**Title: The Effects of Privacy Protection on Forecast Accuracy**

1. Introduction
2. Literature Review
   1. Judgmental Forecasting [1]
      1. Managers tend to exhibit ‘optimism’ bias, where upward adjustments tend to reduce accuracy, and downward adjustments tend to improve accuracy.
      2. Larger forecast adjustments are associated with accuracy improvements more than smaller adjustments (larger adjustments tend to be made when more certain about the forecast, smaller may be made for a variety of invalid reasons, e.g., exhibit control over forecasts, look like the manager is doing their job, etc.)
      3. Judgmental forecasts are inefficient, i.e., do not account for all available information optimally.
      4. Statistically significant association between forecast improvement and:
         1. Adjustment size (positive)
         2. Series volatility (negative)
   2. Global Forecasting Models [2]
      1. Simulations
         1. Complex, nonlinear global models are very competitive over local and linear global models when forecasting heterogeneous time series at both short and long series lengths.
      2. On real datasets
         1. LGBM performed the best (highest accuracy)
         2. Nonlinear global models are more competitive than local ARIMA and linear global in both homogenous and heterogeneous data scenarios
      3. Note that heterogeneous seasonal patterns can significantly degrade the performance of neural network models
      4. Including a clustering feature in global models can improve accuracy
3. Experimental Design
   1. Data
      1. M4 competition time series
         1. Allows us to test interaction between forecasting models and protection methods in different domains.
   2. Forecasting Models
      1. Local
         1. Exponential Smoothing
            1. SES
            2. DES
            3. TES
         2. ARIMA
         3. Facebook Prophet
         4. LinkedIn Greykite
      2. Global
         1. VAR
         2. LGBM
         3. RNN with LSTM cells
         4. NeuralProphet
   3. Protection Methods
      1. Top Coding (0.10, 0.20, 0.40)
      2. Bottom Coding (0.10, 0.20, 0.40)
      3. Additive Noise (1 and 2 standard deviations)
      4. Differential Privacy ( = 1, 10, 20)
      5. *k*-MTS
   4. Evaluation Metrics
      1. RMSE
      2. MAE
   5. Techniques to improve forecasting performance under privacy protection
      1. Global models – include additional covariates based on time series characteristics, e.g., spectral entropy, trend and seasonality strength, etc. (see *tsfeatures*), could be cluster indicators [2]
      2. This strategy may work particularly well with clustering based protection schemes such as *k*-MTS
4. Results
5. Conclusion
6. Acknowledgements
7. References

[1] R. Fildes, P. Goodwin, M. Lawrence, and K. Nikolopoulos, “Effective forecasting and judgmental adjustments: an empirical evaluation and strategies for improvement in supply-chain planning,” *Int. J. Forecast.*, vol. 25, no. 1, pp. 3–23, Jan. 2009, doi: 10.1016/j.ijforecast.2008.11.010.

[2] H. Hewamalage, C. Bergmeir, and K. Bandara, “Global models for time series forecasting: A Simulation study,” *Pattern Recognit.*, vol. 124, p. 108441, Apr. 2022, doi: 10.1016/j.patcog.2021.108441.