

Capacity Scan and Vulnerability Assessment of Alberta's Highway Network

PROJECT DESCRIPTION

This is an on-going research project on long-distance network modelling and vulnerability analysis. Specifically, we will focus on five tasks. First, we will build out our network model of the northeastern quadrant of Alberta to include the entire province. Second, we will develop an expanded set of network measures focusing on (1) network topology, (2) network transportation characteristics, (3) community vulnerability and connectivity, and (4) novel and informative combinations of (1)-(3). These measures should be calculated quickly and applied to any model representation of the provincial network. Third, we will adapt the disruption representation and capacity scan method for urban areas. Fourth, we will identify potential applications of the capacity scanning method (such as 511.org). This will include development of an algorithm to perform disruption representation and capacity scanning adequate for real-time emergency management applications. Fifth, based on the results of the network measures and result of capacity scanning, we will apply facility location optimization techniques to the problem of where emergency resources are best located given transportation facility topologies and population centre locations. This last task may involve understanding where air transportation facilities such as airstrips) are located, which may be integrated for extended transportation capacity in emergency scenarios.

The student will be required to assist graduate students on a project team. They will be asked to provide all types of research support, from literature review, network mathematical model development and coding (typically in Matlab, GIS, and CPLEX), and running (and assessing and presenting) model results using a variety of software and platforms. Much coding work will be required to implement mathematical models and explore numerical results. They will also be expected to provide support in producing documents such as project reports, presentations, and journal and conference publications. It is a must that the student is able to work well in a team research environment, under the direct guidance of PhD and MSc students, and myself (supervisor). The student will attend research group meetings and other meetings pertaining to the project itself.

FACULTY-DEPARTMENT

Engineering - Civil & Environmental

OPEN TO STUDENTS FROM THE FOLLOWING INSTITUTIONS

Chinese universities participating in the [*Double First-Class Initiative*](#).

DESIRED FIELD OF STUDENT STUDY

Quantitative: engineering (all), applied mathematics, geography

INTERNSHIP LOCATION

Edmonton Campus

NUMBER OF INTERNSHIP POSITIONS

1

INTERNSHIP DATES

Start: June/July, 2019

End: September, 2019

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.