ENGINEERING SYSTEMS AND DESIGN

NEWSLETTER

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Engineering Systems and Design, Singapore University of Technology and Design
Website: https://esd.sutd.edu.sg Email: esd@sutd.edu.sg

A New ESD Core Curriculum

We are excited to launch the new ESD core curriculum in September 2017 for all new students entering the ESD pillar! The new curriculum deepens your exposure to topics such as system structure, design, optimization, behaviour, and control. You can look forward to the following 5 new core courses, and each of these new courses will have a term-long project for you to apply what you've learned.

Data and Business Analytics (Term 4) – This course introduces the ESD pillar by focusing on using industrial or commercial data to identify an opportunity for system improvement and estimating the value of this improvement to the system owner.

Manufacturing and Service Operations (Term 5) – This course introduces concepts and techniques related to the design, planning, control, and improvement of both manufacturing and service systems.

Engineering Systems Architecture (Term 5) – This course prepares you to exercise leadership in engineering systems design by focusing on the top-level design of a system.

Network Structure & Control (Term 6) – This course provides an introduction to the modelling of network structures and the control of dynamical systems.

Simulation Modelling and Analysis (Term 6) – This course introduces you modelling complex dynamical systems using simulation methodologies, and using statistical techniques to analyse their output.

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Meet Your Term 4 Professors

Bikramjit Das

40.001 Probability

"Have you ever wondered about the chances of you scoring a goal, winning a lottery, or finding a mistake in your professor's notes? How about the chances of getting an Uber ride in the next three minutes, or why the normal distribution is so "normal"? We learn about the science of modeling uncertainty in this class."

40.002 Optimization

"After this class, you will learn how to formally find the best among many alternatives. You can apply this to simple daily matters such as choosing the best mode of transport from home to school or to professional operations such as finding the best schedule for public buses in Singapore."

Selin Ahipasaoglu

Peter Jackson

Ying Xu

40.011 Data and Business Analytics

"In this course, you will be given an industrial project at the beginning of the semester and tasked to answer some question of interest to the project client. We will rapidly equip you with tools in data manipulation, data visualization, and data analytics that will enable you to answer the question. You will also pick up tools, such as process analysis, that will be valuable in future projects and internships."

Interactive Whiteboards and the Systems Design Studio: A Vision for Design

By Peter L. Jackson, Head of Pillar, ESD

Over the past few months, students and visitors to ESD will have noticed some significant changes in facilities and equipment. We are working to increase the "Big D" design component of our undergraduate experience. We have created a space on the sixth floor of Building 1 called the Systems Design Studio where we play with ideas. It is a place for posing problems, conceiving solutions, and sketching out the consequences. It is a place for UROP teams, project teams, and design classes to meet and iterate through design processes. We encourage the use of physical media (sticky notes, white boards, flipcharts, cardboard, etc.) to express ideas. Feel free to post ideas on the fabric walls, but in a transient way. Some of these design techniques will be introduced as part of the new course in Engineering Systems Architecture.

Funded by the International Design Centre, we have purchased two large interactive whiteboards (IWB). They are currently housed in the ESD reception area and loaded with some interactive games for your educational enjoyment. But their real purpose is to support Systems Design Thinking. We are developing software to allow student teams to use the IWB to conceptualize system solutions and develop initial systems models (operational concept diagrams, activity diagrams, functional architectures, and so on).

Expect to see prototypes of this software in test on the IWB over the coming months. The IWB will be moved to the Systems Design Studio by January, 2018. We look forward to making the Systems Design Studio the "go-to" place for students with ideas to change the world.

ESD Students Playing the "Sands Game" on the IWB

Exciting Undergraduate Research Opportunities Programme (UROP) Projects in ESD

In ESD, you will have the opportunity to participate in exciting UROP projects that will give you a real-life research experience. Working together with ESD faculty, you will rigorously explore, investigate and validate hypothesis and glean useful insights. Through UROP, you will also get the chance to work on cutting edge research projects and participate in the different phases of standard research activity (i.e. developing research plans, writing proposals, conducting research, analysing data and presenting research results in oral and written form). Here are some of the on-going UROP projects that students are undertaking in ESD.

