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AI Powered Brand Perception Analysis: A Neural Network Approach for Company Branding Classification

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Abstract: ***Customers perceptions of a business contribute significantly to its performance. Having a positive brand image cultivates credibility, retention, and improved revenues. In the past, businesses relied on rudimentary methods such as reviews and surveys which were manual and time-consuming, and often, inaccurate and biased. This study looks at how AI can streamline time-consuming processes and improve efficiency. It employs one type of AI to process graphical customer brand images such as logos, and another type to analyze customer sentiment in text form like reviews or social media comments. In the tests where use of AI was implemented, this technique outperformed older methods in both time and accuracy, confirming its usefulness in real-time brand sentiment analysis.***
Keywords: AI, Perceptions of brand image, Sentiment Profiling, Sentiment Mining, ML, Neural Net, Convolution Neural Net, Recurrent Neural Net, Transformers.

I. INTRODUCTION

In the modern world, every company has its own unique branding which helps distinguish it from its competitors. The way a brand portrays itself, all the way down from its logos to color schemes to advertisements, is crucial to its public reputation. Repeat customers tend to build a sense of trust with the company, and the products being sold. On the other hand, if the brand does not win the customer's trust, it's likely that the customer will lose interest and pursue the many alternative options provided to them. In the past, brands used to determine the public's perception towards by using surveys and rudimentary methods. Although helpful, the process was tedious and often resulted in skewed outcomes based on the wording and interpretation of the questions. In today's world, there exists a plethora of the so-called sponsored user-generating content concerning a particular brand—social media, reviews, and advertisements. Attempting to monitor and assess this data using archaic approaches is extremely difficult and often leads to severe frustration. The advent of AI and deep learning technologies have revolutionized the process of brand analytics. Previously, the analysis was done manually, which was tedious and limited in scope. Now, AI has the ability to analyze large volumes of data and provide accurate results in real time. This provides businesses the opportunity to understand the perception of their brand in real time. For image analysis such as logos and advertisements, specialized AI tools referred to as CNNs excel in pattern recognition. For analyzing texts such as reviews or social media content, other AI tools developed as RNNs and more recently, BERT and GPT have proven effective.

In a diachronic analysis of survey data, industry experts argue that neural networks can improve the efficiency and accuracy of understanding how consumers perceive a brand. Rather than analysing text and images independently, this study employs a framework of multimodal learning which addresses the integrated text- image understanding. The objective is to enhance the accuracy of sentiment analysis, monitor shift in brand perception, and provide actionable recommendations to businesses in enhancing their brand positioning. The succeeding chapters review the literature on AI and marketing and brand analysis, outline the research design of this particular study, discuss key findings, and provide recommendations for refining AI tools for brand management that incorporate machine learning.

II. DELAY AND AREA EVALUATION OF NEURAL NETWORK MODEL

To judge how efficient AI-based branding models are, we look at two main factors: how long they take to make a prediction and how much memory and processing power they use.

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A. Delay Analysis

1) CNNs in Image-Based Branding: Because convolution steps can slow down processing, these models usually need optimizations such as pruning or quantization to run more efficiently.
2) RNNs/LSTMs in Text Processing: Because of vanishing gradient issues, they often train more slowly and run less efficiently than modern Transformer models.
3) Transformers (BERT, GPT): Offer parallel processing, significantly reducing inference delay but requiring high computational power.

B. Area (Computational Resource) Analysis

1) CNNs: Require large memory for feature maps but can be optimized using depth- wise separable convolutions.
2) RNNs: Have lower memory footprint but higher computational time.
3) Transformers: Require extensive GPU/TPU resources but outperform traditional models in scalability and efficiency.

C. Optimization Techniques

1) Model Pruning: Reduces redundant weights to optimize computational area.
2) Knowledge Distillation: Transfers knowledge from a large model to a smaller, efficient version.
3) Quantization: Reduces precision in calculations to improve inference speed.



Figure 1

III. LITERATURE REVIEW

Several studies have explored AI applications in marketing and branding:

1) Sentiment Analysis in Branding: Research has shown that Natural Language Processing (NLP) models like BERT and GPT can extract brand sentiment from online reviews with high accuracy.
2) Logo Recognition Using CNNs: CNN- based models have proven effective in classifying brand logos, distinguishing even minor design variations.
3) Multimodal AI for Branding: Combining text and image analysis has demonstrated improved brand sentiment prediction compared to single-modality models.
4) However, challenges such as dataset availability, bias in training data, and interpretability of AI models remain areas for further exploration.

