CENTRAL YanTRa HACK 25’

TEAM NAME: LOGIC LOOPS

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PROJECT TITLE:AI-Powered Optimization for Sustainable Chemical Processes

PROBLEM STATEMENT:

Industrial Chemical Processes are energy consuming and environmentally harmful. There is a need for solutions that minimize energy consumptions and reduce the carbon footprint of these processes without compromising production efficiency

OUR SOLUTION:

- We propose developing an AI-powered system that continuously monitors and adjusts chemical process parameters in real time. By using machine learning and optimization algorithms, the system will identify optimal operating conditions, reduce energy consumption, and minimize environmental impact.
- Our solution leverages AI-driven real-time process optimization to reduce energy consumption and minimize carbon footprints without compromising production efficiency.

- Using machine learning and advanced optimization algorithms, our system continuously monitors and fine-tunes process parameters, ensuring operations run at peak efficiency. This leads to:
- ✓ Lower energy consumption
- ✓ Enhanced process efficiency
- ✓ Reduced environmental impact

- By integrating AI into industrial operations, we drive sustainability while maintaining high-performance standards. Let's transform chemical manufacturing for a greener, smarter future!

OBJECTIVE BREAKDOWN:

1)Design an AI-based model for real-time optimization of chemical processes

- Develop an intelligent system that continuously analyzes process parameters such as temperature, pressure, and reaction rates.
- Implement machine learning algorithms to detect inefficiencies and suggest adjustments in real-time.
- Ensure the AI model adapts to changing operational conditions for optimal performance.

2)Reduce energy consumption and improve process efficiency through parameter optimization

- Identify key process variables that impact energy usage and production efficiency.
- Use predictive analytics to adjust these parameters dynamically, reducing unnecessary energy expenditure.
- Enhance resource utilization while maintaining or improving production output.

3)Promote sustainable industrial practices by minimizing environmental impact

- Reduce emissions and waste generation by optimizing chemical reactions and energy usage.
- Encourage the adoption of AI-driven sustainability strategies in industrial settings.
- Align with global environmental regulations and corporate sustainability goals.

Expected Outcomes & Impact:

1)Significant Reduction in Energy Consumption:

- By optimizing process parameters in real time, the AI system will help industries lower energy usage, reducing operational costs and increasing overall efficiency.
- Improved energy management will lead to less dependency on fossil fuels, contributing to a more sustainable production cycle.

2)Lower Greenhouse Gas Emissions & Environmental Impact:

- With reduced energy consumption, there will be a direct decrease in carbon emissions and other pollutants associated with industrial chemical processes.
- Optimized processes will lead to less waste generation, minimizing harmful byproducts and improving compliance with environmental regulations.

3)Scalable AI-Driven Framework for Sustainable Manufacturing:

- The developed AI system will be scalable and adaptable across different chemical manufacturing sectors.
- This innovation can be integrated into existing industrial setups, making sustainable manufacturing more accessible and cost-effective.
- It sets a benchmark for future AI-driven industrial sustainability solutions, encouraging widespread adoption of green technology in chemical production.

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LONG TERM IMPACT:

This AI-powered optimization system has the potential to revolutionize the chemical industry, making it more efficient, environmentally friendly, and cost-effective. By reducing energy use and emissions, it supports a greener, more sustainable future for industrial manufacturing.

PROGRESS TILL REVIEW 1:

COMPLETED:

1)Machine learning algorithm using :

i)random forest regression.

ii)xgbregressor.

