



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 4, April 2025

AI-Powered Sentiment Analysis System using Vertex AI Auto ML

R. Kalaiselvi ^[1] P.Sathyaraj ^[2] Shinde Chaitanya Rao ^[3] Dadimi Charitha ^[4]

M.Suresh Kumar Reddy ^[5]

Assistant Professor, Dept. of CSE, Kuppam Engineering College (JNTUA University), Kuppam, A.P., India^[1]

UG Students, Dept. of CSE, Kuppam Engineering College (JNTUA University), Kuppam, A.P., India^{[2] to [5]}

ABSTRACT: In an era where digital interactions shape perceptions, sentiment analysis emerges as a powerful tool to decode emotions embedded in text. It empowers businesses, researchers, and decision-makers to transform raw opinions into actionable insights, fostering stronger connections with audiences. This project harnesses the potential of Google's Vertex AI Auto ML to revolutionize sentiment analysis, delivering an intelligent, automated, and explainable system capable of deciphering emotional tones in reviews, social media posts, and beyond.

This approach enhances sentiment-based insights for businesses, researchers, and organizations, improving decision-making processes based on user feedback. By integrating cloud-based AutoML capabilities, this project enhances classification accuracy, scalability, and deployment efficiency, making sentiment analysis accessible for businesses, researchers, and organizations. The model's ability to extract actionable insights from user-generated content supports real-time decision-making, social media monitoring, and customer feedback analysis across various industries.

KEYWORDS: Sentiment Analysis, Natural Language Processing (NLP), Artificial Intelligence (AI), Machine Learning (ML), Vertex AI AutoML, Deep Learning, Opinion Mining.

I. INTRODUCTION

Sentiment analysis has become an essential tool in understanding opinions and emotions conveyed in textual data across various domains, including social media, entertainment, and e-commerce. By leveraging **Vertex AI Auto ML**, this project aims to develop a machine learning model capable of classifying textual inputs such as tweets, movie reviews, and product reviews—into **positive, neutral, or negative** sentiments. Vertex AI AutoML offers an efficient and automated approach to building machine learning models, eliminating the need for extensive feature engineering and manual tuning. This project explores the benefits of using AutoML for sentiment analysis, highlighting its ability to streamline model development, improve accuracy, and provide valuable insights from user-generated content. In today's digital world, user-generated content such as reviews, tweets, and comments play a vital role in shaping business decisions. Sentiment analysis helps organizations in terms of:

- ✓ Gauge customer satisfaction and product quality.
- ✓ Track public sentiment in real time.
- ✓ Make informed business and marketing strategies.
- ✓ Automate the feedback loop for large-scale text analysis.

II. LITERATURE SURVEY

Traditional Sentiment Analysis Methods

Traditional sentiment analysis relies heavily on rule-based systems and classical machine learning algorithms such as Naive Bayes, Support Vector Machines (SVM), and Decision Trees. These approaches typically require: Extensive preprocessing, Manual feature extraction (e.g., bag of words, TF-IDF), Domain-specific tuning etc., Although they provide acceptable performance in structured settings, these methods often struggle with: Ambiguity in language, Sarcasm, slang, and domain-specific vocabulary, Contextual understanding .

Rise of Auto ML and Vertex AI

Auto ML, particularly in platforms like Google Vertex AI, automates the end-to-end model development process—data preprocessing, feature engineering, model training, hyperparameter tuning, and deployment. Benefits of using Vertex AI Auto ML include: Reduced need for deep ML expertise, Scalable infrastructure, Seamless deployment, Built-in evaluation and monitoring. In sentiment analysis, Vertex AI AutoML allows users to train custom models tailored to their datasets without writing complex ML code.

Comparison with Other Platforms

Several platforms offer AutoML capabilities for NLP tasks, including Amazon Sage Maker, Microsoft Azure ML, and IBM Watson. However, Vertex AI Auto ML stands out due to:

- ✓ Superior Google Cloud integration
- ✓ Rich NLP model support
- ✓ Built-in Explainable AI features
- ✓ User-friendly interface and API support

III. METHODOLOGY

This project successfully demonstrated the design, development, and deployment of a sentiment analysis model using **Vertex AI AutoML**. The system is capable of classifying user-generated reviews—such as tweets, movie reviews, or product feedback—into **positive**, **neutral**, or **negative** sentiments. Key highlights of the project include:

1. **Effective use of Vertex AI AutoML** to automate model selection, training, and evaluation without requiring manual algorithm tuning.
2. Integration of **explainable AI (XAI)** to provide understandable reasons for sentiment classification, enhancing trust and transparency.
3. Development of a **user-friendly interface** where users can input their review and get a sentiment label along with a natural language explanation.

