

Machine Learning Tool for Prediction Amine Emission from Carbon Capture Technology

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Project Overview

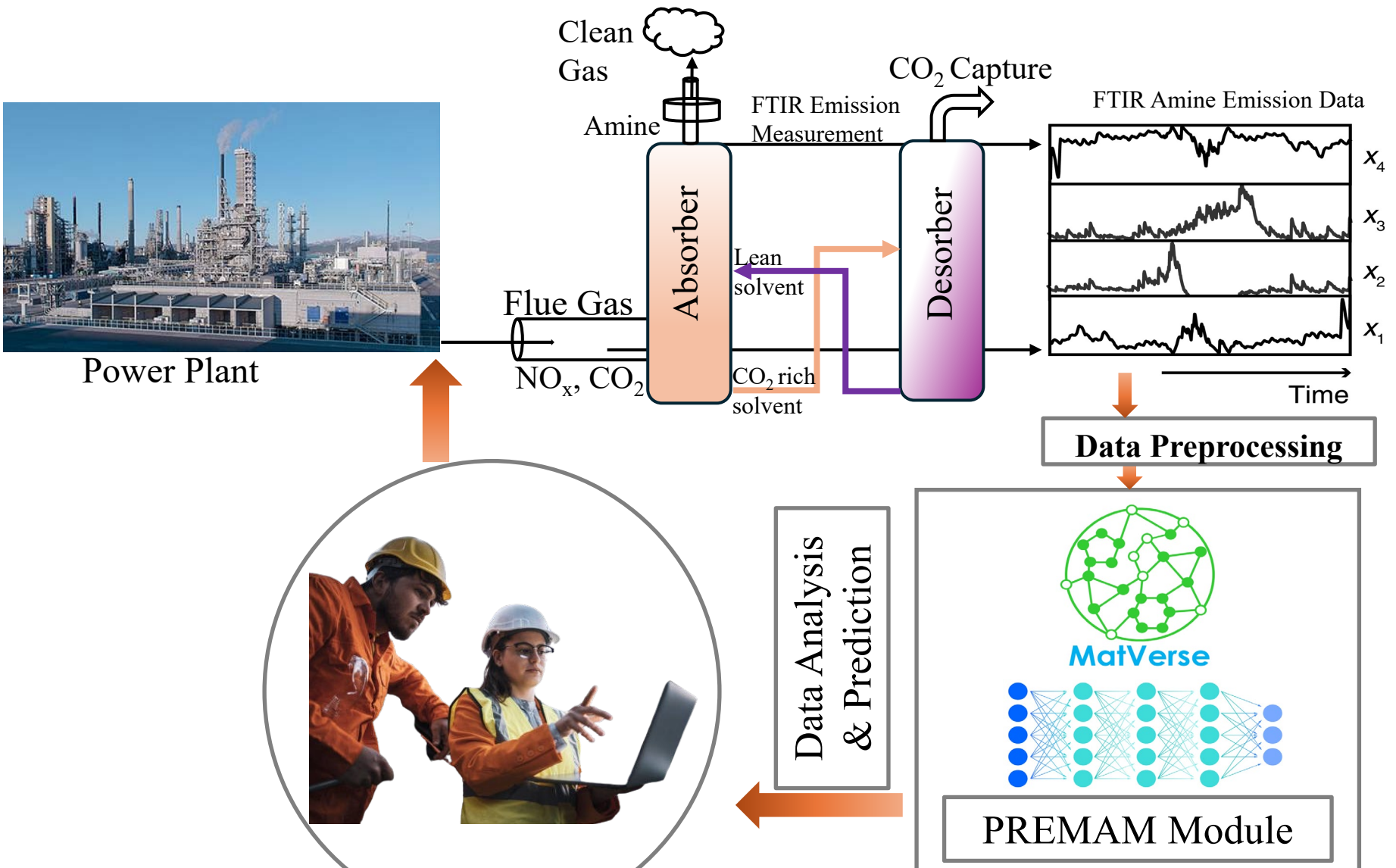


Objective: Develop machine learning (ML) tool to predict amine emissions and recommend effective mitigation strategies for carbon capture technologies in industrial and power generation facilities.