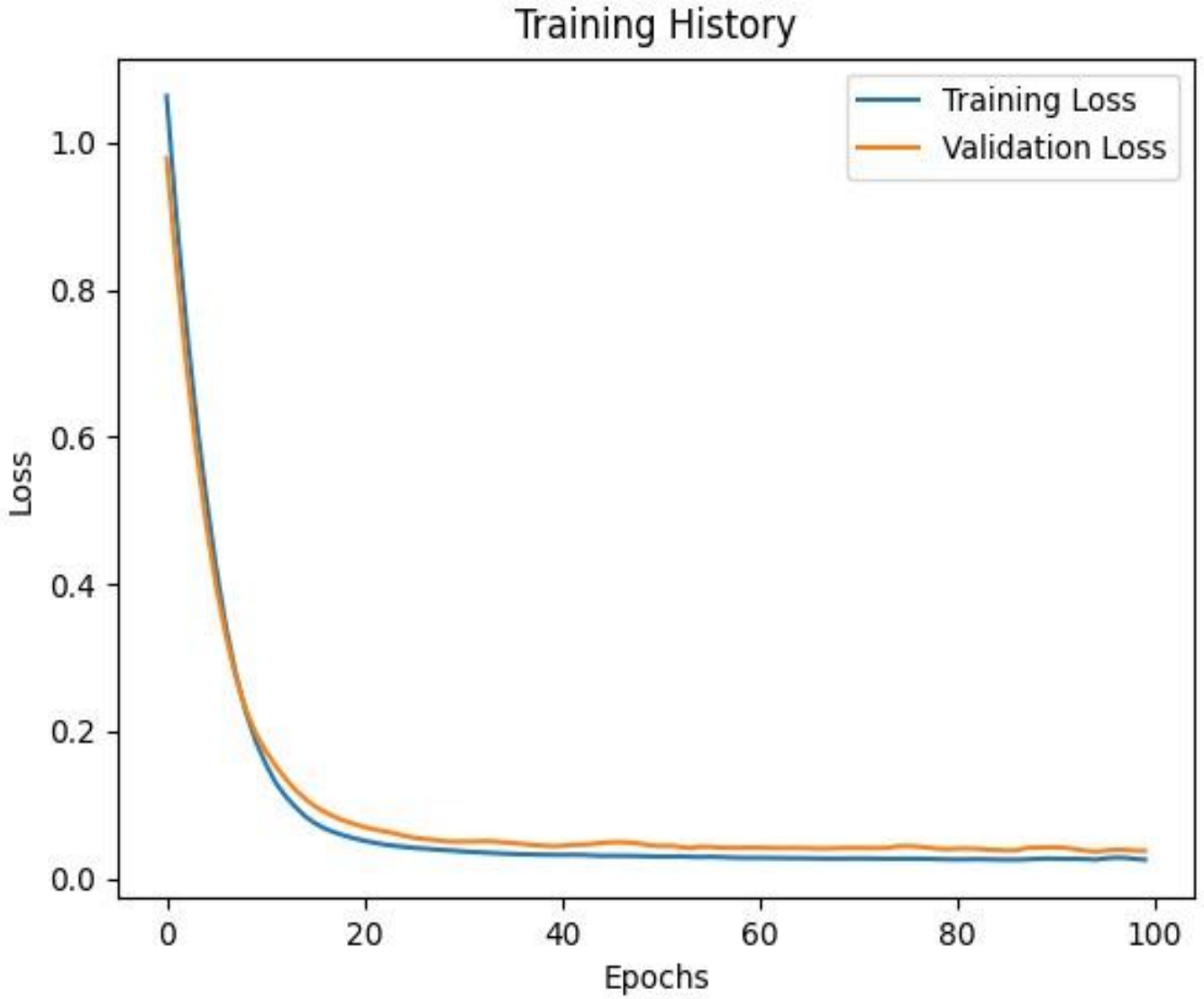
2)Neutral network combining the 2 above models.

3)Physics model to validate dataset output values according to laws of mass and conservation.