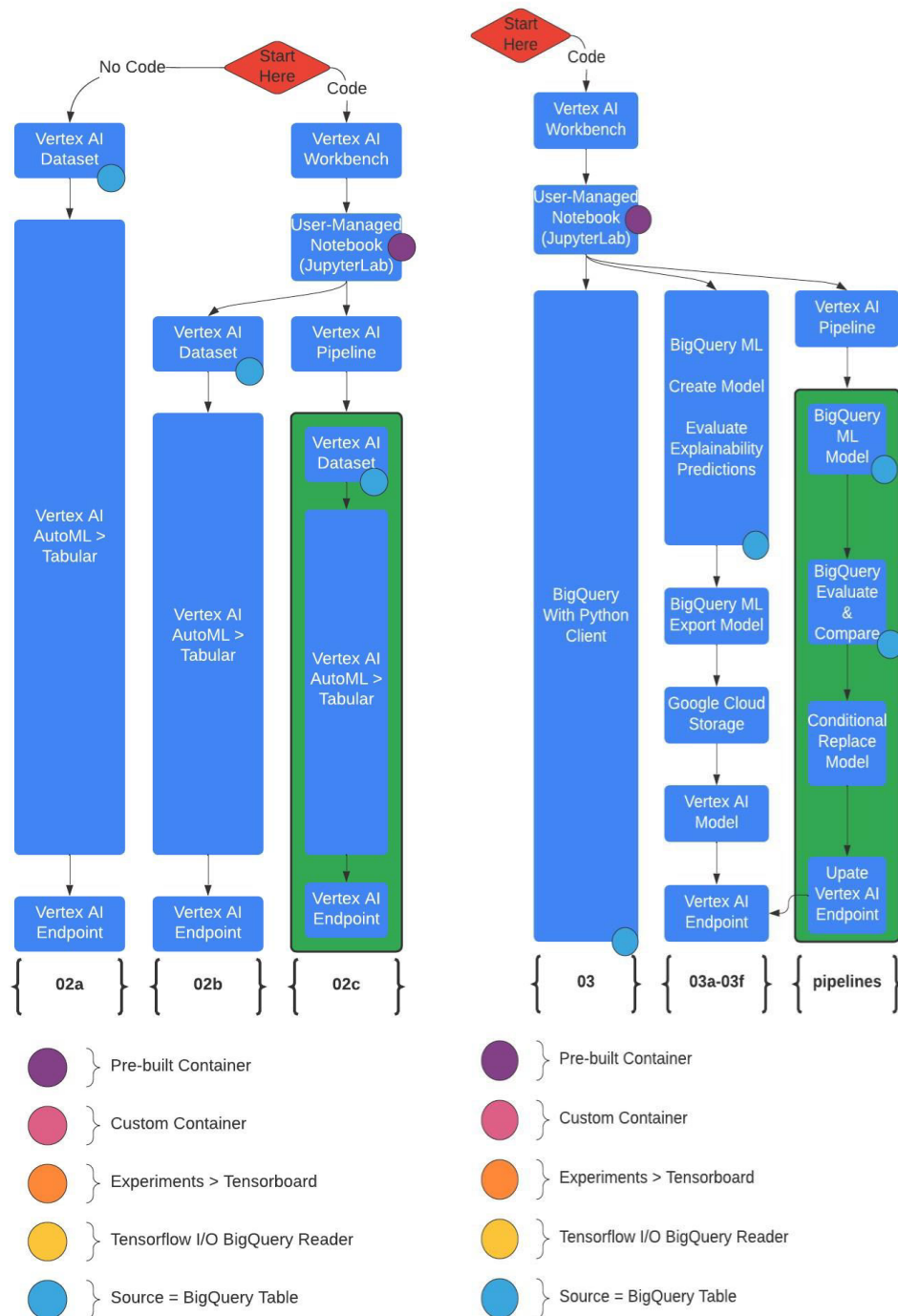


Fig. Architecture flow of vertex AI Auto ML process

This architecture displays how **Vertex AI** can accommodate different workflows ranging from **zero-code AutoML** to **full-code machine learning** using **notebooks** and **pipelines**. Depending on the user's expertise and project needs, they can select the appropriate path for deploying and managing their models efficiently

