**1.Title: A physics-informed and attention-based graph learning approach for regional electric vehicle charging demand prediction**

- **Paper Name**: IEEE_TRANSACTIONS_ON_INTELLIGENT_TRANSPORTATION_SYSTEMS_2021_A physics-informed and attention-based graph learning approach for regional electric vehicle charging demand prediction
- **Author(s)**: Qu, H.; Kuang, H.; Li, J.; You, L.
  **Journal**: IEEE Transactions on Intelligent Transportation Systems
  **Publisher**: IEEE
- **Published Year**: 2021
- **Workflow/Process**: The paper proposes a novel approach named PAG, integrating graph and temporal attention mechanisms for feature extraction and physics-informed meta-learning for model pre-training, addressing misinterpretations in EV charging demand prediction .
- **Methodology**: The methodology involves combining graph embedding and multivariate time-series decoding, utilizing attention mechanisms to enhance feature representation .
- **Approaches**: The approach includes the use of graph convolutional networks (GCNs) and recurrent neural networks (RNNs), enhanced by attention mechanisms to improve model flexibility and performance .
- **Source**: Not provided
- **Dataset**: Not provided
- **Dataset Availability/Public/Open Accessible**: Not provided
- **Dataset Source Link**: Not provided
- **Research Gaps**: The paper identifies limitations in existing models regarding the relationship between EV charging demand and price, suggesting that further exploration is needed in this area .
- **Research Key Findings**: PAG outperforms state-of-the-art methods by approximately 6.57% in forecasting errors and effectively reduces misinterpretations between charging demands and prices .
- **Paper's Results/Output**: PAG shows significant improvements over traditional models, including a 61.3% average improvement over VAR and various percentage improvements in RMSE, MAPE, RAE, and MAE compared to LSTM and other models .

**2. Title: Demand Forecasting for Electric Vehicle Charging Stations using Multivariate Time-Series Analysis**

- **Paper-name**: (2025_Demand Forecasting for Electric Vehicle Charging Stations using Multivariate Time-Series Analysis)
- **Authors**: Saba Sanami, Hesam Mosalli, Yu Yang, Hen-Geul Yeh, Amir G Aghdam
- **Journal**: Not specified
- **Publisher**: None
- **Published-year**: 2025
- **Workflow/Process**: The paper outlines a structured approach starting with problem definition, followed by the proposed learning-based method, and concludes with comparative simulation results and remarks.
- **Methodology**: Utilizes a multivariate long short-term memory (LSTM) network with an attention mechanism for predicting EV charging demand at 15-minute intervals.
- **Approaches**: Incorporates explainable AI techniques, specifically SHapley Additive exPlanations (SHAP), to assess the impact of various factors on predictions, enhancing decision-making for infrastructure planning.
- **Source**: arXiv:2502.16365v1[eess.SY]
- **Dataset**: Comprises 70,080 samples collected over two years, structured with 96 past step sequences and 21 features.
- **Dataset-availability/Public/Open-accessible**: Not specified
- **Dataset-source-link**: Not specified
- **Research-gaps**: The paper addresses the increasing demand for EV charging stations and the challenges of long wait times and insufficient infrastructure.
- **Research Key Findings**: The proposed method effectively forecasts EV charging demand, providing insights into the influence of various factors on prediction accuracy.
- **Paper's Results/Output**: Demonstrated efficacy through simulations using test data from EV charging stations, indicating improved management of charging infrastructure.

**3. Title: Machine Learning Based Forecasting of EV Charging Load in a Parking Lot for Optimal Participation in Frequency Services**

- **Paper-name**: (2024_Machine Learning Based Forecasting of EV Charging Load in a Parking Lot for Optimal Participation in Frequency Services)
- **Authors**: Julian Marius Mittag, Marius Secchi, Jan Martin Zepter, Anna Martin, Mattia Marinelli
- **Journal**: Not specified
- **Publisher**: None
- **Published-year**: 2024
- **Workflow/Process**: The study involves forecasting EV load and optimizing market participation through a decision-making algorithm. It analyzes a dataset from a single parking lot to create artificial parking lots, considering various factors affecting profitability and load curves .
- **Methodology**: The methodology includes a forecasting algorithm for EV load and a decision-making market participation algorithm .
- **Approaches**: The study employs a rolling horizon optimization model that allocates available capacity to frequency services based on historical EV load data, with adjustments made in late auctions .
- **Source**: Not specified
- **Dataset**: A dataset from a single parking lot is used to create artificial parking lots .
- **Dataset-availability/Public/Open-accessible**: Not specified
- **Dataset-source-link**: Not specified
- **Research-gaps**: The study acknowledges limitations due to potential anomalies in the original dataset affecting the artificial parking lots .
- **Research Key Findings**: The profitability for a full year is likely higher than calculated due to seasonal demand variations and potential price increases in spring and summer .
- **Paper's Results/Output**: The results indicate that the model can effectively manage EV load for frequency services, with a focus on user convenience and the potential for continuous activation of aggregated EVs .