Significance: Enable real-time prediction of amine emissions from both the host site and carbon capture processes, particularly for solvent-based systems. This represents a significant advancement in carbon capture and environmental management using advanced ML techniques.

Benefits: Developed ML tool will support in managing amine-based solvents for post-combustion carbon capture, providing suggestions to maintain the solvent's composition over time.

Technical Approach

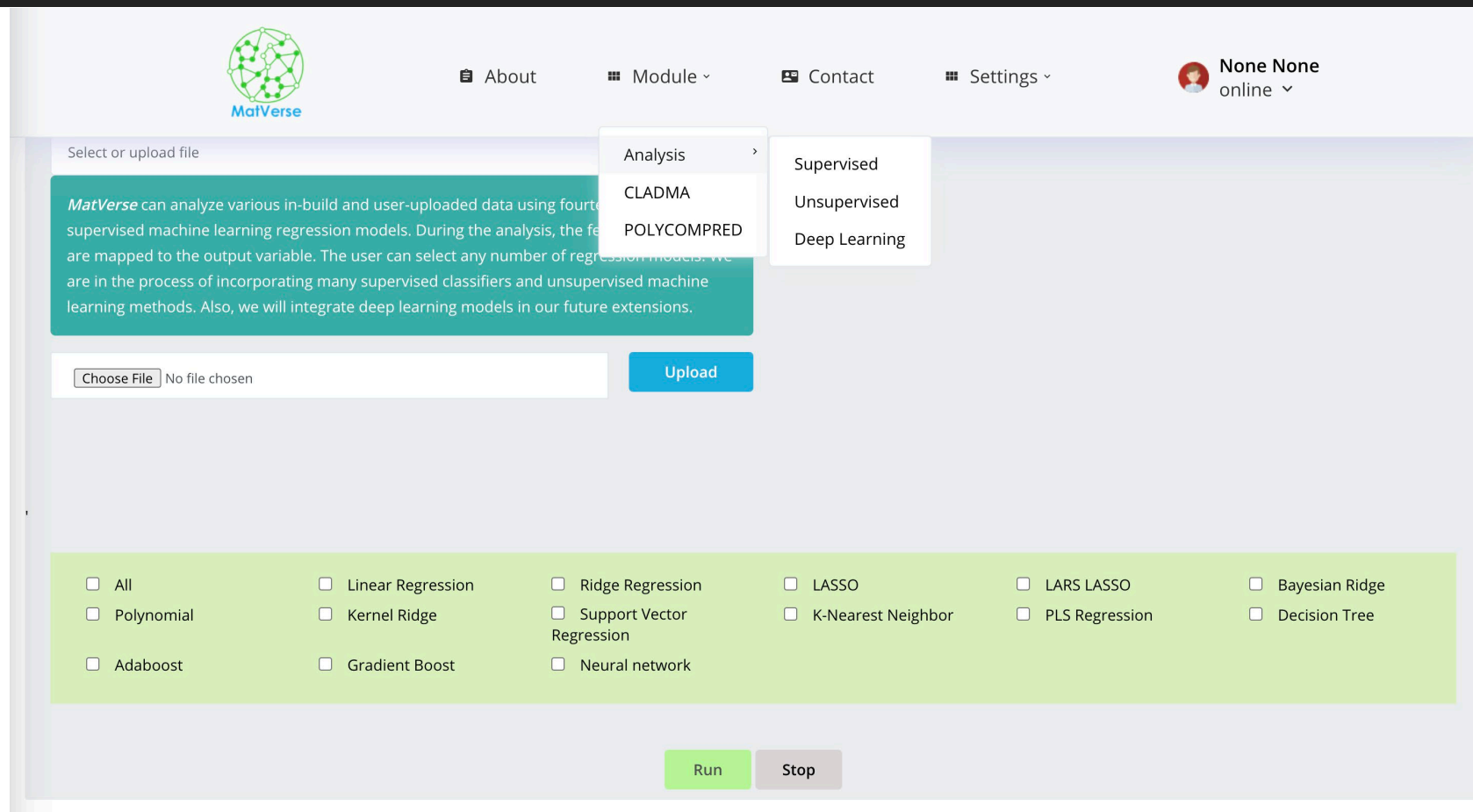


PREMAM: Predicting EMISSION of AMines

Optimization & Integration of PREMAM to MatVerse



A data analysis platform designed to prioritize user needs, allowing for comprehensive exploration of diverse datasets through advanced Machine learning techniques.



