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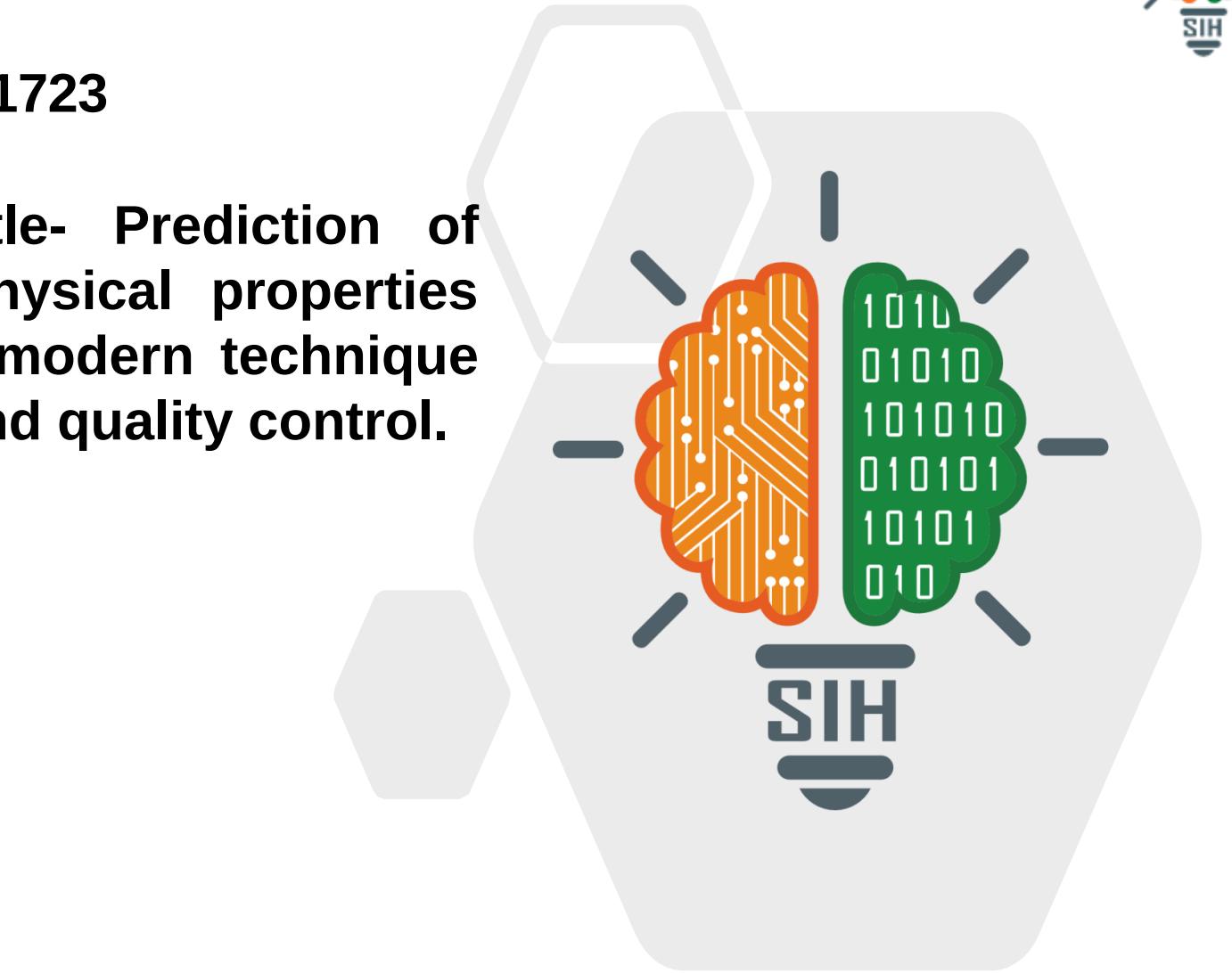
- **Problem Statement ID – 1723**
- **Problem Statement Title- Prediction of Aluminium wire rod physical properties through AI, ML or any modern technique for better productivity and quality control.**
- **Theme- Miscellaneous**
- **PS Category- Software**
- **Team ID- 26331**
- **Team Name- Vital Grid**



IDEA TITLE

Vital Grid

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IDEA/SOLUTION:

- **AI-Powered**: Predicts rod properties (UTS, elongation, conductivity) using AI/ML.
- **Real-Time Monitoring**: Tracks and analyzes key parameters continuously.
- **Instant Adjustments**: Provides predictions and alerts within milliseconds.
- **Seamless Integration**: Works smoothly with existing production systems.