**4. Electric Vehicle Charging Load Forecasting_A Comparative Study of Deep Learning Approaches**

- **Paper Name**: Energies_2019_Electric Vehicle Charging Load Forecasting_A Comparative Study of Deep Learning Approaches
- **Author(s)**: Zhu, J.; Yang, Z.; Mourshed, M.; Guo, Y.; Zhou, Y.; Chang, Y.; Wei, Y.; Feng, S.
  **Journal**: Energies
  **Publisher**: MDPI
  **Published Year**: 2019
- **Workflow/Process**: The paper is organized into sections covering background, methodology, data analysis, experimental results, and conclusions. It includes a detailed discussion of the charging data and comparative studies of various models used for load forecasting .
- **Methodology**: The study employs deep learning methods, particularly LSTM, for load forecasting, focusing on minute-level data from electric vehicle charging stations .
- **Approaches**: The research utilizes a hybrid LSTM model and compares it with other models like ANN, RNN, GRU, and Bi-LSTM. It emphasizes the importance of hyper-parameter tuning and dropout layers to prevent overfitting .
- **Source**: The dataset is derived from a large-scale PEV charging station in Shenzhen .
- **Dataset**: The dataset includes minute-level charging load data collected over a year from 1 July 2017 to 30 June 2018 .
- **Dataset Availability/Public/Open-Accessible**: Not specified in the provided contexts.
- **Dataset Source Link**: Not specified in the provided contexts.
- **Research Gaps**: The paper identifies challenges in load forecasting due to the complexities introduced by renewable energy sources and the stochastic nature of EV charging behavior .
- **Research Key Findings**: The LSTM model outperforms other models in forecasting accuracy, particularly in minute-level load forecasting, with lower MAE and RMSE values .
- **Paper's Results/Output**: The LSTM model achieved MAE values of 0.4782, 0.5734, and 0.5500 across different time steps, demonstrating superior performance compared to ANN and other models .

**5. Title: EV load forecasting using a refined CNN-LSTM-AM**

- **Paper-name**: Elsevier_2019_EV load forecasting using a refined CNN-LSTM-AM
- **Author**: Not provided
- **Journal**: Not provided
- **Publisher**: Elsevier
- **Published-year**: 2019
- **Workflow/Process**: The paper proposes a hybrid CNN-LSTM-AM model that utilizes two time series with different intervals for multi-step prediction, addressing the limitations of single-series approaches. The model processes input through convolution layers to generate a feature matrix, which is then used for predictions .
- **Methodology**: The methodology involves combining two sequences with different intervals through matrix transformation, followed by a one-dimensional convolutional structure to remap features while preserving temporal information .
- **Approaches**: The hybrid model integrates convolutional neural networks (CNN) with Long Short-Term Memory (LSTM) networks and an attention mechanism (AM) to enhance prediction accuracy .
- **Source**: Not provided
- **Dataset**: The ACN dataset, which includes fine-grained charging data for electric vehicles .
- **Dataset-availability/Public/Open-accessible**: Publicly available .
- **Dataset-source-link**: Not provided
- **Research-gaps**: The study identifies the need for improved forecasting methods that consider environmental factors and the behavior of EV owners, which were not included in the current research .
- **Research Key Findings**: The CNN-LSTM-AM model significantly outperforms single models in multi-step forecasting, achieving the lowest RMSE and MAE values compared to other models .
- **Paper's Results/Output**:
    - RMSE values: 0.9519, 1.4529, 1.7991, 1.9896, 2.1325 for different prediction steps.
    - MAE values: 0.5268, 0.8665, 1.1230, 1.3253, 1.3898 for different prediction steps.
    - For 96-step ahead forecasting, RMSE decreased by 15.2%, MAE decreased by 3.1%, and $R^2$ increased by 16.8% compared to the Transformer model .

