Machine Learning Tool for Prediction Amine Emission from Carbon Capture Technology

Lokendra Poudel* & Rahul Bhowmik

Polaron Analytics, 9059 Springboro Pike, Miamisburg, OH, USA

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*Presenter

Project Overview

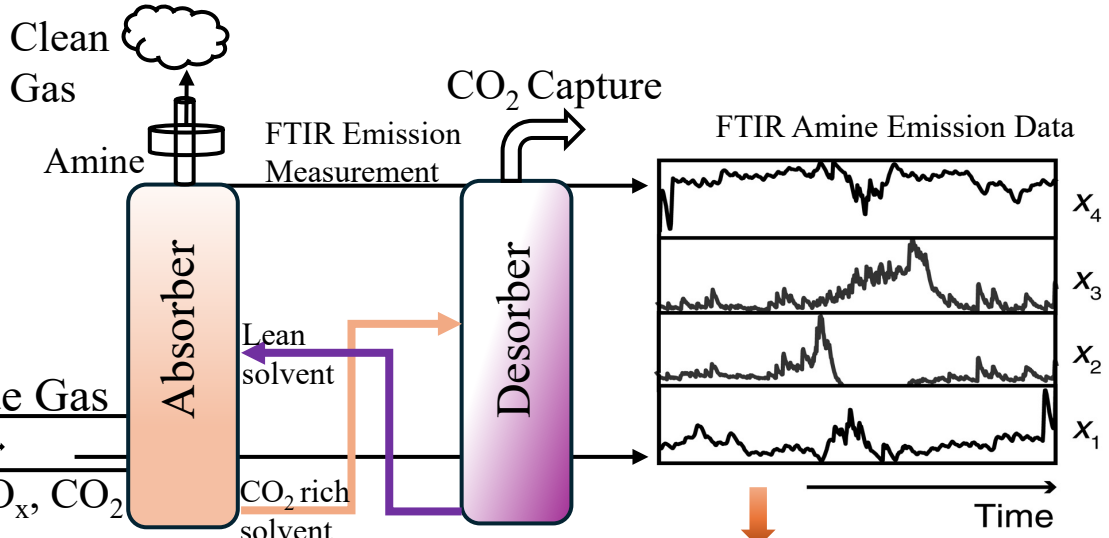
Objective: Develop machine learning (ML) tool to predict amine emissions and recommend effective mitigation strategies for carbon capture technologies in industrial and power generation facilities.

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

Power Plant



Data Preprocessing

Data Analysis & Prediction

MatVerse

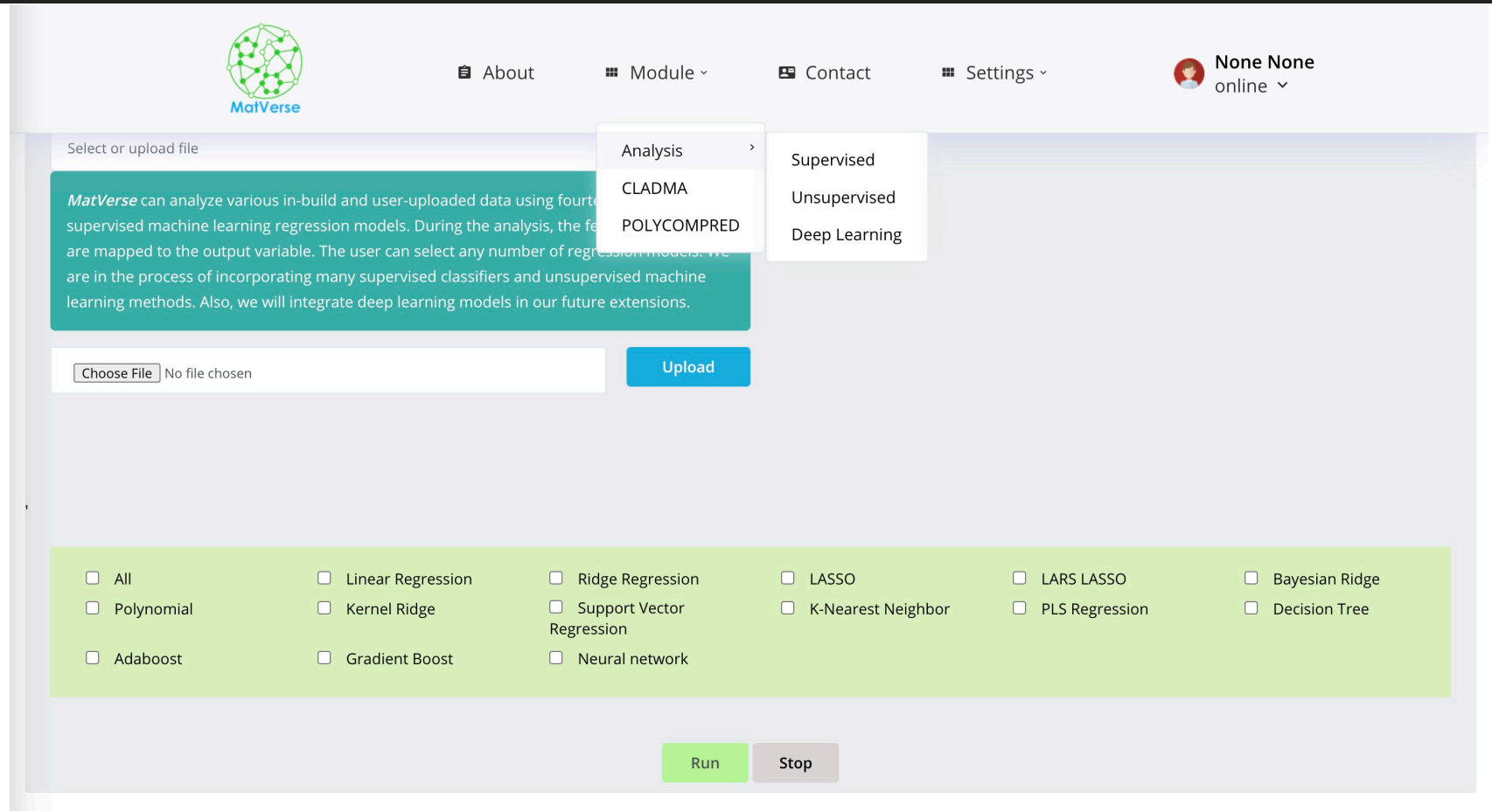
PREMAM Module

PREMAM: **PR**edicting **EM**ission of **AM**ines

Optimization & Integration of PREMAM to MatVerse

MatVerse

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



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

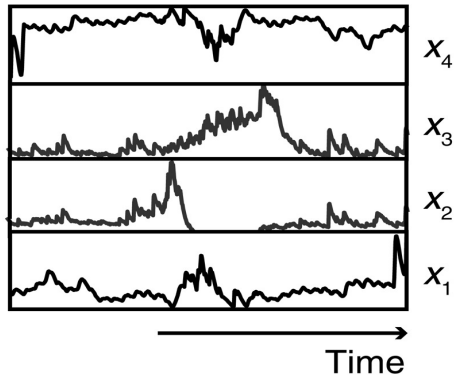
Emissions Mitigation

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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NATIONAL ENERGY TECHNOLOGY LABORATORY