Abstracts

A Bayesian satellite turbidity calibration algorithm framework with a focus on the Great Barrier Reef, Australia

Nasim Sadra, Massey University

Monitoring extreme events that are key drivers of coastal hazards such as flood related turbidity pulses and episodic water quality degradation depends critically on the statistical frameworks we use to retrieve them. Optical remote sensing-based turbidity algorithms typically rely on single spectral bands, band ratios, or index-based regression methods optimised for overall point accuracy. These approaches are primarily calibrated to the low turbidity conditions that dominate the available observations while extreme turbidity pulses critical for coastal hazard assessment, sediment transport dynamics, and infrastructure design are often underrepresented and underestimated. Using Sentinel 2 reflectance data (Level 2) matched with in-situ turbidity data from the Great Barrier Reef (Australia), this study develops a Bayesian regression framework based on maximum band ratio (MBR) and a well-established turbidity index called normalised difference turbidity index (NDTI). The model performance is assessed using leave one out cross validation (LOOCV), focusing specifically on prediction at extreme turbidity values rather than point accuracy alone. Preliminary results indicate that baseline model underrepresents uncertainty at high turbidity despite a good overall fit. This finding has direct implications for how remote sensing can be used for hazard and relevant extreme event modelling. The model structure will be extended to a hierarchical structure to test whether group specific structure improves calibration based on water turbidity regimes. By modelling the data generating process rather than predicting the existing values alone, this work aims to reduce overfitting and offer a transferable framework for uncertainty assessment in other remote sensing applications where rare events are disproportionately important while the dataset is dominated by low values. By doing so, this work aims to support long term coastal monitoring using freely available optical datasets and characterize relevant extremes that shape coastal resilience.

A Statistical Framework for Educational Analytics Using Learning Management System Data: A Data-Driven Approach to Improving Student Learning

Abinaya Nagamuthu, Senior Lecturer

In modern higher education, Learning Management Systems (LMS) have become an important platform for delivering teaching and learning activities. The use of LMS provides large volumes of digital learning data.
This talk presents a statistical framework for educational analytics that supports academics in making data-driven decisions in teaching environments. The LMS data includes attendance records, access to lecture materials, time spent on the LMS, completion of interactive activities, assessment scores, and final examination results. Descriptive statistics are used to summarise learning patterns, while correlation and regression analysis are applied to examine relationships between student engagement and academic performance. Predictive modelling techniques are also introduced to identify at-risk students and forecast their academic outcomes.
The proposed framework demonstrates how raw LMS data can be transformed into meaningful insights for academic decision-making. It supports improvements in course design, teaching strategies, and early intervention for at-risk students, ultimately enhancing student success rates. This talk also highlights the importance of integrating statistical methods with educational data analytics to promote evidence-based teaching practices in higher education.

Implementing the ADAPT Model: Measuring Fidelity and Translating Research into Instructor Support

Laura Short, North Carolina State University

This study investigates the implementation fidelity of the ADAPT model's 10 common learning elements across core data science curricula at North Carolina State University's Data Science and AI Academy. Utilizing Century, Rudnick, and Freeman's (2010) Critical Component Framework, the curriculum was evaluated across four foundational dimensions: Procedural, Educative, Pedagogical, and Student Engagement. To establish a comprehensive, inclusive data set, a qualitative case study was conducted across 7 distinct ADAPT courses. Entire semesters of instructional recordings, materials, and syllabi were reviewed to capture both explicit and subtle integration of the model's core elements in classroom settings. The findings indicate robust execution across several dimensions; however, four specific learning elements demonstrated a need for enhanced instructional support. These underrepresented elements include: explaining the scope of data science and AI expertise, introducing diverse career role models, articulating open research questions, and highlighting exciting discoveries within the discipline. To bridge these pedagogical gaps, empirical findings were directly translated into actionable faculty resources. High-fidelity classroom interactions identified during the data analysis were synthesized into practical, illustrative examples. This presentation demonstrates how implementation data can be leveraged to design targeted instructor support.

Implementation of Machine Learning Techniques for analyzing Autism Spectrum Disorder children through Art Emotion Extraction

Vijayalakshmi C, Professor, Department of Statistics and Applied Mathematics,Central University of Tamil Nadu,Thiruvarur

Autism spectrum disorder (ASD) mainly comprises of Neuro-degenerative disorders associated with social, communication, and behavioral difficulties. This paper mainly deals with the implementation of deep learning techniques to analyses and extract the emotions of autism children through their art using Deep Learning techniques. Feature extraction for the effective recognition of emotions is being obtained. It also targets on identifying the emotions through the artwork of children diagnosed with autism spectrum disorder (ASD) by implementing the predictions of their emotions which will help the doctors and caretakers so that the children will be in safe hands. This leads to the result of contributions to the state-of-the-art results in this research field. It also helps to analyses the ASD children's key emotions and the perceptions enabling them to analyses their emotional state.