

Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

SESSION 1Q

TOMORROW'S TECHNOLOGICAL SOLUTIONS AND APPROACHES FOR TODAY'S PROBLEMS

Session Moderator: Marc Dupuis, Computing and Software Systems
389 MGH

1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Analyzing Clinical Laboratories using Object-Oriented Hierarchies and Discrete-Event Simulation

Hao Wang, Senior, Industrial Engineering

Mentor: Joseph Heim, Industrial & Systems Engineering

Mentor: Zelda Zabinsky, Industrial & Systems Engineering

The process flow in clinical laboratories resembles that in a traditional manufacturing setting, but there are distinct differences between the former and the latter which make it difficult to directly reflect the essential functions of a clinical laboratory in a simulation model. Creating a simulation model enables us to analyze and determine the impact on key metrics such as turnaround time and utilization rates when we change the physical configuration of the laboratory and vary the input parameters of the model. We have adapted the object-oriented nature of SIMIO, a program commonly used in a manufacturing setting, to create a discrete-event simulation modeling language for clinical laboratories reflecting the technical knowledge of experts from the clinical laboratory domain. We organized critical aspects of the clinical laboratory into class hierarchies to clearly delineate their functions and relationships. We then developed specific modules using the class hierarchies to represent the unique behavior of instruments, equipment and processes in a clinical laboratory. Using these modules, we created a simulation model of the clinical laboratory. The domain-specific modules we have formulated provide clinical laboratory experts with a customized tool to understand and improve their own system from a modeling perspective.

SESSION 1Q

TOMORROW'S TECHNOLOGICAL SOLUTIONS AND APPROACHES FOR TODAY'S PROBLEMS

Session Moderator: Marc Dupuis, Computing and Software Systems
389 MGH

1:15 PM to 2:45 PM

* Note: Titles in order of presentation.

Concurrent Construction of Patient Panels and Care Provider Teams

Tatiana Alexandra (Tatiana) Epstein, Senior, Industrial Engineering

Mary Gates Scholar

Mentor: Zelda Zabinsky, Industrial & Systems Engineering

Mentor: Joseph Heim, Industrial & Systems Engineering

Patient centered health care requires that individuals be linked to a team of care providers responsible for guiding them through the full range of health and preventive services. This research addresses the considerations and lays the foundation for understanding how to incorporate patient characteristics when creating patient panels to match the needs of patients and the skill sets of their health care providers. We illustrate how a strategic plan can be developed with varying combinations of care provider team composition. This strategic plan enables clinics to hire staff with the appropriate skill set to meet patient demand for health care. By examining a representative data set, patients will be pooled according to a minimal set of attributes, such as age, gender, and medical conditions, in order to model the mix of patient attributes within a panel. Using probabilistic distributions, an estimate of total workload for each care-giving panel is established. Different combinations of preferences and panel mix amongst the medical professionals are analyzed with respect to the objectives of meeting patient demand while matching patient preferences with physician capabilities and preferences.