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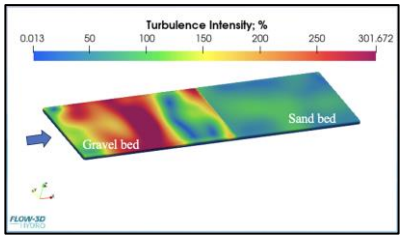
OUR Advisors: Dr. Ellora Padhi, Dr. Gopal Das Singhal

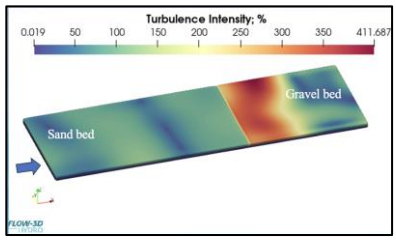
Year of OUR: 2022-23

Area of Research: Hydraulic Engineering

Topic of Research: Numerical Analysis of Flow in a Narrow Open Channel with Transitional Bed

Ongoing research: Numerical simulations utilizing Flow 3D software emerge as a pivotal asset for comprehending fluid dynamics in narrow channels with transitional beds. These simulations effectively show smooth (sandy bed)-to-rough (gravel bed) and reverse transitional bed conditions, offering a cost-efficient alternative to traditional laboratory experiments. Our model adeptly evaluates flow behavior, providing valuable insights into the intricate dynamics affected by varying bed conditions. This innovative approach enhances our understanding of transitional beds and underscores the practical utility of numerical simulations in advancing fluid dynamics research.





Name: Likith Muni Narakala

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OUR Advisor: Dr. Hitesh Upreti, Dr. Gopal Das Singhal

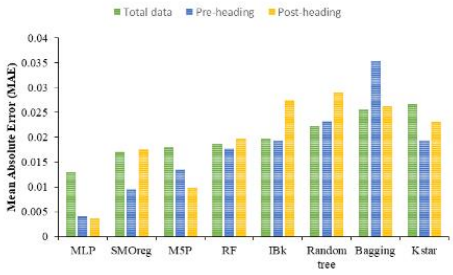
Year of OUR: 2022-23

Area of Research: Water Resources Engineering, Machine Learning

Topic of Research: Analysis of Crop water stress index (CWSI) and its modelling using soft computing techniques

Ongoing research:

The Crop Water Stress Index (CWSI) is a valuable plant-based parameter for assessing crop water stress and optimizing irrigation schedules. This study utilizes eight machine learning algorithms to predict the Crop Water Stress Index (CWSI) for wheat crops, using input parameters such as relative humidity (RH), air temperature (Ta), and canopy temperature (Tc). Experimental data collected from December 2022 to April 2023 includes empirical CWSI values derived from recorded Tc and RH measurements. The study establishes a linear correlation between temperature differences of air and canopy and vapor pressure deficit (VPD) for CWSI calculation. Evaluation of predictive models shows satisfactory performance across all algorithms, with Multilayer Perceptron (MLP) demonstrating the highest accuracy (MAE=0.013)



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OUR Advisors: Dr. Hitesh Upreti, Dr. Gopal Das Singhal

Year of OUR: 2022-2023

Area of Research: Water Resources Engineering, Remote Sensing & GIS

Topic of Research: Crop monitoring in the agricultural fields using satellite remote sensing techniques

Ongoing research:

Agriculture is vital for India's economy, and frequent crop health monitoring is crucial to prevent yield loss. Remote sensing, especially using Sentinel 2 satellite data with 10 m spatial resolution and 5-day temporal resolution is an effective database. The spectral reflectance curve of vegetation, analyzed through visible and near-infrared bands, helps identify crop health at each stage. I have used open-source software package, QGIS to analyze satellite data of Sentinel-2 for crop monitoring

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OUR Advisors: Dr. Gopal Das Singhal & Dr. Ellora Padhi

