‘Why didn’t you allocate this task to them?’ Negotiation-Aware Task Allocation and Contrastive Explanation Generation

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Motivation

Task Allocation is essential for smooth functioning of human-human teams, **For Example**

- ◊ Teachers → Classes
- ◊ Employee (nurses) → Tasks (wards/shifts)

Distributed settings for task allocation (negotiation)

- ◊ The agent gets to participate in determining the allocation; can help avoid complaints
- ◊ Agents should have full knowledge about their teammates
- ◊ The process is time consuming

Centralized settings for task allocation

- ◊ Efficient
- ◊ May result in discontented agents

Our work blends aspects of centralized and distributed allocation → AITA

- ◊ Centralized allocation algorithm inspired using a distributed negotiation protocol.
- ◊ Can easily generate contrastive explanations for unhappy agents.

Negotiation-Aware Explicable Allocation

Upon negotiation, all agents are willing to accept it

The negotiation process to find negotiation-aware allocation

- ◊ Sequential bargaining game
- ◊ An agent offers an allocation in round-robin fashion
- ◊ Subgame-perfect equilibrium (SPE) is the solution

AITA with the simulated negotiation can come up with negotiation-aware explicable allocation

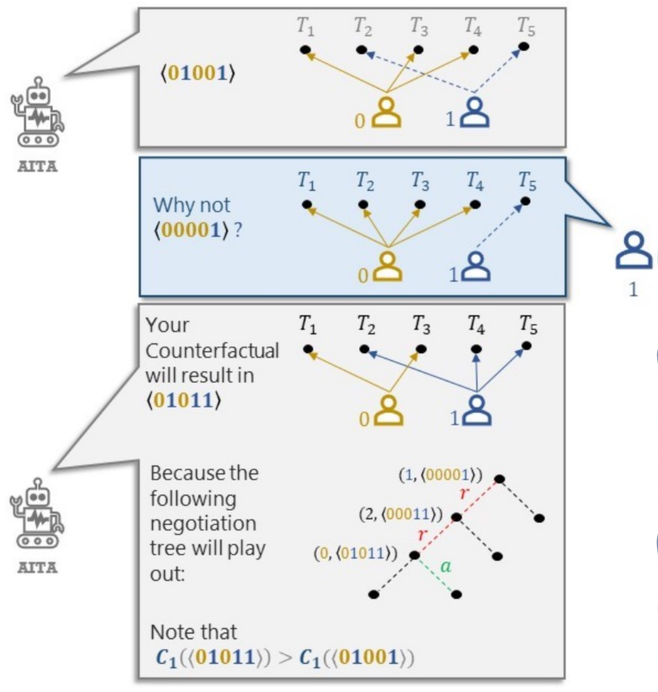
Contrastive Explanation

An allocation may appear unreasonable because humans

- ◊ have limited computational capability
- ◊ are unaware of teammates’ costs and team’s performance

Human gives counterfactual allocation.

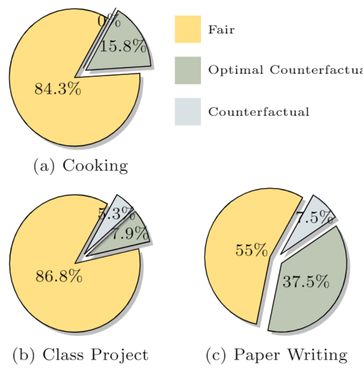
- ◊ Upon receiving a counterfactual allocation, AITA replays the negotiation protocol used to find initial solution but starting with the proposed counterfactual.
- ◊ Authors prove that it results in a final allocation that is either worse than or equal to AITA's initial offer



Results

Human Subject Studies

- ◊ Humans perceived AITA's allocation to be fair.
- ◊ Humans found AITA's explanation to be understandable and convincing.

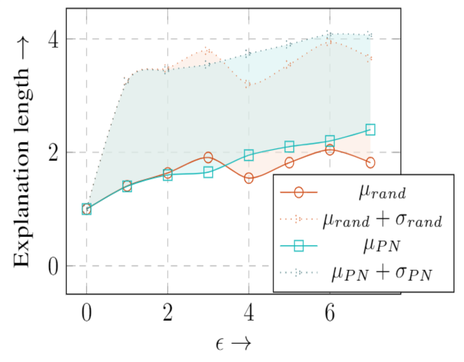


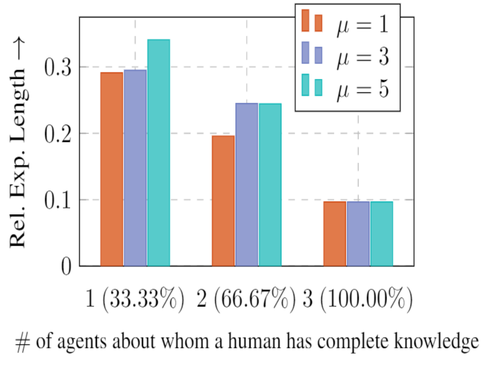
(a) Cooking (b) Class Project (c) Paper Writing

Domain	Explanation	Understandable $(1-5)$	Convincing $(1-5)$
Cooking	Vacuous	4.5	2.33
	Verbose	4.3	4
	Neg-tree	4.5	4
Class Project	Vacuous	4.4	2.8
	Verbose	4.2	3.4
	Neg-tree	3.8	4.4

Impact of Noise on Explanations

- ◊ Average explanation length reduces when humans under-estimate teammates’ capabilities.
- ◊ Average explanation length reduces as a human's knowledge about their teammates increases.





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