

An Indian-Australian research partnership

<b>Project Title:</b>	Adaptive Network Traffic Signal Control Systems using machine learning	
<b>Project Number</b>	IMURA1000	
<b>Monash Main Supervisor</b> (Name, Email Id, Phone)	Nan Zheng nan.zheng@monash.edu	Full name, Email
<b>Monash Co-supervisor(s)</b> (Name, Email Id, Phone)	nil	
<b>Monash Head of Dept/Centre</b> (Name,Email)	Jeff Walker	Full name, email
<b>Monash Department:</b>	Civil Engineering	
<b>Monash ADGR</b> (Name,Email)	A/Prof. Timothy Scott	Full name, email
<b>IITB Main Supervisor</b> (Name, Email Id, Phone)	Tom V. Mathew tvm@civil.iitb.ac.in	Full name, Email
<b>IITB Co-supervisor(s)</b> (Name, Email Id, Phone)	nil	Full name, Email
<b>IITB Head of Dept</b> (Name, Email, Phone)	Deepankar Choudhury	Full name, email
<b>IITB Department:</b>	Civil Engineering	

## Research Clusters:

## Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <b>one</b>. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	<b>Artificial Intelligence and Advanced Computational Modelling</b>
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Circular Economy
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Health Sciences
5	<b>Earth Sciences and Civil Engineering (Geo, Water, Climate)</b>	5	Smart Materials
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Sustainable Societies
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng		
8	HSS, Design, Management		

## The research problem

The proposed research explores how new data sources (e.g. travel time data from google) can be used for traffic signal design for network level traffic signal control systems. Research involves developing AI/machine learning tools to be used to address traffic stream consists of mixed vehicle type – what architecture, algorithms, etc. to be used. The research also addresses the design criteria to be used (delay, throughput, travel time, etc.) and the evaluation framework.

## Project aims

1. Data collection and analysis
2. Development of AI tools suitable for traffic control systems
3. Development of simulation frames work for evaluation of the traffic controls system
4. Case studies from India and Australia

## Expected outcomes

*Highlight the expected outcomes of the project*

Traffic Signal Control System using a model-free network-wide traffic signal optimization

## How will the project address the Goals of the above Themes?

*Describe how the project will address the goals of one or more of the 6 Themes listed above.*

This project is expected to identify AI/ML architecture and develop algorithms to be used in the area of traffic control systems and demonstrating its benefits in congestion management.

## Potential RPCs from IITB and Monash

*Provide names of the potential research progress committee members (RPCs) and describe why they are most suited for the proposed project*

Prof. Nagendra Velaga – expertise on driver behavioural studies

Prof. Avijith Majhi – expertise to optimization and signal control

Prof. Hai Vu, expert in traffic control;

Dr. Wynita Griggs, expert in traffic control.

## Capabilities and Degrees Required

*List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.*

1. M. Tech in Transportation Systems Engineering with good background on computer programming, optimization, and statistics. Knowledge of AI/ML is added advantage.
2. Students from Mechanical, Computer Science, or Electrical Engineering with control or algorithm background

## Necessary Courses

*Name three tentative courses relevant to the project that the student should complete during his/her coursework at IITB (the student will require to secure 8 point in these courses)*

Traffic Engineering  
Engineering Optimization  
Advanced Probability and Statistics

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Transportation and Traffic Engineering and Logistics  
Data Science, optimisation, algorithms  
Computer Simulation  
Modelling and Simulation