National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Urbanization and its Role in Modulating the Local Environment through ML/DL and Numerical Models
Speaker	: Prof. Jagabandhu Panda
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Venue	: ER 303
Date and Time	: 04 Mar 2025 (12:00)
Abstract	: please upload the abstract for conference return seminar 8:29 PM Time: 12 Noon Venue: ER 303 Title: Urbanization and its Role in Modulating the Local Environment through ML/DL and Numerical Models Abstract Urbanization in cities is striding at an incomparable and irreversible rate and is mostly driven by the population migration, which eventually imparts a significant pressure on the local environment, weather and climate in many ways. Therefore, the study on urban meteorology, climatology, and extreme weather is quite important in the current scenario as the country is evolving towards becoming an advanced economy. In this context, urban growth dynamics and future projection over Indian cities are carried out using satellite datasets, relevant spatial metrics, urban density gradient analysis and by applying machine learning (ML) and deep learning (DL) techniques. A heterogeneous urban growth pattern and sprawling for different cities is noticed with dominance of infill or outlying or sprawling or dispersive or aggregation type. A substantial anthropogenic activities is realized through night light and population density analysis. The ML/DL-based study indicates higher growth in Kochi and greater projected rate over Mumbai. While associating the variability of geophysical parameters, local meteorology and environment with the urban growth trends, their correspondence is strongly realized mostly when large-scale stronghold is absent. In several instances a strong association of urbanization with urban heat island (UHI) at the surface, aerosol and particulate matter variability, near-surface temperature, and rainfall is observed. DL-model-based projections also reveal that the projected urban growth will also govern reasonably the future trends of temperature and rainfall over urban areas. The urban-induced land use changes when accounted within Weather Research and Forecasting (WRF) model to study the impacts, it is realized that the urbanization can modulate the local weather as well. The modulations include UHI effects, rainfall patterns and intensity during thunderstorms and convective rain events, wind patterns, fluxes, moisture variability and atmospheric boundary layer characteristics. Such modulations would impact the quality of life over urban areas, which includes water and electricity consumptions, daily activities, health, etc. Therefore, urban meteorology, extreme weather, and associated climatology is quite an important area of research that would help providing inputs for disaster management and policy making.