict (MPC):

• In 75% of the cases approach “all-or-nothing”.
• In 50% of the cases co-owners do not even complain.
• 70% of the conflicts was solved - general collaborative attitude.
• Sometimes there are no acceptable solutions.

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Related Work

Explainability is crucial for autonomous systems to foster the users’ trust

Numerous efforts to solve MPCs in the literature, but lack of explainability

- Fogues et al., (2017): A recommendation system identifies the solution by considering a set of arguments
- Kökciyan et al., (2017): Ontologies, semantic rules and persuasion dialogues
The agents $Ag$ act on behalf of their users, according to their preferences, in order to identify a compromise acceptable for everyone.
The preferred sharing policy is elicited for each user $k \in Ag$ and compared with each candidate solution in $SP$. Each $sp \in SP$ can generate for each user a gain or a loss in utility:

$$utility: u_{k,sp}$$
According to the Schwartz Theory of Basic Values, we define the user’s morality according to 4 value-directions. We interpret the value-direction in the MPC context and we evaluate whether the values of the user $k \in Ag$ are promoted by selecting each candidate solution:

\[
\text{value promotion: } \nu_{k,sp}
\]
The Agent Architecture

Each agent $k \in Ag$ computes for each candidate solution $sp \in SP$ the individual score that represents the user’s appreciation of the solution in terms of utility and value promotion. The individual scores are aggregated into the collective score for each $sp \in SP$:

$$s_{k,sp} = u_{k,sp} \cdot v_{k,sp}$$

$$s_{sp} = \sum_{k \in Ag} s_{k,sp}$$
 Explainable Agents

Cognitive Process

\[
\{ \text{offer} \quad \text{accept/reject} \quad \text{accept/reject} \} = \text{joint action}
\]

Value-based arguments and critical questions supporting/challenging each individual action

Practical reasoning techniques and computational argumentation

\[\text{AS-U: Given the current conflict, I should offer the sharing policy } sp, \text{ that will be accepted by the co-owners and therefore will solve the conflict, that will provide the score } s_{sp} \text{ and that will promote my values } V.\]
Explainable Agents

Cognitive Process

1. Problem Formulation

Atkinson and Bench-Capon, 2007
1. Problem Formulation

2. Epistemic assumptions:
   - All the agents have the same knowledge of the system (only the order over values are private).
   - The co-owners are believed to accept when the offer matches the individual and/or overall maximum score.
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3. Choice of Action

   AS-U and AS-C, and their critical questions, allow the creation of an argumentation framework, that provides the justification for action.
Explainable Agents
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Explainable Agents
Social Process

Tailored explanations
Contrastive explanation
Explaining conflicts

Miller, 2018
Given the disagreement with Bob and Charlie about how to share your picture, to offer $s_p'$ is your most convenient action, because it would allow you to compromise with your friends (remember that openness-to-change is your most preferred value).

Why shouldn’t I offer $s_p_A$ instead?

Because you could get a better score than the one guaranteed by $s_p_A$ (obj13.1), openness-to-change would be demoted (obj13.5), and because Bob and Charlie would most likely reject your offer (obj13.7 and obj13.8).
Given the disagreement with Bob and Charlie about how to share your picture, to offer $sp'$ is your most convenient action, because it would allow you to compromise with your friends (remember that openness-to-change is your most preferred value).

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Why shouldn’t I offer $s_p A$ instead?

Because you could get a better score than the one guaranteed by $s_p A (obj13.1)$, openness-to-change would be demoted (obj13.5), and because Bob and Charlie would most likely reject your offer (obj13.7 and obj13.8).
Given the disagreement with Bob and Charlie about how to share your picture, to offer $sp'$ is your most convenient action, because it would allow you to compromise with your friends (remember that openness-to-change is your most preferred value).

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Discussion

- Explainability crucial for autonomous systems
- Explainability given by cognitive and social processes
- EXPRI’s cognitive process guaranteed by performing practical reasoning
- EXPRI’s social process to be further studied
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Thank you for your attention! Please contact me for any questions: francesca.mosca@kcl.ac.uk