IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	**Characterizing morphology of fluvial landscapes**	
Project Number	**IMURA1137**	
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IITB Department:	Civil Dept	

Research Clusters:

Highlight which of the Academy's CLUSTERS this project will address?
*(Please nominate JUST **one.** For more information, see www.iitbmonash.org)*

1	*Material Science/Engineering (including Nano, Metallurgy)*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*
3	*Math, CFD, Modelling, Manufacturing*
4	*CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control*
5	***Earth Sciences and Civil Engineering (Geo, Water, Climate)***
6	*Bio, Stem Cells, Bio Chem, Pharma, Food*
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*
8	*HSS, Design, Management*

Research 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)

1	***Artificial Intelligence and Advanced Computational Modelling***
2	*Circular Economy*
3	*Clean Energy*
4	*Health Sciences*
5	*Smart Materials*
6	***Sustainable Societies***
7	*Infrastructure*

The research problem

Define the problem

Fluvial landscapes across the world exhibit considerable diversity in terms of biotic and abiotic activities. At the same time, they also display interesting patterns, e.g., channel networks typically assume a tree-like shape. The characteristics of fluvial landscapes are often effectively explained by their morphology. The study of landscape morphology, therefore, aids in comprehending their evolution and in developing better hydrological, ecological, and geo-hazard models. However, existing mathematical frameworks often inadequate in explaining landscape morphology. Consequently, answering crucial questions becomes challenging, such as: How does climate impact landscape morphology? Is predicting the future morphology of a landscape feasible?

Project aims

Define the aims of the project

The principal aims of the proposed research are:

i) To develop quantitative indicators for characterizing landscape morphology, with a specific focus on identifying the morphological imprints of past climatic regimes.

ii) To develop or identify suitable models for predicting future landscape characteristics.

What is expected of the student when at IITB and when at Monash?

Highlight how the project will gain from the students stay at IITB and at Monash

The when student at IITB is expected to conduct literature review, collect data, learn the landscape evolution models available with both supervisors, formulate his/her research statement, perform analysis, and write at least one manuscript. When at Monash, the student is expected to continue analysis and writing research papers.

Expected outcomes

Highlight the expected outcomes of the project

It is expected that the proposed project will lead to a landscape evolution model can explain the effect of climate change on landscape morphology.

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.

First, landscape evolution modelling poses significant mathematical and computational challenges. Second, understanding landscape evolution helps in predicting geo-hazards and ecological disasters, particularly, floods and landslides.

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

Dr. Bellie Sivakumar
Dr. Raaj Ramsankaran
Dr. Ailie Gallant
Dr. Tim Peterson

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.

The student should possess the following qualities:

1. Strong quantitative and analytical aptitude.
2. Proficient computer programming skills.
2. Passion for geography.

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)

1. Hydrogeomorphology
2. GIS in Civil Engineering
3. Digital Image Processing of Remotely Sensed Data

Potential Collaborators

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

1. Prof. Subashisa Dutta, IIT Guwahati, India
Enrico Bertuzzo, University of Venice Cà Foscari, Italy

K**eywords** relating to this project to make it easier for the students to apply.

Landscape evolution. Climate. Hydrology. Mathematical modelling.