IV. EXPERIMENTAL RESULTS

SCREEN SHOTS OF OUTPUT :

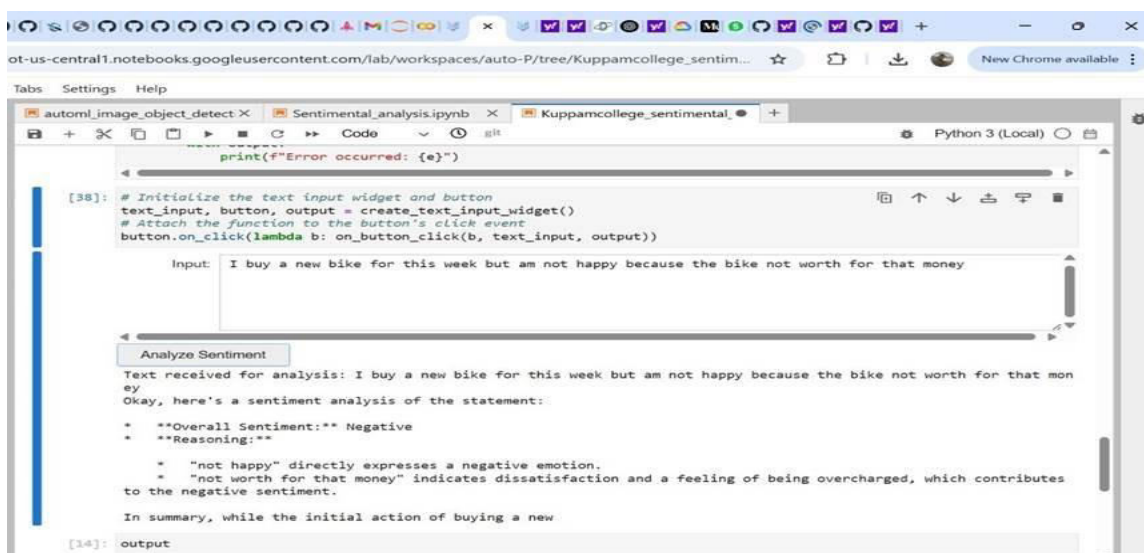


Fig. 1. SCREEN SHOT REPRESENTING THE RESULTS OF EXPLAINABLE AI FOR PREDICTION.

V. CONCLUSION

The deployment of this sentiment analysis system represents a major step toward more intelligent and automated customer feedback understanding. Leveraging Google's Vertex AI AutoML has proven to be highly efficient, especially for non-specialists in machine learning. While the current implementation serves as a strong baseline, future enhancements like multilingual support, real-time monitoring, and emotional classification will further increase its capability and adoption. This project not only contributes to academic learning but also stands as a practical, deployable solution in domains such as marketing, customer support, reputation management, and public policy analysis

REFERENCES

1. Google Cloud Documentation: Vertex AI AutoML
2. "BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding" – Jacob Devlin et al., 2018
3. Liu, Bing. "Sentiment Analysis and Opinion Mining." Synthesis Lectures on Human Language Technologies, 2012.
4. Pang, B., & Lee, L. (2008). "Opinion Mining and Sentiment Analysis." Foundations and Trends in Information Retrieval.
5. Twitter Developer Documentation: Sentiment Analysis Using Twitter Data
6. Explainable AI (XAI) Concepts: DARPA XAI Program and Google Cloud AI Explainability Whitepapers.
7. P. Pulivarthy. "Enhancing data integration in oracle databases: Leveraging machine learning for automated data cleansing, transformation, and enrichment". International Journal of Holistic Management Perspectives, vol. 4, no. 4, pp. 1-18, 2023.
8. Kaggle Sentiment Datasets: Movie Review Dataset, Amazon Product ReviewDataset
9. Deep Learning for Sentiment Analysis: A Review – Zhang, X., et al. (2021)
10. Transformers for Natural Language Processing: Vaswani et al., 2017("Attention Is All You Need")
11. AutoML: Methods, Systems, and Applications – Hutter, F., et al. (2019)



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details