

Machine Learning-based Customer Churn Prediction and Sentiment Analysis Models for Online Educational Service

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Abstract

Online educational service is a highly competitive service sector in Indonesia, with practice tests for university entrance examinations as its main product. In 2020, an online educational service firm is surveyed to have a high percentage of churned customers, at an average of 73%. Churned customer is defined as a customer who no longer uses a service or product, while in comparison, a benchmark churn rate for the whole education industry is merely 9.6%. It indicates a mismatch between expectation and actual service received by the customer. This research develops and implements a prediction model for churned customers using Cross Industry Standard Process for Data Mining (CRISP-DM) methodology. The selected model is built based on the Random Forest algorithm. Furthermore, a sentiment analysis model is also built, based on the Bidirectional Encoder Representations from Transformers (BERT) algorithm. The sentiment analysis model is trained and validated by text data from Twitter, which indicates customers' perspectives on the practice test for university entrance exams. The final models show a 97% rate of accuracy and 100% for recall rate for churned customer prediction model and a 88% rate of accuracy for the sentiment analysis model. Lastly, a dashboard is developed and deployed to monitor online sentiments and their corresponding churn probability.

Keywords

Customer Churn Prediction, Customer Sentiment Analysis, Online Educational Service.

Biography

Ritzke Aisyarah is an Industrial Engineer who graduated from Bandung Institute of Technology in 2021. She currently works in one of the biggest tech startups in Southeast Asia as Fraud Analyst and working at Data and Product Team. Her daily tasks are to analyze and find new patterns of fraudulent also build product for the fraud analysis process. Her research interests include data mining and machine learning.

Praditya Ajidarma is an Industrial Engineering Lecturer in Bandung Institute of Technology (ITB), Indonesia. He earned a Bachelor of Science in Industrial Engineering from ITB, Indonesia, and master's in industrial engineering from Purdue University, USA. He has published journal and conference papers in the fields of collaborative analytics, agricultural robotics system, and knowledge management. He has collaborated with the Indonesian government and private companies in sectors of industrial estate design, special economic zone (KEK) feasibility study, digital power plant monetization, and aircraft manufacturing capacity planning. He also currently serves in working committee under the higher education council (DPT) of the Indonesian Ministry of Education, Culture, Research, and Technology.

Dradjad Irianto is a Professor of Industrial Engineering at Bandung Institute of Technology (ITB), Indonesia. He earned a Bachelor of Science in Industrial Engineering from ITB, Indonesia, master's in administration engineering from Keio University, Japan, and a Ph.D. in Business, Public Administration, and Technology from the University of Twente, Netherlands. He has published journal and conference papers in the fields of quality engineering, knowledge management, and green manufacturing. Dr. Irianto has completed research projects with the Indonesian Ministry of Industry, Indonesian Aerospace, and Toyota Indonesia. He has served as a member of the Indonesian Statistical Society Forum (FMS), the National Economic and Industry Committee (KEIN), Asia Pacific Industrial Engineering

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