**AIML Assignment 1**

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**SDG emphasis**

**SDG 12: Consumption and Production**

This goal is centred on extending the idea of RE on the notion of responsible consumption and production for the conservation of the earth’s resources and the support of sustainable economic growth. Eco-efficiency, particularly in the use of energy from fossil fuels to renewable energy, is the key to this goal. In that regard, by extending cleaner energy products, it is possible to solve the environmental problems, as well as work on energy systems and improve the quality of life and economic reliability globally.

**Problem Statement**

Hawkes, M. & Oreshkine, A. (2020). UNosos Uses Artificial Intelligence to identify High Coal Dependency in Energy Generation to Support Climate Action (SDG 13)

Coal is still one of the leading sources of energy that creates vast amounts of greenhouse gas emissions many countries continue to use it as the primary means of power. These make coal as a source of energy have the following implications; environmental implications, economic implications, health implications with emphasis on climate change implication. Barring the utilization and embracing the use of coal in energy production is the key to reversing the impacts of climate change and inching closer to climate change goals. By identifying countries that are highly dependent on coal for electricity generation, we can:

Target High-Impact Regions for Intervention: When we plot highly coal-reliant nations, one can easily see which areas would gain the most from targeted reforms to reduce their over-dependence on the fossil fuel.

Inform Policy Recommendations for Energy Diversification: Such data can prove very useful to policy makers as they try to formulate a new plan or modify the existing one focusing on the use of coal, investment in cleaner energy technologies and encouraging advancements in efficiency improvements.

Guide Sustainable Investments: The characterization of the value-added coal regions shows the presence of clean energy investment destinations. These areas can therefore be regarded as funding priorities for financial institutions and governments so as to support projects which contribute to the development of a sustainable energy status.

**How the Code Facilitates This Aim**

The code written here is designed to work on energy data and derives mainly the dependency of electricity on coal. Here’s how it works:

Data Processing and Cleaning: In data cleansing, the code deals with missing values, which helps the program to have a neat structure of data in order to analyze it correctly.

Categorization of Coal Dependency: This means that the code has a set of labels of low, medium and high depending on the coal electricity usage. Such a segmentation helps to have a better perspective on countries’ dependence on coal and make the data analysis easier.

Class Imbalance Handling with SMOTE: Another imbalance problem in the case of the given data is solved using SMOTE (Synthetic Minority Over-sampling Technique) for generating artificial samples within the dataset. SMOTE offers improvement in the contrivance of training as it avoids overshadowing of one category of coal dependency through training the model for all the categories hence improving the rate of prediction.

Predictive Modeling: The knowledge that is amassed within this model will allow for the identification of a country’s coals dependency level given its energy signature. This predictive capacity is useful for governments, organisations and researchers who want to track coal dependence, analyse trends and establish realistic climate indicators.

**Next Steps for Actionability**

To transform this analysis into actionable insights, the following steps are recommended:

Training a Classification Model: The performing of the classification model like logistic regression or decision tree on a balanced dataset will enable classification of the countries by their energy attributes. This model could be used to do a foresight on what the level of dependence a country could have on coal in the future, so that one can make some right policies or probably some right investment decisions.

Identifying Regional Trends and Insights: When inspecting the model results, it is possible to identify some tendencies which may be related to geographical or economical indicators of high coals consumption. For example, countries with low income will have higher dependency ratios because they can only afford to harness renewable energy technologies, whereas some regions particularly those with accessible coal resources will exhibit high dependency ratios.

Model Validation with Recent Data: The model’s predictions should be periodically checked against the most recent information in order to be sure that the indicators have remained viable and useful. This validation aids in following the status of the depreciation of the use of coal and establish change in dependency status due to alterations in national policies or technically, or economics.

Developing Targeted Interventions and Policy Recommendations: From it, policymakers can be informed on how best to help inform and/or write legislation, regulation or a social marketing strategy that seeks to decrease the use of coal. For instance, governments could provide grants on investing in renewable energy sources, or taxes on carbon emissions or subsidies on cleaner technologies in regions that are ear-marked as significant coal users.

Encouraging Global Collaboration and Investments: In the same way, by identifying the countries and regions where the proportion of the share of coal-inclusive primary energy is high, this project may help global organizations and investors to address these areas and initiate the implementation of the cleaner generator. Funds channeled towards development of renewable energy like solar or the wind, could enhance the shift from coal, and so foster sustainable development.

Conclusion

This project also nicely ties into SDG 12 (Responsible Consumption and Production). By providing energy data, it raises awareness against wasteful energy consumption and contributes to global endeavours to reduce climate change. Through mapping out high coal regions to contribute towards policies and focus a sustainable investment, this project is part of the Global Shape of a sustainable environment and the Economy.