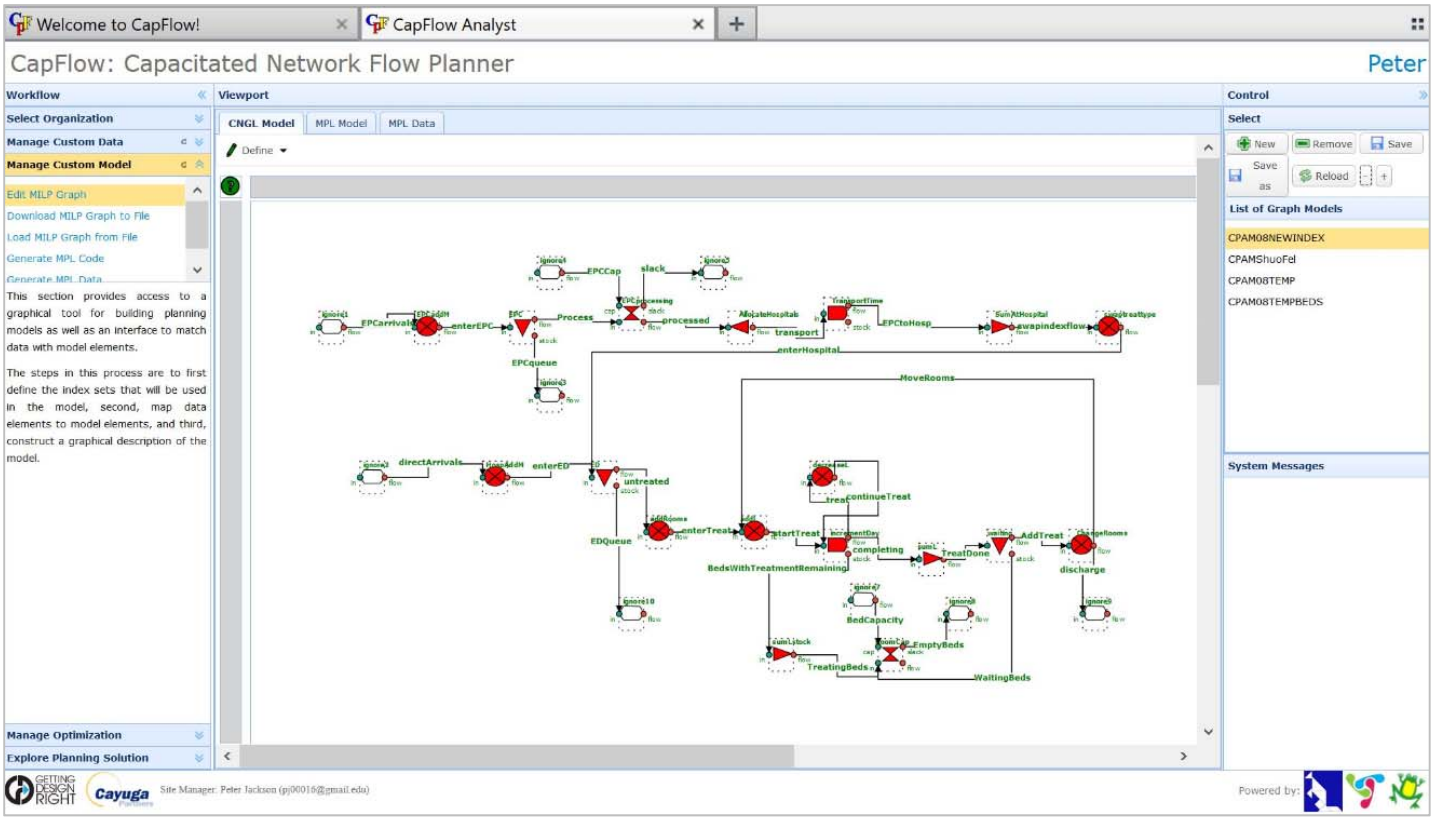
Mass Casualty Response Models Using Graphical Optimization Models (Peter Jackson) – Students are using an experimental graphical optimization modelling system to build a model of patient flows from a mass casualty event site, like a bombing, through the network of supporting hospitals for treatment. At issue is which hospital to send patients with the most severe injuries.

Construct a Physical Model of Traffic Flows (Peter Jackson) – Students are using a physics-based simulation model to model the flow of vehicular traffic in urban environments. In one model, they are demonstrating the phenomenon of a queue that persists after a temporary disruption and in another model, they are designing different ways to manage flow through a traffic intersection.

