Final Year Project Showcase Batch-2021
For the Year 2025

Department of Software Engineering Name of Programme: Software Engineering		
1	**Project Idea**	Big Data Analysis of Greenhouse Gas Shifts Using Explainable AI
2	**Process**	1. **Data Collection:** Utilized Climate TRACE as the primary dataset, integrating historical and real-time GHG emissions data. 2. **Preprocessing:** Cleaned and structured data using Apache PySpark, handling missing values, normalization, and feature engineering. 3. **Model Development:** Implemented a Transformer-based architecture for time-series forecasting, overcoming limitations of traditional models like LSTMs. 4. **Explainable AI (XAI):** Used Integrated Gradients to provide transparent and interpretable predictions. 5. **Platform Development:** Built a web-based dashboard using the MERN stack (React.js, Node.js, MongoDB, PostgreSQL) for visualization and user interaction. 6. **Deployment**: Hosted the model on AWS and the platform on Heroku, ensuring scalability and accessibility.
3	**Outcome**	• A predictive platform that forecasts GHG emissions with high accuracy and provides actionable insights. • Transparent AI explanations for stakeholders (e.g., policymakers, researchers) to understand model decisions. • Interactive visualizations (charts, maps) for exploring emissions trends and scenarios.
4	**Evidence (Theoretical Basis)**	• Literature review highlighted gaps in existing systems: lack of explainability, actionable insights, and scalability. • Demonstrated superiority of Transformer models over traditional methods (e.g., LSTMs) in handling temporal dependencies. • Validated XAI techniques (SHAP, LIME, Integrated Gradients) for interpretability in climate science.
5	**Competitive Advantage or Unique Selling Proposition** Our solution offers a unique competitive advantage by addressing the "black box" problem in AI through the integration of Explainable AI (XAI), fostering greater trust and usability for policymakers. This leads to improved data-driven decision-making with real-time, granular emissions analysis, ultimately enhancing the accuracy of climate action strategies. By focusing on process improvement, our approach streamlines emissions monitoring and mitigation, resulting in both cost reduction and efficiency gains. Additionally, our platform supports the attainment of SDG 13 (Climate Action) by providing tools for precise GHG monitoring and SDG 9 (Industry, Innovation, and Infrastructure) through the use of AI and big data. Furthermore, it contributes to	

	SDG 11 (Sustainable Cities and Communities) by aiding urban emissions reduction planning, enabling targeted carbon reduction strategies and ensuring environmental sustainability for future generations.	
a	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of the whole process** (e.g. What is the issue is current process and what improvement you suggests)	• Addresses the "black box" issue in AI by integrating XAI, enhancing trust and usability for policymakers. • Improves data-driven decision-making with real-time, granular emissions analysis.
b	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	• **SDG 13 (Climate Action):** Provides tools for accurate GHG monitoring and mitigation strategies. • **SDG 9 (Industry, Innovation, and Infrastructure):** Leverages AI and big data for environmental intelligence. • **SDG 11 (Sustainable Cities and Communities):** Supports urban emissions reduction planning.
c	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)	Enables targeted carbon reduction strategies by identifying high-impact sectors and regions.
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	• **Policymakers:** Governments and environmental agencies for climate policy formulation. • **Researchers:** Academics studying climate change and emissions trends. • **Industries:** Corporations aiming to reduce carbon footprints (e.g., energy, transportation sectors). • **NGOs:** Organizations advocating for environmental sustainability.
7	**Team Members (Names & Roll No.)**	1. Maria Ashfaq (SE-21005) 2. Laiba Muhammad Ali (SE-21010) 3. Aqsa Zaib (SE-21013) 4. Muazzam Khan (SE-21042)
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10	**Pictures (If any)**	https://drive.google.com/drive/folders/129Q53ZdN_Gqn6f9Azm_E5pj40SeiWt1e?usp=sharing
11	**Video (If any)**	https://drive.google.com/file/d/1SP2AcF0tBCUhsZidiRZDukSxXxPMSKX-/view?usp=sharing