

An Indian-Australian research partnership

**Project Title:**

**Project Number**

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**IITB Department:**

## Research Academy Themes:

**Highlight which of the Academy's Theme(s) this project will address?**

(Feel free to nominate more than one. For more information, see [www.iitbmonash.org](http://www.iitbmonash.org))

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. **Biotechnology and Stem Cell Research**
7. Humanities and Social Sciences

**The research problem**

*Define the problem*

In this project, our aim is to develop early warning systems for infectious diseases in urban India. Our main focus will be on successful prediction of disease cases by incorporating environmental and epidemiological surveillance data, and other social ecological data in spatio-temporal models. These models will forecast the disease risks for the future years and also generate seasonal risk maps. We will also explore the development of a web-based geographical information system (GIS) for disease surveillance. Usually the distribution of disease counts does not follow a normal distribution. Techniques to deal with spatio temporal overdispersed non-normal data will be developed and model selection and validation methods for such models will be investigated. Methods based on Bayesian inference and Kalman filters will be studied in details.

## Project aims

*Define the aims of the project*

Spatio-temporal models for various infectious diseases that will be used to forecast future disease cases and create risk maps displaying historical records from separate areas in urban India to show the spatial distribution of disease cases.

## Expected outcomes

*Highlight the expected outcomes of the project*

- 1) Development of early warning systems for infectious diseases in urban India.
- 2) Develop a web-based GIS for disease surveillance that will integrate real-time epidemiological and climate data with the risk maps.

## 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 will address the theme Biotechnology. It will give a method to model and map infectious diseases in India.

## 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.*

Dual degrees/Integrated degrees (Bachelors and Masters)/Masters degree in Statistics, Biostatistics, Applied Mathematics, Computational Mathematics, Operation Research  
BTech/Mtech in Computer science engineering, electrical engineering, chemical engineering, Industrial Engineering

## Potential Collaborators

Please visit the IITB website [www.iitb.ac.in](http://www.iitb.ac.in) OR Monash Website [www.monash.edu](http://www.monash.edu) to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Please provide a few key words relating to this project to make it easier for the students to apply.

**Time Series, Spatial data, Bayesian Methods**