**6. Title: Multi-Feature Data Fusion-Based Load Forecasting of Electric Vehicle Charging Stations Using a Deep Learning Model**

- **Paper Name**: (Energies_2023_Multi-Feature Data Fusion-Based Load Forecasting of Electric Vehicle Charging Stations Using a Deep Learning Model)
- **Authors**: Prince Aduama, Zhibo Zhang, Ameena S Al-Sumaiti (Corresponding Author)
- **Journal**: Energies
- **Publisher**: None
- **Published Year**: 2023
- **Workflow/Process**:
    - The study employs a data fusion approach to enhance the accuracy of EV charging load forecasting. It integrates multiple features, including historical weather data, into a deep learning model for robust predictions. The process involves breaking down time indices using empirical mode decomposition and implementing a particle filter for estimation.
- **Methodology**:
    - A variant of the Long Short-Term Memory (LSTM) model, specifically the gated recurrent unit (GRU), is utilized for forecasting. The model incorporates multi-feature inputs to improve prediction accuracy.
- **Approaches**:
    - The approach includes data fusion to combine predictions from different inputs, leading to three distinct charging load predictions based on various features. This method contrasts with conventional LSTM models that typically provide a single prediction.
- **Source**:
    - The paper is sourced from the journal Energies, published in 2023.
- **Dataset**:
    - The dataset includes historical weather data (wind speed, temperature, humidity) and EV charging records.
- **Dataset Availability/Public/Open-Accessible**:
    - The dataset's availability is not explicitly mentioned in the provided context.
- **Dataset Source Link**:
    - Sorry, can't generate citation of the paper due to insufficient data.

- **Research Gaps**:
    - The paper identifies a gap in the application of data fusion techniques for EV load forecasting, which has not been previously implemented.
- **Research Key Findings**:
    - The proposed model achieved a mean absolute prediction error of 3.29%, indicating improved accuracy over traditional LSTM models.
- **Paper's Results/Output**:
    - The results suggest that the data fusion model can significantly enhance EV load forecasting, optimizing energy requirements for charging stations .

**7.Title: Prediction of Electric Vehicle Charging Using _Machine Learning**

- **Paper Name**: IEEE_Prediction of Electric Vehicle Charging Using _Machine Learning
- **Author**: Not provided
- **Journal**: IEEE Access
- **Publisher**: IEEE
- **Published Year**: Not provided
- **Workflow/Process**: The dataset was prepared for analysis by ensuring it was clean, consistent, and ready for statistical analyses. Specifically, 97% of records containing user IDs were considered, with 70% of that data used for training to enhance accuracy .
- **Methodology**: The study employed various machine learning algorithms, including decision trees, random forests, and neural networks, to predict electric vehicle (EV) charging demand .
- **Approaches**: The research utilized a dataset of EV charging data collected from multiple sources, including charging stations and mobile applications. Random forests were found to outperform decision trees in prediction accuracy .
- **Source**: Not provided
- **Dataset**: EV charging data collected from various sources, including charging stations and mobile applications .
- **Dataset Availability/Public/Open Accessible**: Not specified
- **Dataset Source Link**: Not provided
- **Research Gaps**: Challenges include limited availability of real-world data and the need for further testing and validation of machine learning applications in EV charging .

- **Research Key Findings**: The study found that machine learning algorithms, particularly random forests, can accurately predict EV charging demand, with random forests showing lower error rates compared to linear regression .
- **Paper's Results/Output**: The random forest model achieved a Mean Squared Error (MSE) of 646.17, significantly lower than the linear regression model's MSE of 886186.43, indicating better predictive performance .

**8. Title: Prediction of Electric Vehicles Charging Demand: A Transformer-Based Deep Learning Approach**

- **Paper Name**: (Sustainability_2023_Prediction of Electric Vehicles Charging Demand: A Transformer-Based Deep Learning Approach)
- **Authors**: Sahar Koohfar, Wubeshet Woldemariam, Amit Kumar (Corresponding Author)
- **Journal**: Sustainability
- **Publisher**: None
- **Published Year**: 2023
- **Workflow/Process**: The study involves transforming raw individual EV charging session data into a demand profile, aggregating data per day, and removing missing or negative entries. The dataset is then split into training (80%) and testing (20%) sets, followed by normalization before model training.
- **Methodology**: The paper employs a Transformer model for forecasting EV charging demand, comparing its performance against traditional models like ARIMA, SARIMA, and deep learning models such as RNN and LSTM.
- **Approaches**: The research focuses on time series methodologies, utilizing both traditional statistical models and deep learning techniques to predict charging demand over short (7 days) and long (30 and 90 days) time frames.
- **Source**: The study fills a gap in literature regarding the application of attention-based mechanisms for EV charging demand forecasting.
- **Dataset**: The dataset consists of two years of time-stamped aggregate power consumption data from 2400 charging stations located in Washington State and San Diego.
- **Dataset Availability/Public/Open-Accessible**: The dataset is not explicitly stated as open-accessible in the provided context.

