Hertie School of Governance

PREDICTING GERMAN ELECTION WITH MACHINE LEARNING

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MOTIVATION

Social science's endeavor to predict election outcomes bears significant social, political and economic implications in understanding voting behaviour.

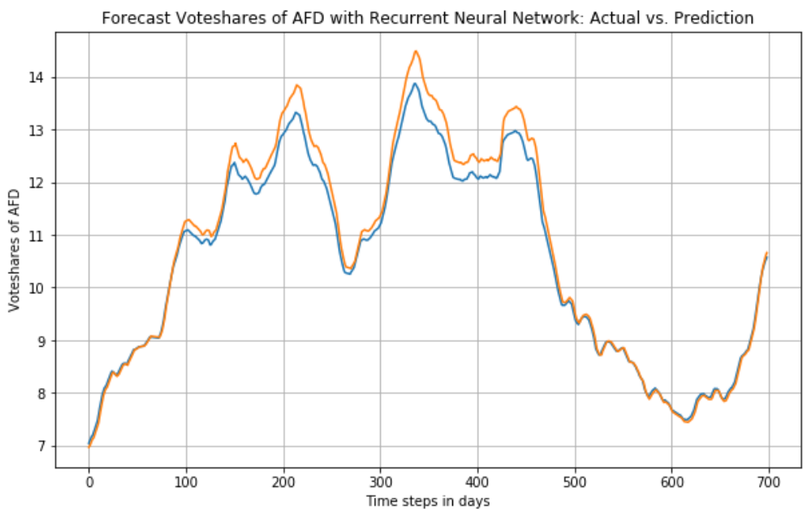
Current state of the art models with advanced statistical methods such as dynamic Bayesian with random-walk approach proposed by Stoetzer, Gschwend, Munzert & Sternberg (2019) captures vote shares in a multiparty election system, but lacks interpretability.

Our research seeks to utilize Machine Learning and Deep Learning techniques to predict the results of the German federal election in 2017 and contribute to the literature on election forecasting..

RESULTS

All models obtained fairly accurate prediction of the final vote shares on election day. RNN model outperforms all other, in terms of accuracy in RMSE metrics.

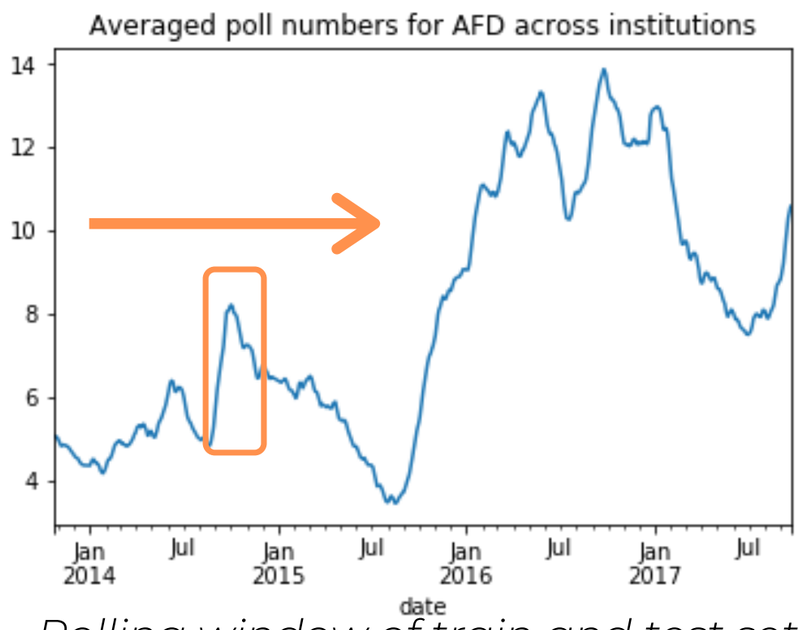
Method	Average RMSE
Dynamic Bayesian	1.88
Linear Regression	1.36
Decision Tree	1.44
Random Forest	1.44
Gradient Boosting	1.46
XGBoost	1.47
RNN	1.32



RNN Model forecast on the last 699 days before election day

CONCLUSION

The success of these models presents an exciting venue of exploration in application of Machine Learning and Deep Learning for election forecast and can be explored much further to gauge the full extent of their utility, particularly in interpretability, parameter tunings for different contexts.



Rolling window of train and test sets

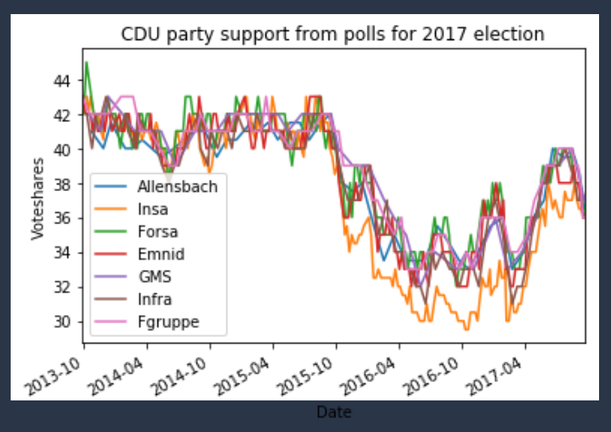
METHODOLOGY

Solutions to forecasting multiple time series sampled at inconsistent frequencies:

- Data was upsampled and averaged across polling institutions;
- A rolling window of 30 days was used to make predictions 3 days into the future;
- Models were evaluated with Root Mean Squared Errors (RMSE)

Main technologies for predictive analysis:

- Traditional machine learning algorithms for regression tasks;
- Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM) units with context-carrying cells.



Common trends across institutions allow for averaging to strengthen signals and decreasing random variation noise