Participatory Algorithmic Management: Elicitation Methods for Worker Well-Being Models

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Background

Increasingly more workplaces are managed by algorithms that handle scheduling, task assignment, and matching functions. Algorithms promise efficient streamlined results, but emerging evidence suggests that algorithmic management often undermines worker well-being. Numerous reports show that warehouse workers are under serious physical and psychological stress due to task assignment and tracking without appropriate break times; Uber and Lyft drivers feel automated evaluation is unfair and distrust the system's opaque payment calculations; shift workers suffer from unpredictable schedules that destabilize work-life balance and disrupt their ability to plan ahead. There is growing recognition that worker well-being must be considered when designing a workplace that integrates AI, and guidelines for achieving this goal have been proposed.

Research Goals

How can we computationally model worker well-being so that algorithmic management can be optimized for and assessed in terms of worker well-being?

Methods

To explore whether shift worker well-being models can be created for algorithmic management, we created a scheduling web-tool to elicit worker preferences. The elicitation methods we used were 1) ranking-based elicitation and 2) pairwise comparison-based elicitation [Figs. 1& 2]. See Table 1 for the features used.

We conducted 25 semi-structured interviews with workers as they interacted with the web-tool to understand:

- How well preferences can be elicited into personalized well-being models
- Whether any patterns emerged from model creations
- How the elicitation and participatory model creation process impacted workers

We also interviewed three shift worker managers to gain insight into how they would incorporate worker well-being models in scheduling.

Figure 1. Ranking-based elicitation for task preference model. 1) The worker selects relevant tasks. 2) The worker provides inputs on their evaluations for each task. 3) The worker ranks the tasks according to their preferences.

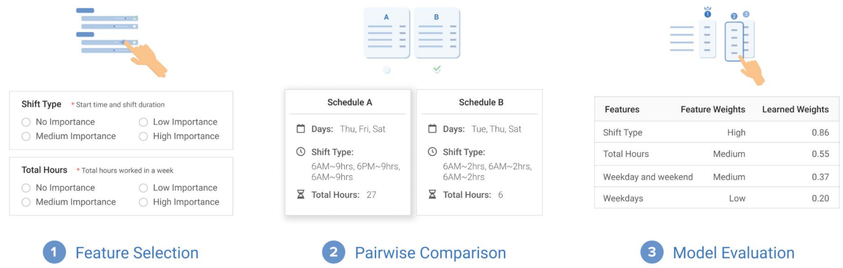

Figure 2. Feature weight- & pairwise comparison-based elicitation for schedule preference and managerial fairness models. 1) The worker chooses a set of relevant features. 2) The worker expresses preferences by choosing preferred options from a series of pairs of alternatives. 3) The worker evaluates the model learned from the pairwise comparison responses.

	Preference Feature	Explanation
Schedule Preferences	Shift Type	Workers' preferred combination of day, shift start time, and shift duration.
	Total Hours	The total hours assigned in a week.
	Weekdays	Shifts assigned only on weekdays.
	Weekdays & Weekends	Shifts assigned on both weekdays and weekends.
	Same Number of Days	Shifts assigned on the same days over weeks.
	Same Days	Shifts assigned for the same number of days over weeks.
Managerial Fairness Preferences	Reliability	Worker who is very reliable. They show up on time to their shifts and they rarely cancel.
	Performance	High performing worker, i.e., is productive, completes tasks effectively, assists coworkers.
	Fewer Hours	Received fewer hours than requested.
	Limited Availability	Worker who received fewer hours due to external circumstances (healthcare, childcare, etc.).
	Fewer Preferred Shifts	Received fewer preferred shifts.
	Volunteering	Worker who volunteered last month for shifts considered undesirable by their coworkers.
	Seniority	Worker who has high seniority (years at the company).

Table 1. Shift worker well-being model features: Schedule preference features capture characteristics of shift work and working conditions that influence workers' physical, psychological, and financial well-being. Managerial fairness features capture factors that could be used to determine which workers should get assigned work/shift.

Findings

Shift worker interviews revealed:

- A diverse range of preferences for tasks, supporting the potential for personalized task assignment to maximize worker preferences and wellbeing
- Pairwise comparisons allowed workers to discover preferences
- Participation enabled worker empowerment feelings as some participants explained their workplaces did not consistently track or use their preferences
- Some workers expressed a preference for human involvement in scheduling decisions

Shift worker manager interviews revealed:

- They envision this tool aiding them in improving worker satisfaction in schedules by using it to meet worker preferences
- Managers have differing interpretations of what represents fair scheduling

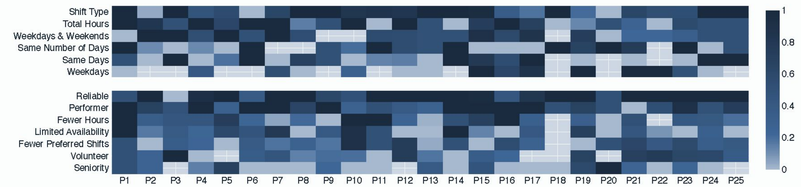

Figure 3. Schedule preference and managerial fairness models. (Top) Schedule preferences for each participant. (Bottom) Managerial fairness preferences for each participant. For both schedule preference model and managerial fairness model visualizations, we denote preferences not selected by participants with a default background color.

Conclusion

Our worker well-being models and elicitation methods suggest the promise of centering workers in algorithmic management.

Future Work:

- We take care to recognize that design decisions of well-being models must take into consideration diverse organizational cultures and norms of workplaces to preserve worker and manager communication.
- This research may be applied to domains such as gig work where there are no human managers.
- Another direction of work is expanding research on perspectives of AI fairness with regards to temporality or repeated allocation decisions.

We hope this work will inspire further research that incorporates workers' voices and participation in AI integrated workplaces.