Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number

2025-01-30

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)	
Project Title	Leveraging Geospatial Technology and Graph Neural Networks for Governance and Economic Development
Project Summary (Minimum 500 and maximum 2000 characters)	Geospatial technology has emerged as a critical tool in governance and economic development, providing decision-makers with rich, location-specific insights that facilitate resource allocation, policy formulation, and infrastructure planning. However, traditional analytical approaches struggle to fully leverage the complex, interconnected nature of geospatial data. Graph Neural Networks (GNNs), known for their powerful capabilities in handling relational data, offer an innovative solution for effectively harnessing the full potential of geospatial datasets. This research proposes the integration of GNNs with advanced geospatial technology to enhance governance frameworks and foster sustainable economic development, including sustainable development goals (SDGs). The proposed research will initially involve gathering diverse geospatial datasets, including satellite imagery, demographic data, economic indicators, and infrastructural layouts. These datasets will be structured into interconnected graphs, capturing the inherent relational nature of spatial entities. Subsequently, a graph neural network model will be developed and trained to detect spatial patterns, correlations, and anomalies pertinent to governance challenges such as urban sprawl, resource distribution inefficiencies, and regional economic disparities. The developed model's predictive and analytical capabilities will then be tested through case studies focusing on urban areas experiencing varying levels of economic development. These case studies will specifically examine governance outcomes related to resource allocation, infrastructure projects, and urban development policies, assessing economic improvements through metrics like employment rates, GDP per capita, and infrastructural growth. By harnessing geospatial technology and GNNs, this research seeks to transform how governance and economic development are understood and managed in an increasingly interconnected world. The outcomes promise to empower decision-makers with precise, scalable tools to build resilient and prosperous societies.

Ph.D. Supervisors
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Manabendra Saharia	Civil Engineering	msaharia@iitd.ac.in
Supervisor 2	Sandeep Kumar	Electrical Engineering	ksandeep@ee.iitd.ac.in

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

- B.Tech. (Electrical Engineering) or B.Tech. (Civil Engineering)
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Source of fellowship/funding and project number (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Project Funding

Role of Faculty Members involved:	
Supervisor-1	Manabendra Saharia (Geospatial Technology, SDG, Sustainable Development)
Supervisor-2	Sandeep Kumar (AI, Graph Neural Networks)