SMARTSHIFT: A Scheduling Optimization System for Nursing Staff in Healthcare

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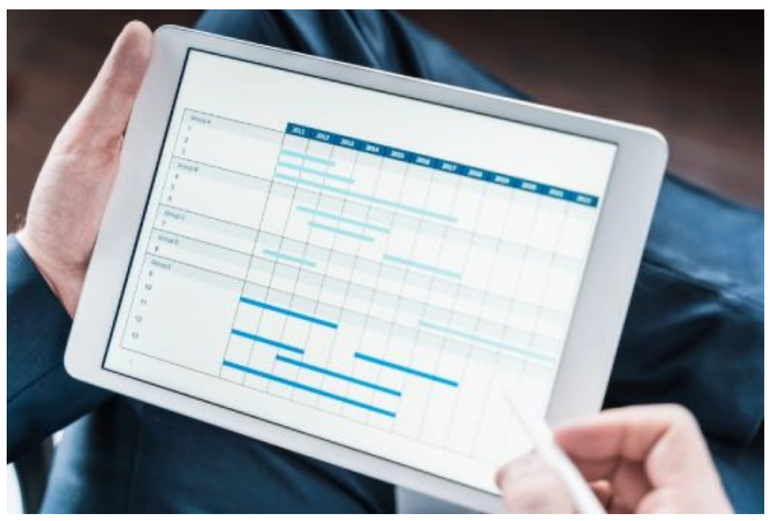
Problem & Motivation

Nursing staff scheduling is a complex and time-consuming process that must balance multiple requirements simultaneously.

Schedules need to account for staffing needs, working-time regulations, staff availability, individual preferences, skills, and fair workload distribution.

In many healthcare settings, scheduling still relies heavily on spreadsheets, manual adjustments, and informal communication, making unexpected changes particularly difficult to manage.

- **Staffing and coverage requirements**
- **Working-time and rest regulations**
- **Staff availability and preferences**
- **Fair distribution of demanding shifts**
- **Last-minute changes and unexpected absences**



Requirements & Methodology

1. Requirements Analysis

A requirements-analysis questionnaire was developed and distributed to healthcare professionals involved in staff scheduling. The study focused on:

- current scheduling practices and workflows
- operational difficulties and recurring problems
- staff availability and preferences
- rules and constraints used when creating schedules
- management of last-minute changes and unexpected absences

2. Methodology

The scheduling model distinguishes between hard constraints, which must always be satisfied, and soft constraints, which are optimized whenever possible.

Hard Constraints

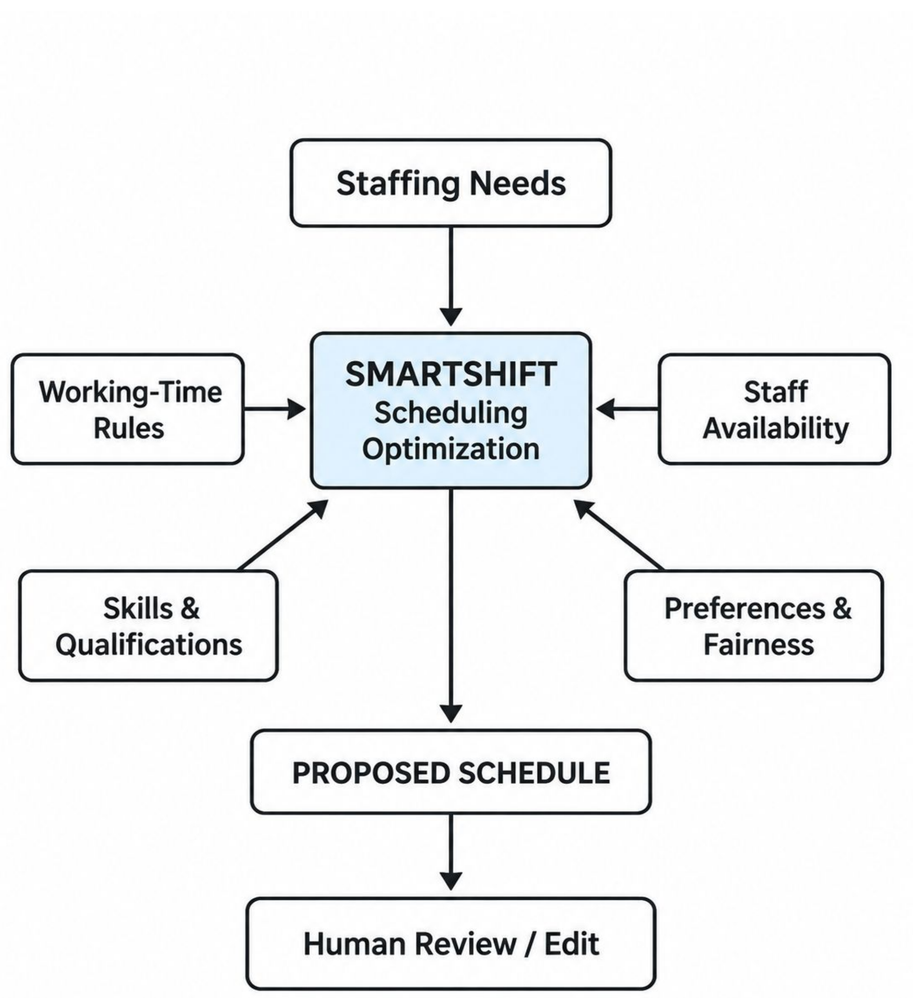
- Minimum staffing levels
- Mandatory rest periods
- Working-time limits
- Required skills and qualifications

Soft Constraints

- Staff preferences
- Balanced distribution of undesirable shifts
- Avoidance of demanding shift sequences
- Fair workload allocation

SmartShift System

SmartShift is designed as a configurable decision-support system for nursing staff scheduling. It combines scheduling rules, staff-related data, and optimization techniques to generate a proposed schedule that can be reviewed and modified by the responsible user.



System Components

Web Application

Desktop Application

Virtual Assistant

Conclusions & Next Steps

Conclusions

- SmartShift supports the creation and management of nursing shift schedules by combining operational constraints with staff preferences.
- The system maintains human control, allowing the scheduling manager to review and modify the generated schedule.
- Availability, leave, preferences, schedule creation and subsequent changes are managed within a common environment.

Next Steps

- Complete the implementation of the SmartShift platform.
- Pilot and evaluate the system with intended users in real-world operating conditions.
- Refine the system based on user feedback and evaluation results.

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