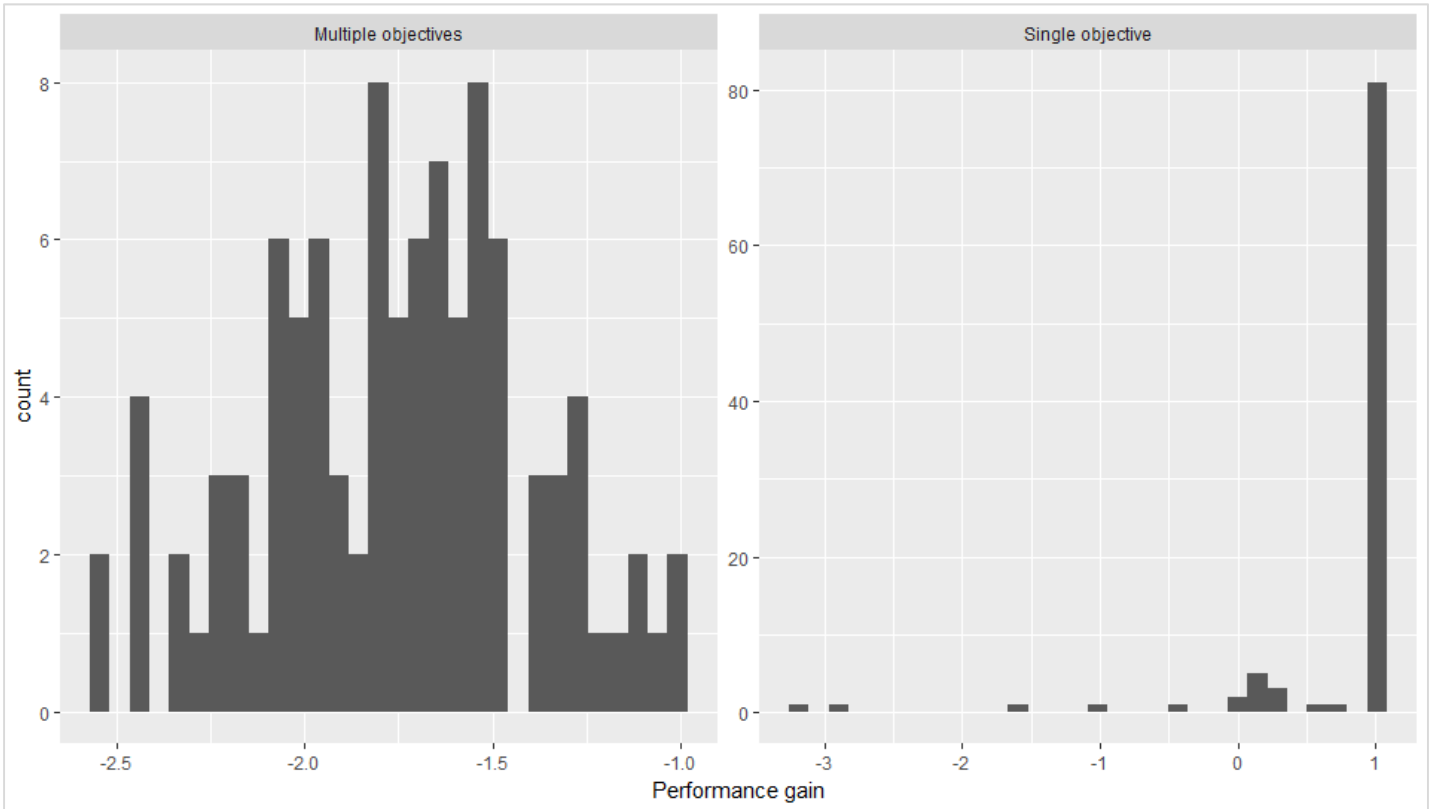
Quantifying the Impact of a Research Paper on its Impact (Karthik Natarajan) – In this project, the student will collect empirical data for one premier journal – Operations Research and try and quantify the impact of the length of a paper with its impact. The student will perform data collection from unstructured data such as webpages, and then study the relation between the length of a paper and other such predictor variables and its impact. This will involve carefully determining the length of the study, doing statistical analysis and developing models to capture the relation. The outcome of the project will be to help researchers in an area understand how best to have impact.

Improving Water Resources Management with Paleoclimatic Data – A Case Study in Northern Thailand (Stefano Galelli). The study is set in the Ping river basin, northern Thailand, which encompasses several large water reservoirs and one of the world's most productive rice growing areas. In this region, water must be effectively allocated to competing needs: irrigation, domestic use, hydropower production, and flood controls. Using available paleoclimatic data, the project aims to (1) understand whether current reservoir operating policies are challenged by extreme events that happened in the past, and (2) improve these policies, leveraging additional knowledge from past events.

