Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number

2024-02-23

Project Proposal for Ph.D.

Project Details	
Project Title	**Machine Learning Approaches to Enhance the Extraction and Clarification Process of Fruit Juice Using Dual-Biocatalytic Systems**
Project Summary (Minimum 500 and maximum 2000 characters)	The extraction and clarification of fruit juices are crucial operations in the food industry, directly influencing product quality, yield, and nutrient preservation. Conventional extraction techniques often yield suboptimal results due to the complex structure of biomass, leading to the loss of valuable nutrients and lower juice recovery. This project seeks to address these challenges by implementing a dual-biocatalytic system, leveraging immobilized enzymes like cellulase and pectinase to break down key structural components in fruit tissues, thereby improving extraction efficiency and juice clarity. The core of this project lies in the use of immobilized enzymes within matrices such as micro/nano-encapsulation or nanoparticles, providing enhanced enzyme stability, reusability, and resistance to harsh environmental conditions. In tandem, machine learning algorithms will be utilized to model and predict enzyme performance, including catalytic turnover, substrate range, and sequence-function relationships. This data-driven approach will allow for fine-tuning of the biocatalytic process to achieve industrially relevant results. By integrating machine learning, the project aims to automate the identification of optimal process conditions and enzyme configurations, leading to more efficient, scalable, and sustainable juice processing methods. The expected outcomes include improved juice yield, enhanced clarity, reduced processing time, and lower energy consumption

Ph.D. Supervisors

Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Prof Kavya Dashora	CRDT	kdashora@rdat.iitd.ac.in
Supervisor 2	Prof Shekhar Agnihotri	NIFTEM	shekharagnihotri@gmail.com

Project requirements (Student qualifications, experience required, etc)
***The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)**

- MTech in enzyme technology/ mathematics/biotechnology/agriculture and process engineering
- Candidate should have a fellowship of their own and willing to work in interdisciplinary subjects

Source of fellowship/funding (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Candidate with his/her own fellowship/ Institute Fellowship

Role of Faculty Members involved:	
Supervisor-1	Prof Kavya Dashora : Process optimization, Enzyme configuration, Machine learning, Data analysis
Supervisor-2	Prof Shekhar Agnihotri: Process Measurement and Evaluation, Enzyme Immobilization, Biocatalytic System Development