**Alcohol Sale Forecast Using Long Short-Term Memory Networks**

Prasetyo, Zufar Bagas1, Akbar, Zulfiqar Fauzul2

1Department of Electrical Engineering, Faculty of Intelligent Electrical and Informatics Technology, Sepuluh Nopember Institute of Technology

2Department of Informatics, Faculty of Intelligent Electrical and Informatics Technology, Sepuluh Nopember Institute of Technology

1. **INTRODUCTION**

In this time, data play significant role in any major. In industry and business, data are compulsory aspects used for planning because the lead time needed for decision making is ranged from several years to a few seconds. Therefore, forecasting is important to process the data so that it can be an insight to do planning or decision making. Many forecasting methods are available to use, from the simplest methods, such as naïve methods, to the highly complex methods, such as neural networks. The development of technology makes forecasting can be done easier(Makridakis et al., 2000).

One of the powerful methods of forecasting is by using artificial neural networks (ANN). ANN are machine learning models inspired by biological neurons. It can find the best functional form characterizing the data (Hill et al., 1994). For time series analysis, the best neural network architecture is recurrent neural network. However, for standard RNN architecture, any given inputs on the hidden layer would cause either exponential decay or blow up on the output when cycling around the recurrent connections. To resolve that, a method called long short-term memory (LSTM) is introduced by changing the structure of the hidden neurons of standard RNN (Hua et al., 2019). Therefore, we want to use this LSTM network to forecast a business sale from the previous year’s sales data. Here, we use alcohol sales data consisting monthly sold unit of alcohol for the past 27 years from 1992 to 2019 because it is a business sales data, and it has trend and seasonal data pattern.

1. **REFERENCES**

Hill, T., Marquezb, L., O’connor, M., & Remusa, W. (1994). Artificial neural network models for forecasting and decision making. In *International Journal of Forecasting* (Vol. 10).

Hua, Y., Zhao, Z., Li, R., Chen, X., Liu, Z., & Zhang, H. (2019). Deep Learning with Long Short-Term Memory for Time Series Prediction. *IEEE Communications Magazine*, *57*(6), 114–119. https://doi.org/10.1109/MCOM.2019.1800155

Makridakis, S., Wheelwright C, S., & McGee, V. E. (2000). Metode dan Aplikasi Peramalan Edisi Kedua. In *Erlangga*.