- **Dataset Source Link**: Sorry, can't generate citation of the paper due to insufficient data.
- **Research Gaps**: The literature review highlights a lack of research on forecasting EV charging using attention-based mechanisms, despite their potential to outperform recurrent neural networks.
- **Research Key Findings**: The Transformer model outperforms traditional models (ARIMA, SARIMA) and deep learning models (RNN, LSTM) in both short-term and long-term EV charging demand predictions.
- **Paper's Results/Output**: The results indicate that the Transformer model effectively addresses time series forecasting challenges, particularly in predicting EV charging demand, as evidenced by lower RMSE and MAE compared to other models .

**9. Title: Prediction of EV Charging Behavior using Machine Learning**

- **Paper Name**: (2017_Prediction of EV Charging Behavior using Machine Learning)
- **Authors**: Sakib Shahriar, A R Al-Ali, Ahmed H Osman, Salam Dhou, Mais Nijim
- **Journal**: Not specified
- **Publisher**: None
- **Published Year**: 2017
- **Workflow/Process**: The paper begins with background information on machine learning concepts, followed by a detailed methodology including dataset description and experimental setup. Results are presented and discussed, leading to future research directions and conclusions.
- **Methodology**: The study employs various machine learning algorithms, including Random Forest (RF), Support Vector Machine (SVM), XGBoost, and Artificial Neural Networks (ANN) for predicting session duration and energy consumption.
- **Approaches**: A novel approach is proposed that integrates weather, traffic, and local events data with historical charging records to enhance prediction accuracy. The RF algorithm is utilized for visualizing variable importance and feature selection.
- **Source**: Not specified
- **Dataset**: The dataset used is the adaptive charging network (ACN) dataset.

- **Dataset Availability**: Not specified if the dataset is public or open-accessible.
- **Dataset Source Link**: Not provided
- **Research Gaps**: The paper identifies the need for improved prediction accuracy by incorporating additional data beyond historical charging information.
- **Research Key Findings**: The inclusion of additional data positively impacts prediction accuracy, significantly improving upon previous work that relied solely on historical data.
- **Paper's Results/Output**: The most important predictors for session duration are identified as maximum traffic after arrival and time of connection, while historical average consumption is the key predictor for energy consumption .

**10. Title: Short-Term Load Forecasting for Electric Vehicle Charging Stations Based on Deep Learning Approaches**

- **Paper Name**: Appl. Sci. 2019_Short-Term Load Forecasting for Electric Vehicle Charging Stations Based on Deep Learning Approaches
- **Authors**: Juncheng Zhu, Zhile Yang, Yuanjun Guo, Jiankang Zhang, Huikun Yang
- **Journal**: Applied Sciences
- **Publisher**: MDPI
- **Published Year**: 2019
- **Workflow/Process**: The paper discusses the forecasting of electric vehicle (EV) charging loads, addressing the challenges posed by the stochastic nature of EV charging behaviors and the impact on power systems.
- **Methodology**: The study employs four deep learning approaches to model and forecast EV charging loads from the perspective of charging stations.
- **Approaches**: The four featured deep learning models include Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRU), among others, which are compared based on their forecasting performance.
- **Source**: The research is based on historical data related to EV charging scenarios.
- **Dataset**: The dataset consists of hourly-based historical data on EV charging.
- **Dataset Availability**: The dataset is not explicitly stated as open-access or publicly available.
- **Dataset Source Link**: No specific link provided for the dataset.

- **Research Gaps**: The paper identifies the need for accurate forecasting models to mitigate the impact of EV charging on power systems.
- **Research Key Findings**: The GRU model demonstrated the best performance in forecasting EV charging loads, indicating its potential as a reliable tool for short-term load forecasting.
- **Paper's Results/Output**: The results highlight the effectiveness of deep learning models, particularly GRU, in improving the accuracy of hourly-based EV load forecasting .