

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 shift workers are under serious physical and psychological stress due to task assignment and tracking without appropriate break times.
- 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.
- Our work proposes guidelines for achieving this goal.

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

We created a scheduling web-tool to elicit worker preferences to explore whether shift worker well-being models can be created for algorithmic management.

The elicitation methods we used were [1] ranking-based elicitation (Fig. 1), and [2] pairwise comparison-based elicitation (Fig. 2). See Table 1 for the features used.

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

- How well can preferences be elicited into personalized well-being models?
- Do any patterns emerge from model creation?
- How does the elicitation and participatory model creation process impact workers?

We also interviewed three shift work managers to understand how they would incorporate worker well-being models in shift scheduling.

Task 1: Backroom Stocking

☐ Applicable ☒ Not Applicable

Task 2: Cashier

☒ Applicable ☐ Not Applicable

☐ Applicable ☐ Not Applicable

Task 1: Backroom Stocking

Disagree Neutral Agree

1. This work is interesting to me ☐ ☐ ☐

2. This work is useful to society ☐ ☐ ☐

3. This work is not a physical risk to my health ☐ ☐ ☐

4. This work is not stressful ☐ ☐ ☐

Task 1: Rounding on existing patients

Task 2: Admittinn patients

Task 3: Consults

Task 4: Following up on labs

1 Task Selection

2 Task Evaluation

3 Task Ranking

Fig. 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.

Shift Type * Start time and shift duration

☐ No Importance ☐ Low Importance ☐ Medium Importance ☐ High Importance

Total Hours * Total hours worked in a week

☐ No Importance ☐ Low Importance ☐ Medium Importance ☐ High Importance

Schedule A

Schedule B

1 Feature Selection

2 Pairwise Comparison

3 Model Evaluation

Features	Feature Weights	Learned Weights
Shift Type	High	0.86
Total Hours	Medium	0.55
Weekday and weekend	Medium	0.37
Weekdays	Low	0.20

Fig. 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	Preferred Shift Type	The 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 Same Days	Shifts assigned for the same number of days over weeks. Shifts assigned on the same days over weeks.
Managerial Fairness Preferences	Reliability	Worker who is very reliable, i.e., shows up on time to shifts, rarely cancels.
	Performance	Worker who is high-performing, i.e., is productive, completes tasks effectively, assists coworkers.
	Fewer Hours	Worker who received fewer hours than requested.
	Limited Availability	Worker who received fewer hours due to external circumstances (healthcare, childcare, etc.).
	Fewer Preferred Shifts	Worker who received fewer preferred shifts.
	Volunteering	Worker who volunteered last month for shifts considered undesirable by other workers.
	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 shifts assigned.

Findings

Shift worker interviews revealed:

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

Shift work manager interviews revealed:

- Managers 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.

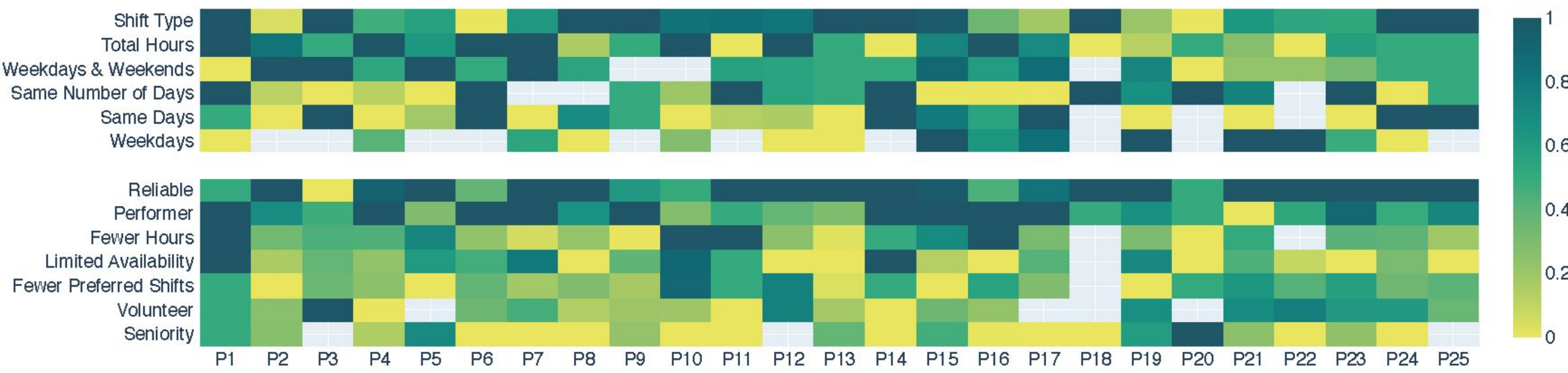


Fig. 3 Schedule preference and managerial fairness models. (Top) Schedule preferences for each participant. (Bottom) Managerial fairness preferences for each participant. For both schedule preference model and managerial fairness model visualizations, we denote preferences not selected by participants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

Conclusion

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

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.