Problem Resolution:

- **Accurate Predictions**: Utilizes AI/ML to precisely predict wire rod properties like UTS, elongation, and conductivity.
- **Dynamic Adjustments**: Continuously adjusts parameters in real-time to ensure high-quality output.
- **Instant Feedback**: Provides immediate monitoring and alerts for quick corrective actions.
- **Seamless Integration**: Integrates efficiently with existing production systems, ensuring smooth operation.

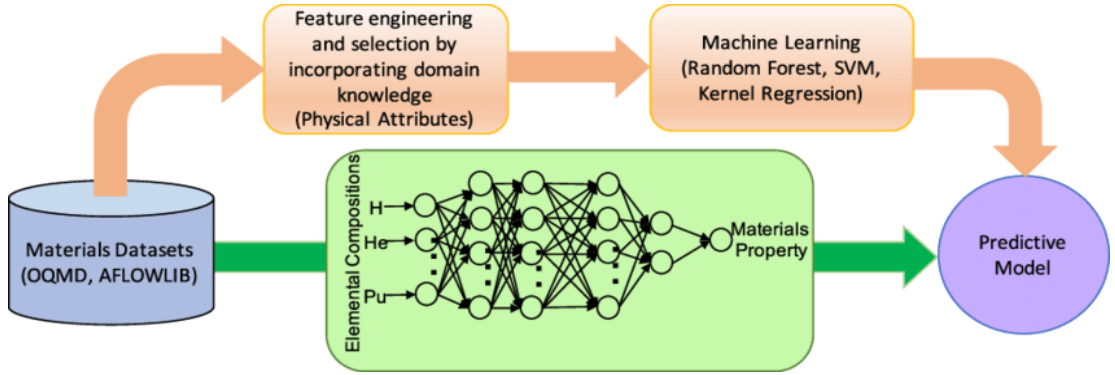
Unique Value Propositions:

- **Accurate Predictions**: AI/ML-driven analysis delivers precise predictions of wire rod properties.
- **Real-Time Adjustments**: Instantly adjusts production parameters to maintain optimal quality.
- **Seamless Integration**: Effortlessly integrates with existing systems for smooth operation.
- **Enhanced Efficiency**: Provides immediate feedback and optimizations, improving productivity and quality control.

TECHNICAL APPROACH

TECHNOLOGY:

- **Data Collection**: IoT Sensors for temperature, pressure, and chemical composition.
- **Data Processing**: Python (NumPy, Pandas), TensorFlow/PyTorch for AI/ML development.
- **Real-Time Monitoring**: Node.js, React.js for dashboard and user interface.
- **Database**: MongoDB for storing real-time data.
- **Integration**: APIs for integrating AI predictions with existing production systems.



Sensors: Collect real-time data.
Data Collection: Stream data via IoT.
Data Storage: Save data in MongoDB.
Data Processing: Process data with Python.
AI/ML Model: Predict properties with TensorFlow/PyTorch.
Real-Time Monitoring: Display and control with React.js and Node.js.
Integration: Apply predictions and adjustments using APIs.

FEASIBILITY AND VIABILITY

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Technical: Advanced AI/ML models can accurately predict properties based on real-time data.

Operational: Seamlessly integrates with existing production systems with manageable training requirements.

Economic: High ROI due to reduced defects and optimized production processes.

Data Management: MongoDB efficiently handles large volumes of data for storage and processing.

Challenge	Solution
Data Quality and Consistency	Implement robust data collection systems and real-time validation checks to ensure high-quality data.
Model Accuracy and Reliability	Use advanced AI/ML models with continuous training and validation to maintain high prediction accuracy.
Integration with Existing Systems	Develop flexible APIs for seamless integration with current production control systems.

Impact

Improved Quality: Consistently produces high-quality aluminium rods with fewer defects.

Boosted Efficiency: Enhances production speed and reduces waste through real-time adjustments.

Cost Reduction: Lowers expenses related to rework and material waste.

Benefit

Consistent Quality: Ensures uniform rod properties, enhancing overall product reliability.

Increased Efficiency: Real-time adjustments minimize waste and optimize production speed.

Cost Savings: Reduces production costs by cutting rework and material waste.

RESEARCH AND REFERENCES

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- **AI and ML for Manufacturing Optimization**
  AI/ML in Production
- **Real-Time Data Integration in Manufacturing**
  Data Integration Solutions
- **Predictive Analytics in Industrial Processes**
  Predictive Analytics
- **Industry 4.0 and Smart Manufacturing**
  Smart Manufacturing