Year of OUR: 2022-2023

Area of Research: Hydraulic Engineering

Topic of Research: Estimation of flow properties in a smooth and rough narrow channel

Ongoing research:

This research study aims to explore the complex interactions between gravel bed flows and bluff bodies, shedding light on the underlying flow dynamics, sediment transport mechanisms, and potential implications for various engineering and environmental applications. To achieve these objectives, a comprehensive series of laboratory experiments will be conducted using a specially designed flume setup (Width= 30 cm, Length= 5.5 m) with a median size of gravel approx. 2.5 cm. Two wooden objects (10 cm × 10 cm × 5 cm) & (10 cm × 10 cm × 7 cm) will be considered for the study which will be acting as bluff body. The said bluff bodies will be strategically placed within the gravel bed flow to simulate real-world scenarios where obstacles such as bridge piers or boulders obstruct the river channel, to investigate various flow parameters, including flow velocity, specific energy variation.

Fig. Wooden block placed on a gravel bed.

Fig. ADV installed to measure the flow velocity.

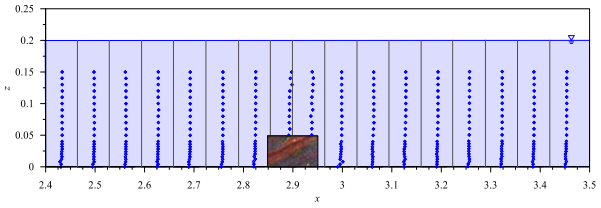

Fig. Effect of 7.5 cm wooden block on flow velocity profiles.

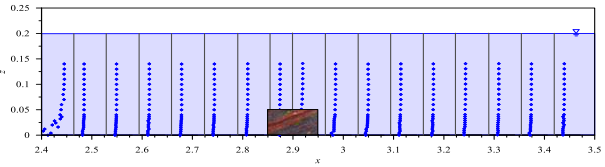

Fig. Effect of 5.5 cm wooden block on flow velocity profiles

Name: Sankalp Dixit

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Advisor: Dr Shalini Rankavat

Year of OUR: 2022-2023

Area of Research: Transportation Engg.

Topic of Research: Effect of recycled aggregate (sawdust) on physical characteristic of cement concrete blocks

Ongoing research: In this research study, the feasibility of utilizing sawdust as a partial replacement for sand in M30 concrete for concrete block pavement was investigated. The main objectives were to assess the mechanical, physical, and environmental properties of the resulting concrete blocks and determine the optimum percentage of sawdust replacement.

The environmental impact decreases as the percentage of sawdust used as a partial replacement for sand in concrete increases, indicating a positive environmental impact.

It implies that use of sawdust as a sand replacement in M30 concrete for block pavement reduces the carbon footprint but compromises compressive and flexural strength. Future research should focus on improving sawdust-reinforced concrete's mechanical properties and exploring alternative waste materials for sustainable infrastructure development.

Fig. Casting of Concrete Moulds

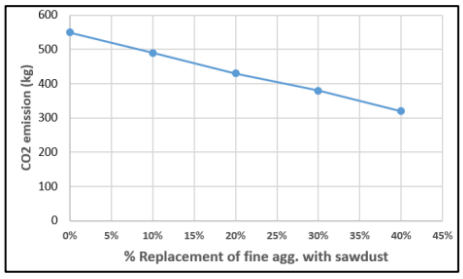

Fig. Carbon footprint emission from concrete cubes with sawdust

Name: Shivam Babu

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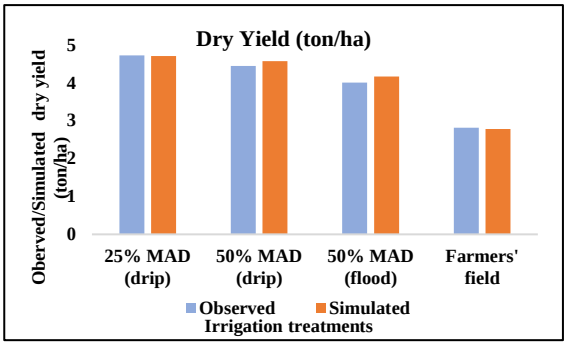
OUR Advisors: Dr. Gopal Das Singhal & Dr. Hitesh Upreti

