Urban Flood Information System (UFIS) for the city of Hyderabad

***UFIS Highlights*:**

- ***Envisions a future where urban flooding is a manageable challenge for the city of Hyderabad.***
- ***Proposes an end-to-end flood information system integrating meteorology, hydrology and stakeholder-relevant aspects.***
- ***Efforts have been made to understand the climatological aspects of rainfall and flood drivers, as well as the utilization of different types of rainfall products.***
- ***Introduces data collection platforms with an emphasis on citizen's involvement via SnapFlood™ and Twitter (SnapFlood).***
- ***Releases VarshaMitra, a mascot, illustrating the data collection aspect.***

Hyderabad, October 05, 2023: Researchers at the Indian Institute of Technology Hyderabad (IITH) are embarking on an innovative journey to address the longstanding challenge of urban flooding in Hyderabad. The team, led by Dr Satish Kumar Regonda, is developing an Urban Flood Information System (UFIS) to minimize the effects of floods in the city of Hyderabad. ***The focus in setting up UFIS is the collection of flood-relevant data, understanding of the collected data, employing modeling techniques to simulate as well as forecast rainfall amounts, flood depths and its extent, and development of products as per the needs of policymakers and stakeholders.*** The absence of key input data, for example, rainfall at finer intervals, flood flow measurements, etc., hinders flood modelling efforts. Therefore, one of the preliminary tasks for setting a reliable UFIS is to have a medium through which flood-related data can be collected. **In this regard, *SnapFlood™* was envisioned to provide a platform for the citizens to provide flood-relevant information data, which may become an integral part of the UFIS data in the future. Efforts are also directed to social media platforms such as Twitter to yield flood information.** In fact, one of the first works for the city of Hyderabad, which used the Twitter platform to identify flood hotspots, was presented at the American Geophysical Union (AGU) conference in the year 2021.

Research scholars from Dr Satish's research group, **R**ainfall-runoff **A**nalysis modeling and **F**orecasting **T**ools (RAFT) have worked in multiple dimensions to address the aspect of urban floods in Hyderabad. Mohammed Azharuddin focused on climatological aspects of rainfall and understanding of weather patterns that bring rain to Hyderabad. Ponukumati Padmini examined alternate rainfall products for their utility in flood-relevant applications for the city of Hyderabad. Many works are in the pipeline, including weather, hydrology and hydraulic modeling at an urban scale, as well as real-time flood information dissemination through social media platforms. Further, as the UFIS project gains momentum, efforts are extended to developing different components of the UFIS. Thus, the research efforts are dedicated to improving the city's resilience to floods and ensuring the safety and well-being of its residents. This research exemplifies the institution's commitment to innovation and societal impact.

Complementing the team efforts, Prof B S Murty, Director IITH, said, *"The UFIS project is a testament to our commitment to address real-world challenges through cutting-edge research. By bringing together experts from various domains and collaborating with government agencies, we aim to create a transformative solution that will benefit not only Hyderabad but also serve as a model for other flood-prone cities in the country."*

Elaborating on the aim of the study, Dr Satish Kumar Regonda, Lead Researcher and Associate Professor, Department of Civil Engineering & Climate Change, IITH, said, *"As a child, I used to like rain, and when it rains a significant amount, no school on that day, who does not like it? I do like rain now, too, and I do realize that its consequences are huge, particularly when it rains heavily. Rain that brings floods puts the city at a standstill, causing damages of different types, including human losses. This highlights the need to develop systems such as UFIS, which makes cities to be flood resilient via integrating meteorological, hydrological and stakeholders' relevant aspects and develops products which may enhance flood awareness."*

Video Abstract: ***https://youtu.be/zz9i62ucZ3c***

Salient Features of the Research:

Weather Forecasting and Stakeholder Collaboration: The UFIS project is a multifaceted effort that aims at the collection of flood-relevant data, understanding of the collected data, employing of modeling techniques to simulate as well as forecast rainfall amounts, flood depths and its extent, and development of products as per the needs of policymakers and stakeholders. In this regard, RAFT emphasizes the involvement of citizens in data collection and collaborations with various academic institutes, organizations, and agencies[1], as they are critical to building a robust system to provide reliable and accurate rain- and flood-related information.

Towards a Resilient City: The UFIS's goal is to provide reliable and accurate rain and flood forecasts and then deliver flood-relevant information in advance at different locations within the city. This proactive approach aims to empower stakeholders to make informed decisions and enhance the city's resilience to floods. By harnessing modeling techniques, including that work in data-scarce environments and collaborating with government agencies, IITH envisions a future where urban flooding becomes a more manageable challenge.

Published and Presented works:

- Mohammed, A., S. K. Regonda and N.R. Kopparthi, Climatological features of high temporal resolution rainfall over the Hyderabad city, India, Urban Climate, 42, https://doi.org/10.1016/j.uclim.2022.101118.
- Ponukumati, P., A. Mohammed, and S. Regonda, 2023: Insights on Satellite-Based IMERG Precipitation Estimates at Multiple Space and Time Scales for a Developing Urban Region in India. J. Hydrometeor., 24, 977–996, https://doi.org/10.1175/JHM-D-22-0160.1.
- Mohammed, A., & Regonda, S. K. (2023). Synoptic circulation patterns of urban floods for the city of Hyderabad. International Journal of Climatology, 1–18. https://doi.org/10.1002/joc.8250.
- Ponukumati, P., Azharuddin, M. and Regonda, S., 2021, December. Urban Flood Vulnerability Mapping using Analytical Hierarchy Process (AHP) for the city of Hyderabad, India. In AGU Fall Meeting Abstracts (Vol. 2021, pp. H35ZC-10). *https://ui.adsabs.harvard.edu/abs/2021AGUFM.H35ZC.10P/abstract*

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About IIT Hyderabad:

Indian Institute of Technology Hyderabad (IITH) is one of the eight IITs established by the Government of India in 2008. In a short span of **15** years, the institute has become one of the top-ranked institutions in the country and has received global recognition. It has **300+** full-time faculty, **4,800+** students, **18** Departments + **1** Centre for Interdisciplinary Programs, nearly **500+** state-of-the-art Research Facilities, and five research and entrepreneurship centres. The institute has a strong research focus with approx. Rs **900+** crores of sanctioned research funding, with PG+PhD students accounting for about **60**% of total student strength. IITH has more than **9500+** research publications with **1,42,000+** Citations, **190+** Published Patents, **2,200+** sponsored/consultancy projects with **500+** running projects, and about **150+** startups that have generated **1000+** jobs and a revenue of **Rs. 1200+ Cr**. Follow us on Instagram, LinkedIn, Twitter, Facebook, Koo, and YouTube for the latest updates.

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Abbreviations: [1]Greater Hyderabad Municipal Corporation (GHMC) and its divisions such as Enforcement Vigilance and Disaster Management (EVDM) wing, Indian Meteorology Department (IMD) Hyderabad, Telangana State Development Planning Society (TSDPS), Telangana State Irrigation Department, Central Water Commission (CWC), National Remote Sensing Centre (NRSC), National Center for Medium-Range Weather Forecasting (NCMWRF) and National Disaster Management Authority (NDMA)