THE OUTPUTS :

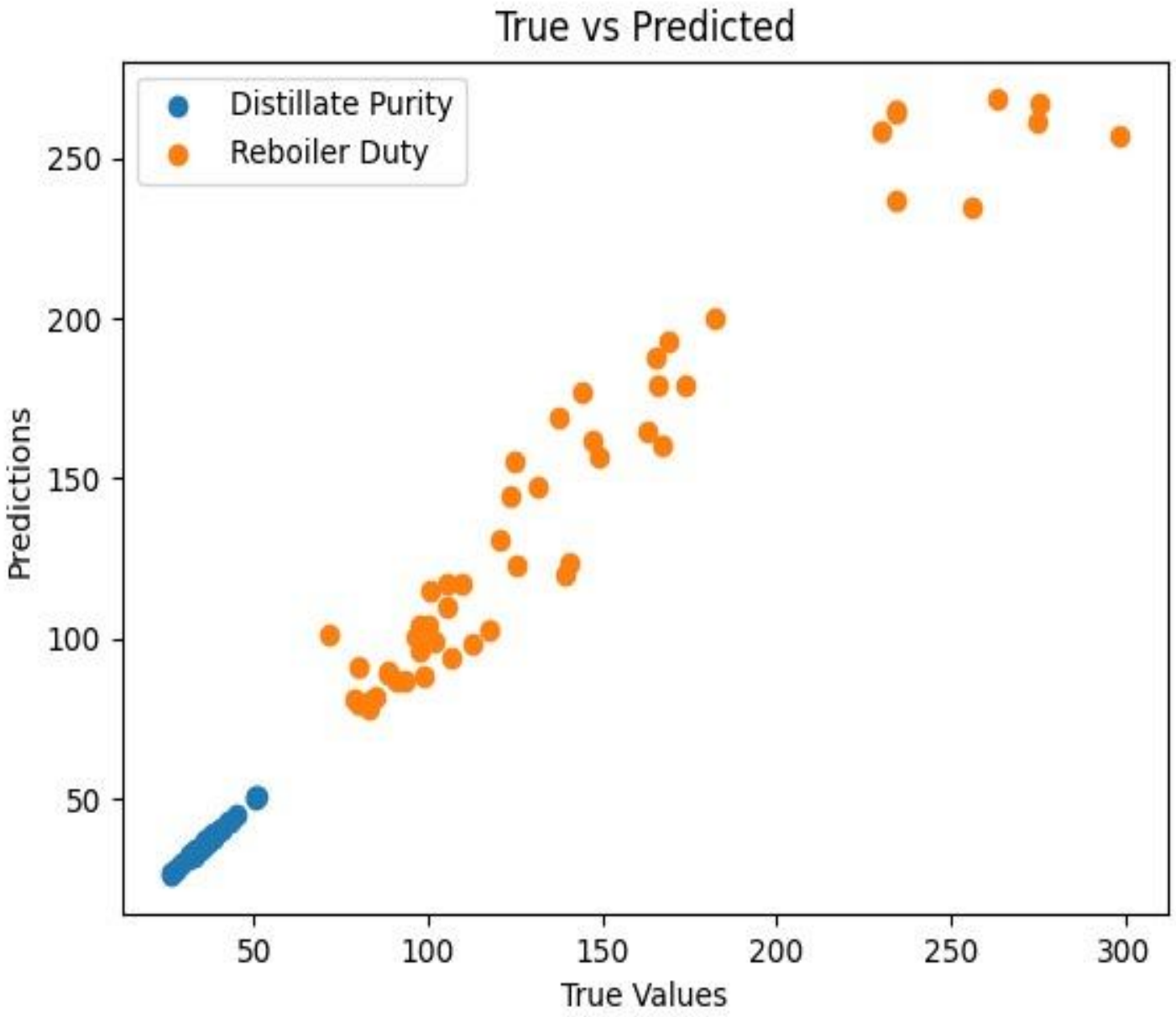
PHYSICS MODEL TEST GRAPH:

OUR MODEL SHOWS MINIMAL LOSS TO THE IDEAL LEVELS ACCORDING TO THIS TEST GRAPH.



COMPARISON GRAPH:

- THE GRAPH SHOWS COMPARISON BETWEEN THE TRUE AND PREDICTED VALUES.
- The graph shows close to linear nature.The linearity proves the validity of our model.



THANKS