The screenshot shows the MatVerse web application interface. At the top, there is a navigation bar with the MatVerse logo, 'About', 'Module', 'Contact', and 'Settings' menus, and a user profile for 'None None' who is online. Below the navigation bar, there is a file upload section with a 'Choose File' button and an 'Upload' button. A dropdown menu is open under 'Module', showing 'Analysis' with a sub-menu containing 'Supervised', 'Unsupervised', and 'Deep Learning'. Below the upload section, there is a text area with the following text: "MatVerse can analyze various in-build and user-uploaded data using four supervised machine learning regression models. During the analysis, the features are mapped to the output variable. The user can select any number of regression models. We are in the process of incorporating many supervised classifiers and unsupervised machine learning methods. Also, we will integrate deep learning models in our future extensions." Below the text area, there is a 'Run' button and a 'Stop' button. At the bottom, there is a grid of checkboxes for various machine learning models: All, Polynomial, Adaboost, Linear Regression, Kernel Ridge, Gradient Boost, Ridge Regression, Support Vector Regression, Neural network, LASSO, K-Nearest Neighbor, LARS LASSO, PLS Regression, Bayesian Ridge, and Decision Tree.

Capabilities of ML Tool



Real-Time Prediction

Forecast future emissions using historical data and operating parameters



Causal Impact Analysis

Baseline emissions analysis with/without stress tests



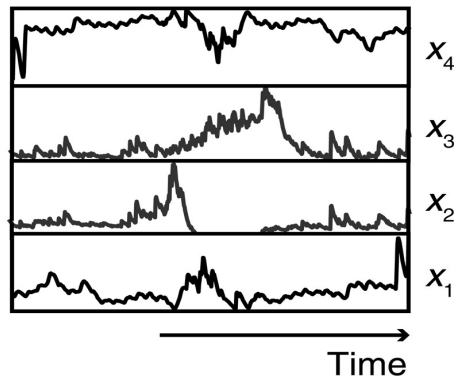
Emissions Mitigation

Predict emissions in "what if" scenarios for optimal plant operation

Moving Forward

What we needed

1. FTIR Amine Emission Datasets



2. Baseline and stress test datasets with different scenarios

- ✓ *Water wash temperature increase*
- ✓ *Water wash temperature increase*
- ✓ *Flue gas temperature increase*
- ✓ *Lean solvent flow rate decrease*
- ✓ *Lean solvent and flue gas flow rate decrease*
- ✓ *Lean solvent temperature increase*

3. Timeline of Datasets availability for data processing and model development

4. Relevant emission dataset (public or private) for robust model development

Team

Polaron Analytics Employees



**DR. RAHUL
BHOWMIK**

CEO and Senior
Scientist

Expertise:

Data Analytics, AI/ML,
Business Operations,
Non-Dilutive Funding



**DR. LOKENDRA
POUDEL**

Research
Scientist

Expertise:

Data Analytics, AI/ML,
Quantum Mechanics and
Computing



**DR. PHAN
DUY NHAT**

Data
Analyst

Expertise:

AI/ML, LLM, Technology
Development



DOUGLAS BROOK

Business
Development
Manager

Expertise:

Opportunity Identification,
Entrepreneurship, IT

Subcontractor



JAMIE GATEAU

Chief Growth Officer,
Peerless Technologies

Expertise:

Leadership, Multi-million-dollar Projects, IT,
Business Opportunities

Commercialization



Phase Shift I

Acknowledgement



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