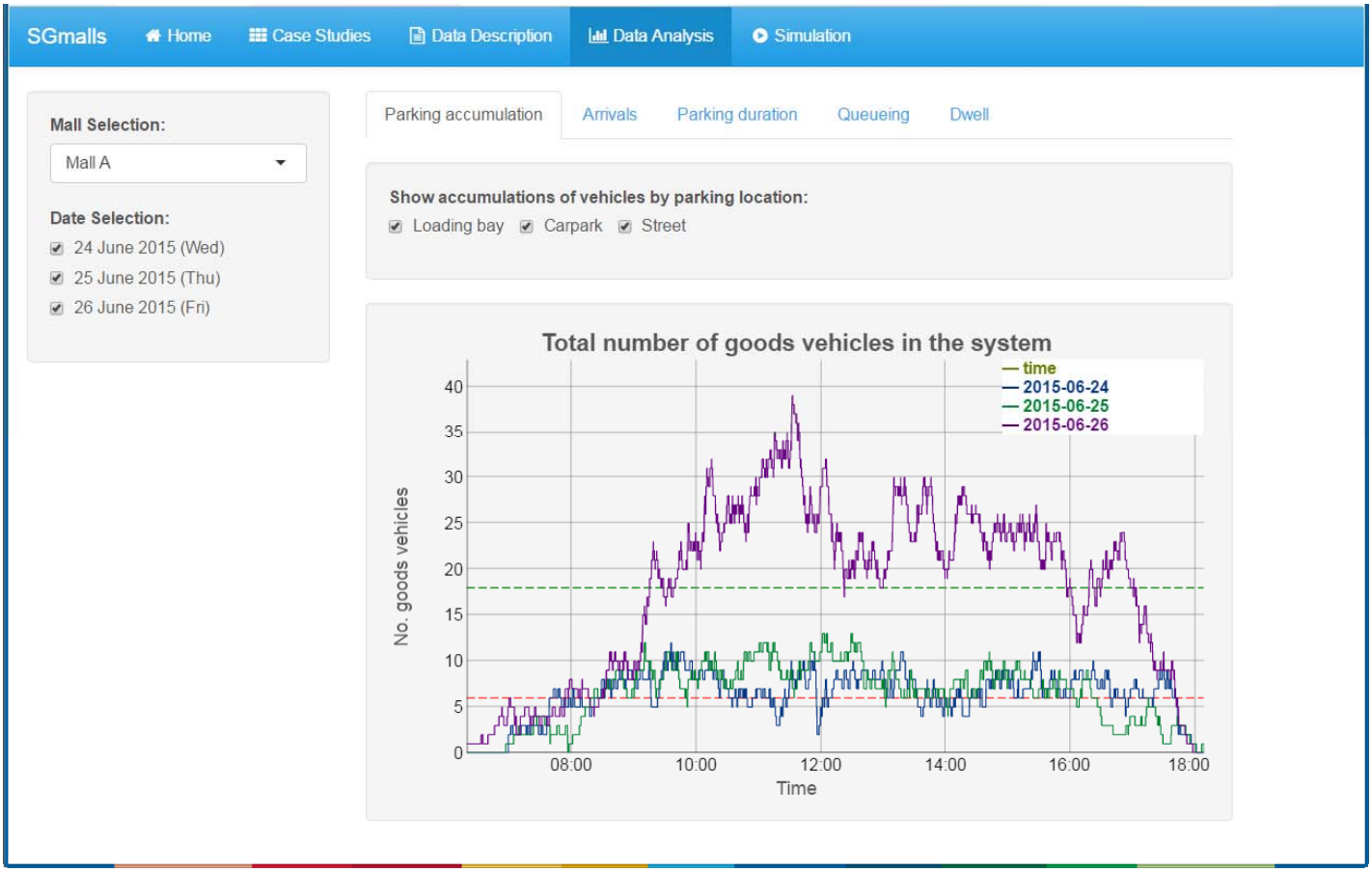
Urban Freight Transportation Data Analytics (Lynette Cheah) – Our daily consumption activities heavily depend on a complex urban network of delivery vehicles. The luxury of being able to find fresh meat, French cheeses and tasty durians within few meters from our homes comes at the cost of having a myriad of trucks moving goods from the production sites to our front door, congesting urban roads and parking lots as well as producing noise and air pollution. In our project, we take a data-centred approach to analyse the Singapore freight transport system. We then develop data-driven models to test solutions to reduce the number of vehicle trips needed.



Mass Casualty Response Using Graphical Optimisation Models- Students Model Patient Flows from a Mass Casualty Event



Improving Water Resources Management with Paleoclimatic Data – Performance Gain of Operating Policies Designed with Paleo Data



Urban Freight Transportation Data Analytics – Online Repository of Freight Data in Singapore

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