

## ABSTRACT

### **Indonesian Interconnect Telco's Traffic Forecasting for Anomaly Detection Using Hybrid (EEMD and BPNN) Method**

Nova Ikawardhana

Supervisor: Prof. The Houw Liong

Co-supervisor: Arie Ardiyanti, MT

Interconnection is a connectivity between telecommunication operators that enables customers of one operator to communicate with customers of other operators. This gives a good business opportunity to all operators engaged in interconnection. For the Telco Provider, Outgoing calls are the “expense” and Incoming calls are the “revenue”. Periodically, operators make interconnection settlement to calculate the bill to be paid and received. There are two issues related to settlement process. First, the total of transaction value is huge, approximately IDR 5 trillion/month. Second, each operator should fulfill their obligations to other operators at the agreed time; subsequent payment is not allowed. Based on them, the validity of data is an important aspect that must be ensured. Validation has purpose to detect any anomaly. Anomaly should be correctly identified because it has the potential to cause loss.

A conventional method to find outliers is by comparing the time-series traffic forecasting result against the actual traffic. This study proposes a “Hybrid” model that combines data decomposition using EEMD followed by time-series traffic forecasting using BPNN. Data decomposition is needed to be carried out because of traffic data characteristics that are non linear and non stationary. After being decomposed into simpler components, traffic forecasting process is expected to be more efficient.

This research simulates data from an operator in Indonesia that acts as terminating side. Dataset used in this experiment was a 7-months dataset from billing process, consisting of 6 months data for training and 1 month data for testing.

The results of the experiment show that Hybrid model (EEMD and BPNN) is more efficient because it has smaller iteration number compared to BPNN model only. Moreover it also finds that BPNN model gives a slightly more accurate result compared to Hybrid model. Unfortunately BPNN model needs bigger effort that is represented by bigger iteration number. Both Hybrid and BPNN models have agreement and same abilities in detecting anomaly that is defined by daily deviation more than 2%. The presence of anomaly has business impacts for terminating operators. As illustration, this research finds two anomalies in a month that are equivalent to company's loss as much as IDR 7.9-11.7 millions.

Keywords: interconnection, BPNN, EEMD, traffic forecasting, anomaly detection, business impact