Using Integer Programming to Build Block Schedules for Medical Residents
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Problem Statement
The University of Michigan Medical School (UMMS) offers postgraduate medical training programs across many disciplines
Ensuring adequate resident education and proper service coverage requires many training programs to integrate schedules
Coordinating the long-term block schedule – assigning every trainee to services over the year – is a complex challenge
Traditionally, program leadership (chief residents and program directors) constructs the block schedule by hand
The construction process is resource-intensive yet often fails to satisfy the individual & collective needs of stakeholders

Importance of Schedule Quality
Schedule quality impacts

- Clinical/administrative workflow
- Patient access, quality, safety, satisfaction
- Training quality and burnout

Research Objective
Develop a decision support system to enable fast construction of high-quality block schedules while improving measures of quality

Solution Approach
1. Formulate
   One model, generalized to satisfy all 3 programs’ needs

2. Encode
   Written in C++ using CPLEX 12.4, implemented in Visual Studio 2012

3. Load
   Inputs provided in a collection of .txt, .csv, and .xls files

4. Solve
   Software solves to optimality under input conditions

5. Review
   Schedule and metric reports generated for presentation to administrators

Impact/Results
Facilitated concurrent scheduling of all 3 programs for first time
Enabled program leadership to more precisely specify scheduling needs compared to manual construction
Provided improved satisfaction (relative to prior years) regarding:
- vacation requests
- elective/research offerings
- fellowship interview and graduation conflicts
- schedule fairness
- pacing and challenging rotation sequences

Ongoing Work
Evaluating alternative formulations for impact on solve time
Implementing additional metrics based on leadership feedback
Streamlining administrative and schedule revision processes

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