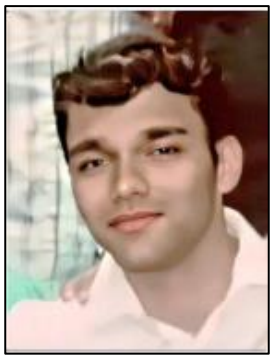
Year of OUR: 2022-2023

Area of Research: Water Resources Engineering, Agricultural Water Management

Topic of Research: Modeling of crop yield using the AquaCrop model and data collected in agricultural fields

Ongoing Research: Crop yield simulation models play a vital role in the decision-making process since these models can save time and resources. These simulation models are helpful in making informed decisions to optimize agricultural productivity and food security. I am using AquaCrop, one of these models developed by the Food and Agriculture Organization (FAO) to simulate biomass and dry yield of various types of crops, especially in limited water conditions. The objectives of the present study are to simulate biomass and dry yield through the AquaCrop model and to compare these with the observed biomass and dry yield obtained through field experiments.





Name: Thakur Aaryan Singh

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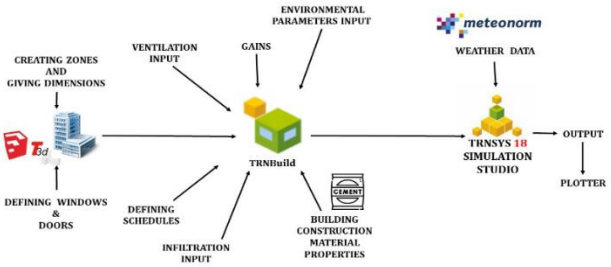
Advisor: Dr. Manoj Kumar Singh

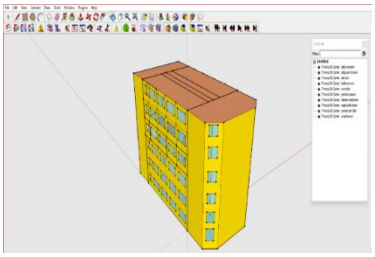
Year of OUR: 2022-2023

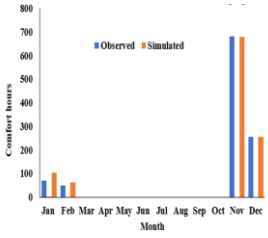
Area of Research: Building energy Simulation

Topic of Research: To Understand the Thermal Performance of a Non-Air-Conditioned Hostel Room of Shiv Nadar Institution of Eminence Using Building Energy Simulation

Ongoing Research: We used TRNSYS and Google SketchUp to make energy model of selected building which helped to simulate and calculate the observed indoor warm-up time for the zone. In this study, Mean Biased Error (MBE) and Coefficient of Variation (CV) techniques were used to assess the difference and variability between data logger measurements and readings obtained with TRNSYS 18® software. A temperature range of 18°C to 27°C was set as the definition of comfortable time. Neither the data logger nor the TRNSYS 18® software recorded comfort times from March to October. The data suggest that temperatures recorded during the above months did not fall within the established comfort range of 18°C to 27°C.







