Energy Consumption at Slow Charging Infrastructure for EV

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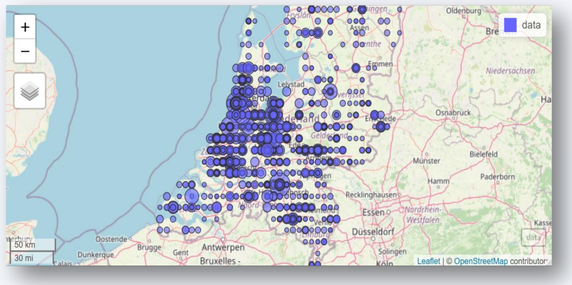
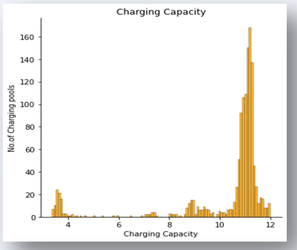
INTRODUCTION

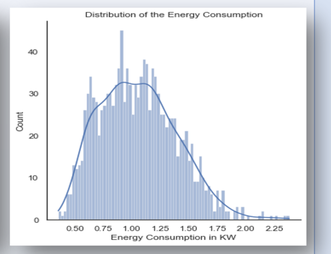
In the 21st century, Electronic mobility has seen a continuous growth due to an increased focus on renewable energy and environmental issues. Therefore, it's necessary to develop an accurate algorithm to predict the power demand of electronic mobility for policy, technical and environmental decision support.

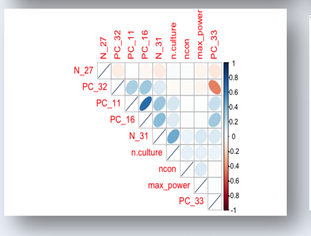


RESEARCH DATA

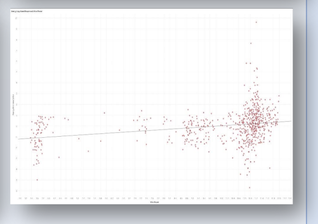
Dataset was collected as part of the EVnetNL dataset and has a total of 119 attributes which belong to 9 categories, including space, population, economic development, and transportation information.







Feature Correlation



Charging Point at Netherland

DATA CLEANING

Remove Constant Features → Remove Quasi-Constant Features → Remove Correlated Features

FEATURE SELECTION

Feature selection was performed using Lasso regression, Random forest.

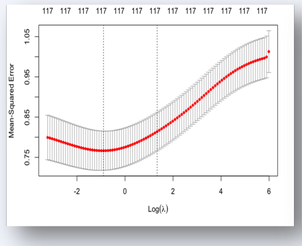
REGRESSION MODEL

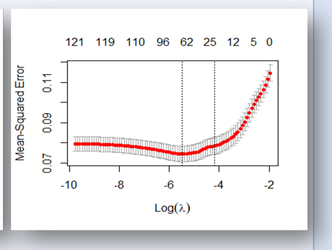
- Lasso and Ridge Regression
- XGboost LightGBM RandomForest
- Stacking(All Model Combine Together)

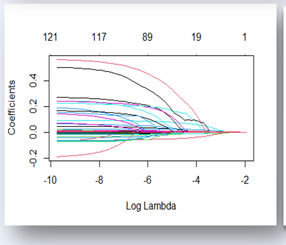
MODEL ANALYSIS

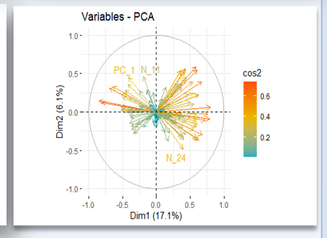
Lasso, Ridge & PCR

Lasso, Ridge and PCR was conducted for dimension regression after which the regression was applied to reduce complexity and attain better results.



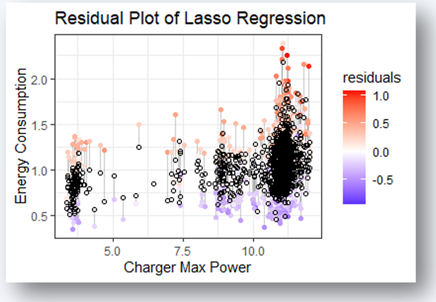


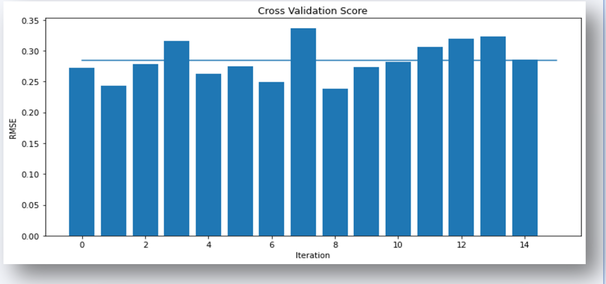


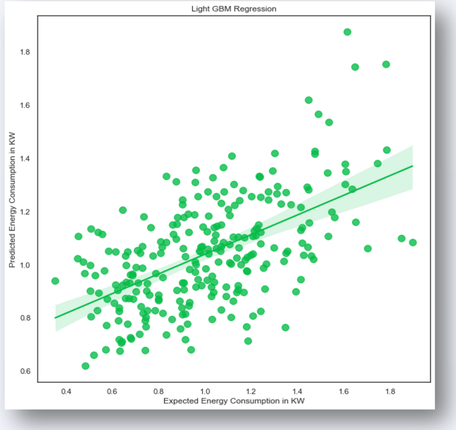


Tree Model

Tree model uses bootstrap to extract data and select subset features to train sub-tree, which maintains the diversity of sub-trees. Therefore, it is robust..

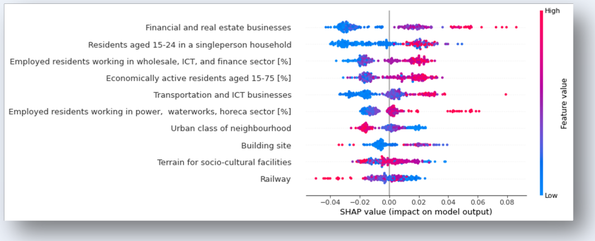






Stacking

Stacking was implemented as multiple heterogeneous weak learners can be used make better predictions and improve the model robustness. However, this was not the case.



RESULT EVALUATION

Model Name	Mean Square Error
Ridge Regression	0.698
Lasso Regression	0.070
Random Forest	0.072
XGboost	0.074
LightGBM	0.068
Stacking	0.092
PCR	0.073

CONCLUSION

1. Polynomial regression can be explored to help improve the accuracy.
2. Economic prosperity has strong relationship between energy consumption and locational factors.
3. Business types and Population characteristics are linked to the energy consumption at charging pools placed based on the demand.

TAKEAWAYS

1. Lasso regression and PCR proved that a dimension reduction using linear regression did not work as well as expected.
2. Polynomial regression can be explored to help improve the accuracy.
3. Lasso and random forests performed the best as compared to other models and had the lowest MSE.
4. Stacking the models didn't work as well as the individual models themselves
5. Deep learning models could be explored for better accuracy.

QR FOR MORE DETAIL