

An Indian-Australian research partnership

Project Title:

Project Number



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Monash Head of Dept/Centre (Name,Email) *Full name, email*

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IITB Department:

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</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 www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

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The research problem

Define the problem

In the era of data, Digital twin is in the mind of every company. Being able to manage, control, understand, from a central point of view, a complex process such as the global supply chain, or the procurement strategy, in a close to real-time fashion is an absolute target for strategic planner.

To convert that view into a reality, the capacity to map real-time information (data, IoT, events) into a virtual representation of a complete process is mandatory. Such a virtual representation can break physical silos in a horizontal orchestration where anybody from the chain push and pull information. Such virtual representation is then used to simulate, learn and optimize policies from different level of operations.

Such representation, mandatory to enable sensitivity analysis, what-if scenarios and policies optimization is at the core of the digital twin but not straightforward.

As a company, we foresee many applications of such digital twin, but we need to explore the state of art capacity to represent a business complex processes in the era of data. Such representation will come with its associated policy optimization techniques.

[keywords: digital twin, optimization, reinforcement-learning, multi-agent modelling, supply chain]

Project aims

Define the aims of the project

Explore and deliver digital model of a complex business process to enable what-if scenarios and policy assessment.

The project aims to address the capacity to move from events capture of a business process to its digital representation in a model based and / or model free representation to enable policy control.

The company will provide data and expertise on a supply chain application case in order to assess the capacity of proposed solutions in a real word case.

Expected outcomes

Highlight the expected outcomes of the project

Here is the expected outcomes, in a chronologic order :

- State of art report of literature regarding the numerical representation of a complex business process.
- Digital representation of a large-scale supply chain real case study using Michelin data
- Sensitivity Analysis, What-if scenarios, Optimization: how to extract operational information from the proposed digital representation. Let's call this explainability.

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.

We would like to address the digital twin question from the simulation of complex systems and the data science and AI point of view.

The ideal set of capacities sits in the middle of the computer science competencies, applied mathematics to tackle the optimization problematics and the data science for the data aspect of the problem.

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.

Monash University: Decision Support Systems Laboratory for the system aspect of the problem

Peter J. Stuckey as the group lead on data science & AI for the simulation and optimization capacities