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# A classification of ethical issues in personnel scheduling

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## 1 Introduction

The development of algorithmic applications in many areas raises more and more ethical concerns about their short and long-term consequences, whether they are about transparency, justice, security or many others. In order to identify and answer them, many reports like [3] established guidelines in order to assist either developers or lawmakers designing and regulating AI systems. These reports aim to be as generic as possible so that they can be relevant for as much automated decision-making systems as possible. Due to this however, the task of linking these abstract principles to actual situations and concrete methods to solve them can be difficult.

If AI ethics tends to be focused on machine learning applications, many applications may raise ethical concerns in the field of Operations Research too. It is known for a while, but recent studies show a new scale. For example, in France, Parcoursup's assignment algorithm impacts hundred of thousands of students' course each year, raising questions about the criteria that are used and their legitimacy [1]. Another example we can consider deals with navigational tools, that have a great impact on traffic and could cause dangerous effects depending on the circumstances [2]. Similarly to these examples, there are many OR applications that already have a great impact on society, and for which ethical questions need to be asked. In fact, the issues that may come with OR algorithms are also diverse and depend from the different types of problems. In order to design proper ways to tackle these issues, a first step is then to identify them into the context of use. In that presentation, we would like to focus on personnel scheduling problems, and most especially analyze the ethical issues related to employees' conditions that these problems can involve, in order to draw some research avenues.

## 2 Personnel scheduling and ethical issues

Algorithm management has been used extensively with personnel scheduling [4], and its consequences on employees' conditions (behaviours, emotions, working conditions, etc.) are numerous. It can be complicated to distinguish the borders of the different problems personnel scheduling encompasses, and creating a classification for these problems could help us identify relevant solutions more easily. By doing this, we could also determine whether an issue is related to a technical limit, such as the difficulty to ensure model fairness for example, or related to a conflict between multiple criteria or expectations (workload, work-life balance, etc.). In the context of the latter, it probably has to be settled through a discussion with the involved organization, or for the most important and dangerous issues, with society as a whole. In order to create a classification of the different issues that takes into account these points, we present multiple dimensions that could help sort out identified issues.

We first want to regroup issues that are strongly linked with each other, in order to obtain a few groups of related problems. Inside each of these classes, we can identify multiple axes. First of all, we can separate issues depending on the time horizon of their consequences. Short-term consequences might be more visible and easily measurable, while long-term consequences might require more attention to identify them and their number of possible causes might amply increase. For instance, dealing with short-term and long-term health issues does not require the same attention and causes can come from different aspects of the work activity, in addition to particular schedules. Then, we can also separate issues that have a direct impact at the individual level (fatigue, autonomy, mental workload...) from those who have an impact on a group (unfairness, understaffing...) and those who might have a larger impact (low quality of service, job attractiveness...). Some issues that impact a certain level could also have an indirect impact on other levels (e.g. in a hospital, employee fatigue might have an impact on patient satisfaction). Finally, there are many different agents that can be impacted by schedules who have different activities and needs, each of them will only be affected by a subset of all the identified issues.

Using such different axes, multiple classifications may be inferred, and some of them may be more relevant than others depending on the group we try to classify. These classifications will then help us associate issues to relevant solutions in the literature, if they exist. Our classification will be presented during the conference.

### 3 Perspectives

Designing and choosing technical solutions in accordance to abstract ethical principles might be difficult. Instead of using a global and generic approach, we proposed a classification for the particular subject of working conditions under algorithmic personnel scheduling. The goal of this approach is to create a taxonomy that will help us identify key ethical issues in personnel scheduling problems, that we will then integrate into our project. This project consists of creating a tool that gives the decision-maker more agency in designing the schedule, with an emphasis on integrating their ethical views more easily. Then, with a cognitive psychology perspective, we can analyze the interactions between the decision-maker and the system in order to show the benefits and limits of our contribution. For this work, our classification may also help us clarify the specific points we want to experiment on, and help making links between OR and cognitive psychology fields.

In a more general scope, this approach applied for other specific problems could help us link in an easier manner ethical principles to their final implementation. The discussions between OR specialists and non-specialists about ethical topics can also be facilitated. For instance, in complex problems that may induce collective issues and tensions or just rely on a lot of social interactions, working in collaboration with sociologists could be useful in order to have a better understanding of specific situations.

### References

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