CENTER FOR HEALTHCARE ENGINEERING & PATIENT SAFETY
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Dermatology Residency Shift Scheduling Tool

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Problem Statement

Dermatology residents must be assigned to daily half-day activities (specific clinics, administrative time, etc.), subject to various rules, guidelines, and metrics.

Specifically, the goal is to determine which activity to assign each resident on each work day in the morning and in the afternoon over the course of a month.

24 Residents

28 Activities

28-31 Dates

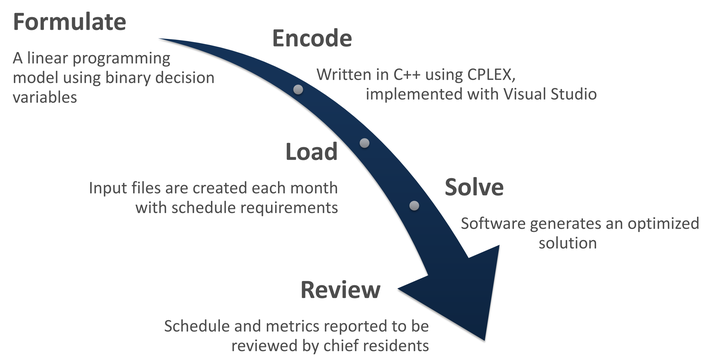
Challenge
Constructing a feasible, high-quality schedule is difficult and requires many hours for a human to do.

Feasible Schedule
A valid schedule that meets all of the hard requirements presented by the Dermatology chief residents.

Optimal Schedule
A schedule requiring a minimal number of undesirable features, such as mid-day travel, lost admin time, and deviations from preferred assignments.

Research Goal
Build a computerized tool that rapidly generates high-quality schedules.

Solution Approach



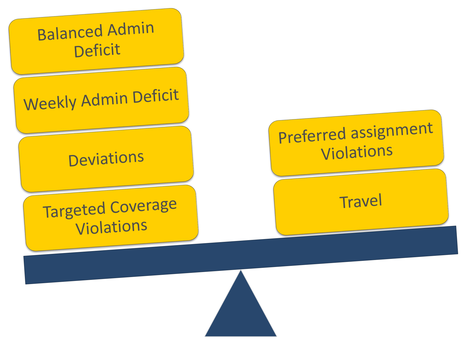
Decisions
Do we assign resident *r* to activity *a* on date *d* in the morning, in the afternoon?

Rules
Various rules must be met in order to produce a feasible schedule (e.g., each resident must be assigned to an activity every weekday morning and afternoon, and each clinic has adequate coverage).

Basic Assignment: $$\sum_{a \in A} x_{rad} = w_d \qquad \forall\, r \in R, d \in D$$

Coverage: $$lb^P_{adc} \leq \sum_{r \in R_c} y_{rad} \leq lb^P_{adc} \qquad \forall\, a \in A, d \in D, c \in C$$

Metrics
We incorporate measures of quality to differentiate feasible schedules. These metrics should be optimized, but optimizing one metric may result in other metrics being suboptimal. We work with the chief residents to determine an acceptable balance.



Impact/Results

In a matter of seconds, the computer model produces a schedule of **higher quality** than a human could produce over many hours or even days.

This tool frees the chief residents to focus on more important tasks related to **caring for patients**.

Making updates to an initial schedule takes the computer only seconds, meaning changes are relatively easy to implement.

Sample Output

Name	Time		2-Oct	3-Oct	4-Oct	5-Oct	6-Oct
			Mon	Tue	Wed	Thu	Fri
Resident 1	AM		PEDS	PEDS	Holiday	PEDS-Call	PEDS-Call
PEDS1/PEDS1	PM		PEDS	PEDS	Holiday	Surgery	TC
Resident 2	AM		DF	TC	Holiday	Admin-Thu	DF-CC
Clinic/Clinic	PM		Admin-Gen	TC	Holiday	TC	Admin-Gen
Resident 3	AM		DF	Admin-Gen	Holiday	Admin-Thu	DF
DOM3/DOM3	PM		DF	DF	Holiday	DF	DF
Resident 4	AM		TC	DF	Holiday	Admin-Thu	TC
VAFoot/VAFoot	PM		VA-Foot	DF	Holiday	Admin-Gen	TC
Resident 5	AM		TC	TC	Holiday	Admin-Thu	TC
Clinic/Clinic	PM		TC	Admin-Gen	Holiday	TC	TC

Ongoing Work

Implement functionality to modify existing schedules with new requirements, applying minimal changes.

Implement new infrastructure to more efficiently handle resident pre-assignments and clinic coverage requirements.

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