Name: Aakriti Sahni

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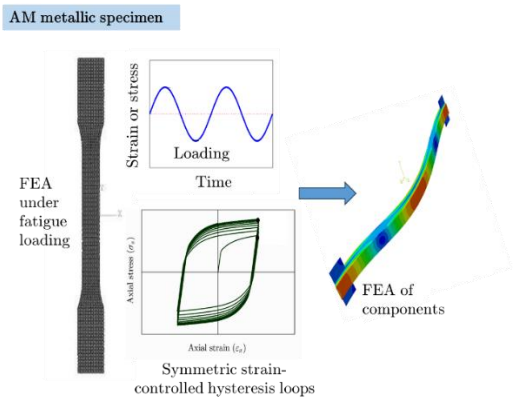
Advisor: Dr Atri Nath

Year of OUR: 2023-2024

Area of Research: Fatigue, 3D Printing

Topic of Research: Characterization of Additively Manufactured Materials under Monotonic and Cyclic loads

Ongoing research: This study will focus on characterizing the behaviour of additively manufactured (AM) steel under monotonic and cyclic loading in the low cycle fatigue regime. The results from the study will be useful to incorporate design guidelines for the usage of AM materials to resist failure against fatigue loading. This study will include experimental work related to mechanical testing and SEM studies, as well as, numerical studies based on Finite element analysis (FEA).



Name: Akanksha

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OUR Advisors: Dr. Gopal Das Singhal

Year of OUR: 2023-24

Area of Research: Water Resource Engineering, Remote Sensing

Topic of Research: Analyzing chlorophyll content and nitrogen status in wheat crop using remote sensing technique

Ongoing research: The research centers on enhancing wheat crop health through the analysis of chlorophyll and nitrogen levels using remote sensing techniques. The approach involves detecting chlorophyll content using a chlorophyll content meter and exploring its correlation with nitrogen levels. Currently, we're going through various papers to gather insights relevant to our research goals. This helps us understand existing knowledge and lays the groundwork for our study. By combining practical measurements and insights from literature, it aims to contribute useful information for better wheat crop management.

Name: Anika Govil

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OUR Advisors: Dr Ellora Padhi; Dr Gopal Das Singhal

Year of OUR: 2023-24

Area of Research: Water Resources - Hydraulics

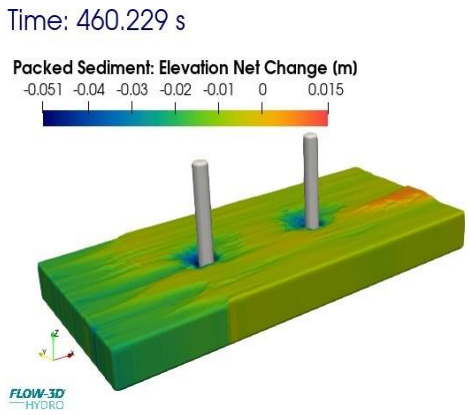
Topic of Research: Investigation, Numerical and Experimental scourinduced by Interference of the Adjacent Piers

Ongoing research:

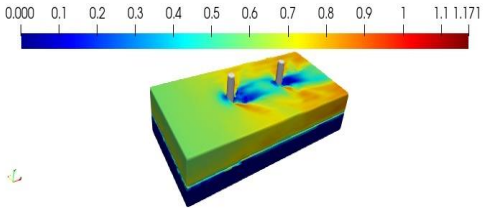
Ensuring secure bridges is crucial for public safety, preventing potential loss of life, property damage, and disruptions to economic activities. A primary cause of bridge failure is scour at piers, mainly when located close to each other, necessitating further research for enhanced safety measures.

Insufficient countermeasures against pier interference scour intensify under high flow, necessitating further research on optimizing space between piers. FLOW-3D HYDRO software utilizes numerical simulations, such as LES and RANS, enabling cost-effective and flexible insights for enhanced safety through validated analyses of diverse pierconfigurations, reducing the reliance on large-scale physical experiments andfostering global collaboration in systemdesign and optimization.

The simulation models on the right demonstrate the interference between two bridge piers in tandem arrangement, depicting the consequential scour development as a function of varying water velocities.



