
Departmental Seminar

Seminar Title	: Analyzing and Forecasting Urban Growth over Coastal Indian Cities and their association with Rainfall and Temperature
Speaker	: Asmita Mukherjee
Supervisor	: 89815 16022
Venue	: ER 303 Class Room
Date and Time	: 27 Dec 2024 (4:45 PM)
Abstract	: Urbanization in Indian megacities is pacing at an unparalleled and irreversible rate. This phenomenon is mostly driven by population migration and thereby exerts tremendous pressure on the local environment. The current study analyzes the growth dynamics, forecasts future urban growth of four major coastal Indian cities (viz., Mumbai, Chennai, Kochi, and Vishakhapatnam) and highlights their association with rainfall and temperature. Land Use Land Cover (LULC) thematic datasets are classified using Landsat imageries using Random Forest algorithm for the years 1990 to 2023. These datasets are used to explore the capabilities of deep learning (DL) models like CNN and ConvLSTM for accurately projecting the future urban growth in the considered cities. The variability of the four LULC classes, viz., (i) urban built-up, (ii) vegetation, (iii) water body, (iv) agriculture and barren land, indicated that urban expansion mostly took place at the expense of barren lands. The urban landscape mostly depicts dispersive outward growth, with a significant amount of compaction near the city core in recent years. The results derived through Shannon's Entropy, various Spatial Metrics, and urban density gradient analysis also indicated the same. The urbanization is higher in Kochi (from 1990 to 2023), while the projected rate is higher in the case of Mumbai (from 2024 to 2035). The rainfall and temperature climatological trends indicate that there is no significant rainfall pattern for any of the cities, with Mumbai being the exception, which shows a rising trend. The future trend (realized through ConvLSTM model) is projected to be unaltered except for Vishakhapatnam, where it is expected to increase in the coming years. The average temperature across all cities depict an increasing trend. For Mumbai and Vishakhapatnam, however, the "increasing trend" is anticipated to become a "no significant trend" by 2035. Besides, the other factors that are impacted by urbanization include surface urban heat island, PM2.5, aerosol optical depth, etc. The DL model-based forecast, therefore, indicates a continuation of urban expansion, which is expected to have a significant impact on local weather and climate, including rainfall and temperature trends.