New Lab Course Proposal
Applications of AI in Sustainability

Course Title: Applications of AI in Sustainability

Course No: KSS 6XX

About the course: This lab course aims to provide students hands-on experience working with various kinds of data – from acquisition, to processing to analysis and drawing inferences and presenting them. Through a combination of brief lectures, hands-on labs, and field exercises, students will gain proficiency in using sensors, working with existing primary and secondary data sets, and GIS tools coupled with AI/ML techniques for real-world applications in environmental assessment and management. The course is also structured in a way that each technique is presented in the context of real-world applications in a specific sub-field of sustainability.

Course Proposers: Manoj Kumar Tiwari (CE), Vipul Arora (EE), Sruti S Ragavan (CSE)

Who can take the course: Ph. D., M. Tech., and Advanced UG (final year) students.

Units: 2-0-3-0-9 [2 Lecture + 3 Hours Lab per week, 9 credits]

Prerequisite: Basic knowledge in AI/ML

Course content:

- (Week 1-2) Fundamentals
  - Data acquisition
    - Primary (through sensors)
    - Remote data acquisition
    - Working with secondary data
  - Modeling/trend analysis, etc.
  - Presenting results (Visualization, etc.)
- (Week 3-4) Air (Sensor data for predicting / visualizing air quality)
  - Sensor calibration, forecasting, fault forecasting
  - Train simple predictive lab in model
  - Read state-of-the-art models / use existing models for inference.
- (Week 5) Climate (Temperature, precipitation, etc.)
  - Sensors and their data
  - Simple predictive models
  - https://github.com/google-deepmind/graphcast
- (Week 6-7) Land (GIS + remote sensing data for predicting LULC, etc.),
  - What is GIS – nature of remote sensing data
  - Basics of image processing, corrections
  - Historical data / old maps / trends
  - LULC

- (Week 8-9) Water (Flood modeling)
  - Continue from climate & lab data
  - Go into flood inundation models
  - Discharge predictions
- (Week 10) Agriculture
  - Irrigation, Crop productivity estimation, diseases, livestock
- (Week 11-13) Final Project
  - Provide available campus/public data and ask to model something.

Textbooks and References

- No designated textbook.
- Papers on applications of AI will be assigned as readings in various application areas.
- A lab manual to be developed as we go, to help with future offerings.

Signature of the Proposers:

This course is APPROVED/~~NOT APPROVED~~   Convener, DPGC, KSS

This course is APPROVED/NOT APPROVED   Chairman, SPGC