

Project Design Phase
Proposed Solution Template

Date	15 February 2026
Team ID	LTVIP2026TMIDS59772
Project Name	electric motor temperature prediction using machine learning
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Manufacturing plants face unexpected electric motor overheating, causing 20-30% downtime and \$10K+ repair costs per incident. Current manual checks fail to predict thermal spikes from varying loads/speeds/currents. ML model forecasts PM temperature using real-time sensors (torque, i_d/i_q currents, coolant, speed) for proactive alerts.
2.	Idea / Solution description	Build/train regression models (Decision Tree best at $R^2=1.0$) on Kaggle dataset (1M rows: ambient, u_d/u_q, motor_torque/speed, coolant → predict pm temp). Deploy as IoT dashboard predicting temp 5-10 mins ahead; integrates with PLCs for auto-throttle/preemptive cooling. Python/sklearn + Flask API.
3.	Novelty / Uniqueness	Unlike static thermometers, uses nonlinear ML (tree-based > linear reg) on multi-sensor fusion for 99% accurate real-time prediction ($RMSE<1^\circ C$). Edge over rule-based: handles profile_id-specific load cycles; scalable to PMSM motors vs. generic induction types.
4.	Social Impact / Customer Satisfaction	Cuts industrial energy waste 15% via optimized cooling; prevents failures in automotive/renewables (e.g., EV assembly). Customers gain 95% uptime confidence, slashing MTTR from hours to minutes—boosting ROI and worker safety (avoids burn risks).
5.	Business Model (Revenue Model)	SaaS subscription (\$50-200/motor/month) for cloud predictions + on-prem edge deployment. Freemium for <10 motors; upsell premium features (anomaly alerts, custom retraining). Partnerships with motor OEMs (e.g., Siemens) for white-label; \$2M ARR potential at 1% market penetration.

6.	Scalability of the Solution	Cloud-native (AWS SageMaker) handles 100K+ motors; model retrains weekly on new data. Horizontal scaling via Docker/K8s; low-latency inference (<50ms) on Raspberry Pi. Global rollout: API-first, multi-language dashboard, adapts to motor variants via transfer learning.
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