Enhanced Energy Consumption Prediction Using Deep Learning and Ensemble Methods

Project Overview:

In Phase 2, we will build upon the foundation established in Phase 1 and focus on implementing advanced techniques to enhance the accuracy and robustness of our energy consumption prediction system. We will leverage deep learning architectures and ensemble methods to make more accurate predictions of future energy consumption patterns.

Project Phases:

1. Data Preparation and Preprocessing:

- Download and preprocess the energy consumption dataset from the provided Kaggle link.
- Handle any missing data and perform feature engineering to create relevant features.
- Normalize or scale the data as necessary.
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2. Model Selection:

- Explore different deep learning architectures, including recurrent neural networks (RNNs), long short-term memory (LSTM) networks, and convolutional neural networks (CNNs).
- Implement ensemble methods like Random Forest and XGBoost for comparison.
- Determine the most suitable models based on performance in a preliminary assessment.

3. Hyperparameter Tuning:

- Conduct hyperparameter tuning for selected models to optimize their performance.
- Use techniques such as grid search or random search to find the best hyperparameters.

4. Model Training:

- Train the selected models on the preprocessed dataset, using the optimized hyperparameters.
- Keep track of model training progress and monitor for overfitting or underfitting.

5. Evaluation and Validation:

- Evaluate model performance using relevant regression metrics (e.g., Mean Absolute Error, Mean Squared Error).
- Utilize cross-validation to assess model generalization.
- Compare the deep learning models with ensemble methods to identify the best-performing model.

6. Model Deployment Plan:

- Develop a plan for deploying the selected model in a real-time or batch prediction system.
- Ensure that the deployment process is well-documented and ready for integration into the existing energy management system.

7. Documentation and Reporting:

- Maintain detailed documentation of all work, including code comments, model descriptions, and hyperparameter settings.
- Prepare a Phase 2 report summarizing the work done, challenges encountered, and the results achieved.

8. Phase 2 Submission:

- Prepare the Phase 2 submission according to the specified format, including a summary of the project, a link to the project documentation, and any other required details.

9. Phase 3 Planning:

- Begin planning for Phase 3, where we can focus on scalability, system integration, and further improvements based on the project's objectives and feedback.

10. Regular Updates and Collaboration:

- Maintain open communication within the team, sharing insights and progress regularly.
- Be prepared to adapt and make necessary adjustments as the project evolves.

This Phase 2 project plan should set the stage for implementing advanced techniques to improve energy consumption prediction. Be sure to continuously align your work with the project's goals and objectives, and make the most of the available data and resources.