Basic Details of the Team and Problem Statement

Ministry/Organization Name/Student Innovation:
Rashtriya Ispat Nigam Limited, Visakhapatnam Steel Plant

PS Code: 1332

Problem Statement Title: Hot metal, Steel Ladle, and Scrap pot Tracking by auto-capturing the Ladle number and locations at SMS-1 and SMS-2.

Team Name: Cyphers

Team Leader Name: Aditya Pandey

Institute Code (AISHE): U-0564

Institute Name: University of Petroleum and Energy Studies

Theme Name: Transportation & Logistics

Idea/Approach Details

Describe your idea/Solution/Prototype here:

Our innovative solution, powered by cutting-edge technologies, aims to revolutionise ladle management and usher in a new era of predictive maintenance and operational excellence.

Real-time Tracking: Using computer vision, we enhance ladle images, perform precise OCR, and improve safety by accurately tracking ladle locations.

Server Security: Our server boasts **resilience against DDoS attacks**, maintains privacy with zero-knowledge proofs, and employs decentralized data storage.

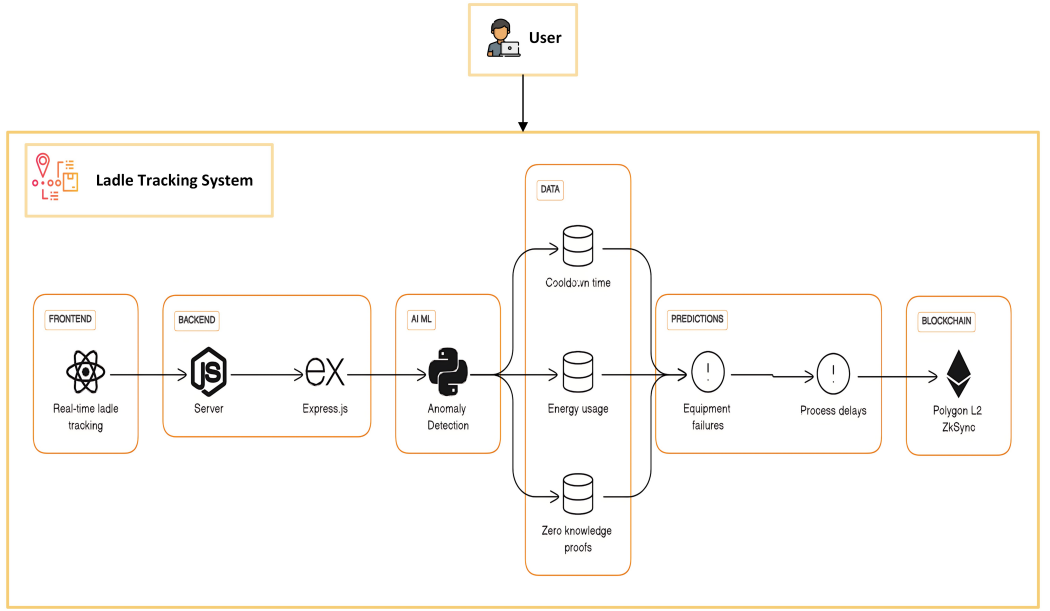
Predictive Machine Learning: By **predicting equipment failures and process delays** while considering ambient conditions, we enhance ladle performance forecasting through our machine learning model.

Data analysis and AI Recommendations : **Early Detection of anomalies** and optimizing parameters leads to **reduced energy consumption** and **significant cost savings** in ladle operations.

Blockchain Security: Our model integrates blockchain to protect ladle data, ensuring **tamper-proof records** and controlled access to historical information.

Testing and Simulation: Employing **digital twins allows us to simulate ladle** operation changes, reducing risks and potential disruptions before implementation.

Low Network Resilience: Our solution remains robust in low connectivity areas, ensuring uninterrupted ladle tracking and minimal latency.



Describe your Technology stack here:

AI/Machine Learning: Python with Scikit-Learn and TensorFlow for AI capabilities.
Blockchain: Hedera Hashgraph for secure, distributed ledger.
Scaling: Polygon L2 ZK-Sync for efficient scaling.
Storage: BTFS for decentralized data storage.
Computer Vision and Recognition : OpenCV for image processing and Tesseract OCR for optical character recognition.
Frontend: React JS and Three.js for dynamic interfaces.
Backend: Node.js and Express.js for server-side logic.

Idea/Approach Details

Describe your Use Cases here

Predictive Maintenance: Using data analysis to predict equipment issues, allowing timely repairs and reducing unplanned downtime, saving resources and increasing efficiency.

AI-Driven Process Optimization: Real-time tracking and AI analysis of ladle data identify bottlenecks, improving ladle operations for enhanced productivity.

Energy Consumption Reduction: Analyzing data for energy efficiency reduces consumption and costs during ladle operations, leading to substantial financial savings.

Real-time Tracking via Computer Vision: Employing computer vision technology for instant, precise object tracking, enabling real-time monitoring and control in various applications.

Describe your Dependencies / Show stopper here

Guarantees **seamless functionality** even in areas with poor network coverage, ensuring **uninterrupted operations**.

Safeguards essential ladle data with the impenetrable security of **Blockchain Technology**.

Maximizes productivity by using advanced algorithms to **predict equipment failures and process delays** with a goal of achieving 100% efficiency.

Creates **real-time digital twins** of ladles through 3D modeling, facilitating comprehensive testing.

Bolsters reliability by employing **computer vision** to capture ladle numbers, **eliminating reliance on external services** and reducing downtime vulnerabilities.

Team Member Details

Team Leader Name:Aditya Pandey

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Member 1 Name: Kartik Gupta

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Member 2 Name: Priyanshi Rai

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Member 3 Name: Md Arslan

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Member 4 Name: Jyotiraditya Singh

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Member 5 Name: Anurag Negi

Branch (Btech/Mtech/PhD etc):Btech | Stream (ECE, CSE etc): CSE | Year (I,II,III,IV): II

Team Mentor 1 Name: **Dr. Ram Kumar**

Category: **Academic** | **Expertise:** **AI/NLP** | **Domain Experience :** **8 years**