

Format for CSR Proposals of Social Relevance

1. Title of Project: Deep Learning based Predictive Modeling of Environmental Parameters

2. Background/Motivation: The presence of particulate matter (PM) and pollutants such as Sulphur Dioxide (SO₂), Nitrogen oxides (NO_x), Carbon Monoxide (CO) etc. in the atmosphere beyond a threshold limit is known to cause various health issues (e.g. asthma, allergy, increased mortality rate and premature deaths). They also affect the economy in several ways, e.g. heavy haze and smog during winters lead to accidents on highways causing damage to infrastructure, loss of property etc. Due to increased urbanization, industrialization and various factors such as deforestation, private mode of transport, boost in real estate, the air pollutants are rapidly increasing in the atmosphere. Many nations have formed consortiums to combat such issues by assessing their impact in the upcoming years. In recent years, effort towards developing accurate environmental models using various approaches has gained a lot of momentum.

3. Objectives of the project: The objective of this project is to first collect and analyze the complex environmental data through various state-of-the-art time series techniques. Based on this outcome, machine learning (ML) methods are going to be utilized to capture the dynamic trends of a large number of environmental parameters including particulate matter and pollutants that cause long-term health hazards. While developing such ML based models, intelligent formulations would be placed so that models do not get over-fitted with the data used to make them more robust. To identify the most significant features, ML based sensitivity analysis will be performed to enable a decision maker to find the most crucial environmental parameters to control.

4. Brief Methodology: Some salient methodological features of this project are mentioned below:

- Real-time sensor big-data analysis using state-of-the-art time series handling techniques
- Nonlinear deep learning based time series modeling of large number of environmental parameters.
- Auto-tuned Deep ML model design using neural architecture search strategy.

- Feature engineering using ML based Global Sensitivity Analysis using Monte Carlo approaches

5. Target population/Beneficiaries: Companies working in climate change, Software companies interested in climate change, Municipal corporations, State and Central Government agencies.

6. Expected Outcome/Deliverables:

This project connects with the United Nations goals of Sustainable cities and communities and Climate action. This kind of predictive models of environmental parameters are going to help the policy makers to take informed decision on controlling the prevailing practices in cities by acquiring accurate futuristic predictions of the environmental parameters. This helps directly in designing smart and sustainable Indian cities, where people will be able to live healthy.

Deliverables: ML models capable of predicting the dynamic trends of environmental parameters in future.

7. Timeline and Budget:

	Year 1	Year 2	Year3
Budget (in Rs lakhs)	6.9	6.9	6.9
Milestones	1. Data collection (data from literature), 2. Data analysis, 3. Auto ML based formulation to build ML model # 1	1. Auto ML based formulation to build ML model # 2, 2. Comparative analysis of several ML models, 3. Proof of the concept on literature data	1. Sensitivity analysis, 2. Application of such framework on data of an Indian City (accuracy subject to the data availability), 3. Final Report submission.

8. Proposer Name & Designation:

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