Velocity contour



Name: Likith Muni Narakala

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OUR Advisor: Dr. Gopal Das Singhal and Dr. Hitesh Upreti

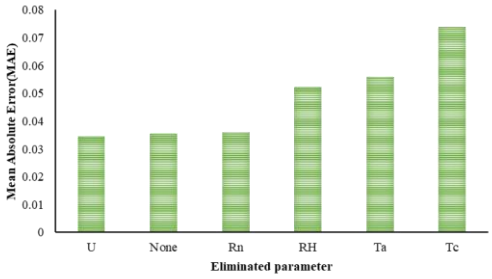
Year of OUR: 2023-24

Area of Research: Water Resources Engineering, Remote Sensing, Machine Learning

Topic of Research: Assessment of Crop water stress index using remote sensing and machine learning techniques

Ongoing research:

Climate change poses a global threat requiring swift response and mitigation, impacting agriculture significantly. Challenges include reduced crop yields, increased drought stress, shifting agroecosystem boundaries, and unpredictable weather patterns. The Crop Water Stress Indicator (CWSI) is a crucial tool for irrigation scheduling, offering insights into crop water requirements. Empirical CWSI estimation faces limitations in defining baselines, prompting a shift to remote sensing and machine learning methods. Remote sensing, vital in agricultural water management, utilizes active and passive sensors on various platforms, considering spatial, temporal, radiometric, and spectral resolutions. Machine learning models, underutilized in CWSI prediction, are explored to capture complex relationships. This study aims to bridge the gap between traditional CWSI estimation methods and automated processes, contributing to sustainable agricultural water management.



Name: Sanjana

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OUR Advisors: Dr Hitesh Upreti, Dr Gopal Das Singhal

Year of OUR: 2023-24

Area of Research: Water resources engineering, Machine Learning

Topic of Research: Estimation of Evapotranspiration using Machine Learning model and data collected in agricultural fields.

Ongoing Research: The objective of the project is to develop a machine learning model to predict evapotranspiration (ET) with minimal parameters for efficient agricultural water management. It involves gathering diverse datasets containing essential information, aiming to reduce the number of parameters required for FAO 56 Penman-Monteith ET calculation by employing techniques to identify and select key features, leveraging domain knowledge to streamline the input variables using Machine Learning.

Name: Chinthamaneni Sriyodh

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OUR Advisors: Dr. Hitesh Upreti and Dr. Gopal Das Singhal

Year of OUR: 2023-2024

Area of Research: Water Resources Engineering, Remote Sensing

Topic of Research: Detection of irrigation events in agricultural fields using remote sensing techniques

Ongoing research: I am working to detect irrigation and wetting events in agricultural fields by estimating soil moisture of fields by means of RADAR and optical and remote sensing data. I am utilizing the open source satellite data in an emerging GIS tool, Google Earth Engine. A successful completion of this project would be helpful for better estimation of crop water requirements, mapping irrigation in agriculture and improving management of agricultural water.

Name: Thakur Aaryan Singh

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Advisor: Dr. Manoj Kumar Singh

Year of OUR: 2023-2024

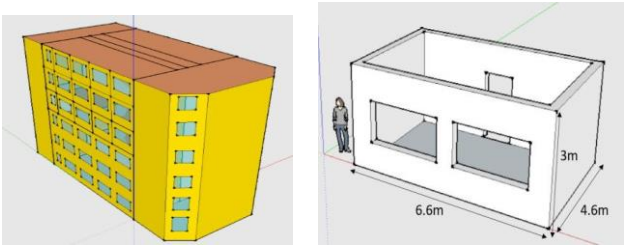
Area of Research: Building energy Simulation and passive designing

Topic of Research: Study to Enhance Thermal Comfort of a Non-Airconditioned Hostel Room of Shiv Nadar Institution of Eminence

Ongoing Research: Based on the previous research readings the comfort hours of the building were increased by the means of bioclimatic chart analysis and passive design strategies.

Different combinations of insulation layers and construction materials in the building façade were implemented in the energy model and simulated in the Transys. Further the ACH in the observed room was also changed accordingly. These things collectively let us know the best combination that we can do in the passive designing strategies to increase the comfort hours in the building.

Project Image



Increase in comfort hours after energy simulation and passive designing