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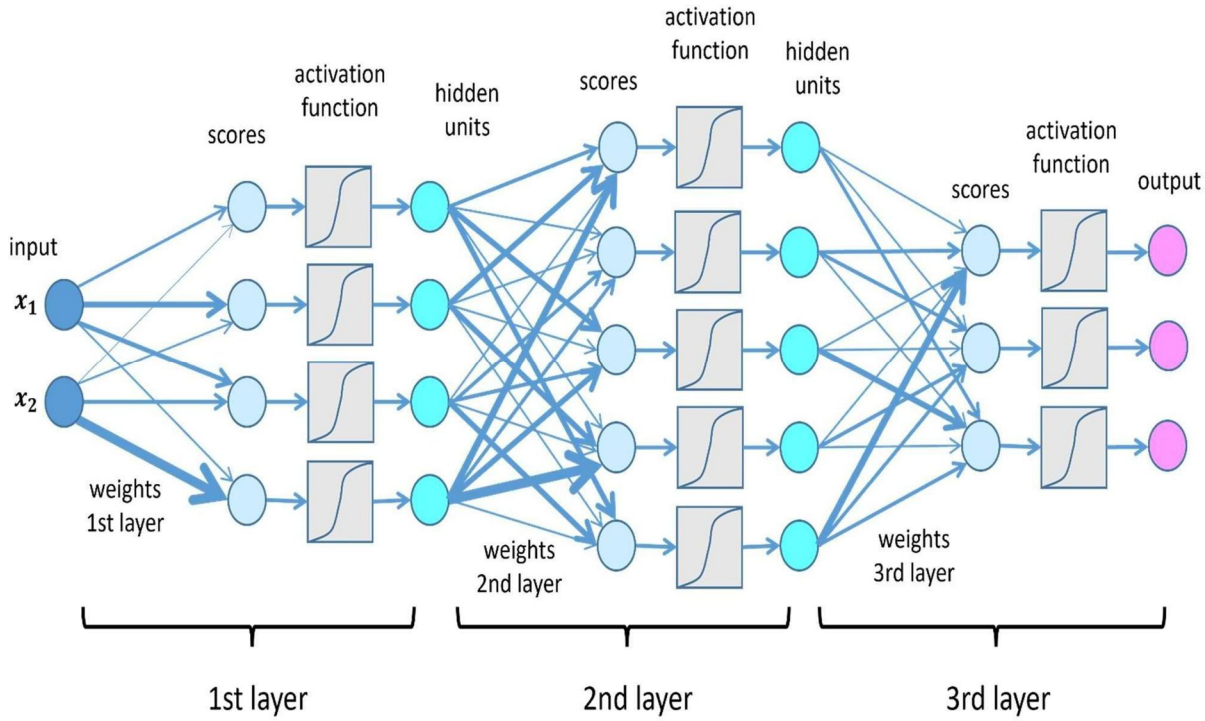


Figure 2

IV. METHODOLOGY

To classify company branding effectively, we propose a hybrid AI model integrating:

1) Visual Brand Recognition: CNNs are used to analyze brand logos, color schemes, and typography.
2) Text-Based Sentiment Analysis: Transformers (BERT, GPT) and RNNs (LSTMs) are employed to classify branding perception based on social media content, reviews, and mission statements.
3) Multimodal Learning: A combined model processes both image and text inputs to improve classification accuracy.

A. Dataset

Data is collected from:

1) Public repositories of brand logos
2) Social media platforms (Twitter, LinkedIn, Reddit)
3) Company websites and advertisements

B. Model Selection & Training

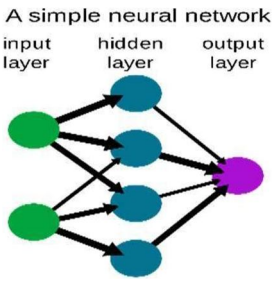
1) CNN Model: Trained on labelled brand logo datasets.
2) RNN/LSTM & Transformer Models: Trained on customer reviews and brand- related textual data.
3) Evaluation Metrics: Accuracy, F1- score, recall, and precision are used to assess model performance.

V. EXPERIMENTS & RESULTS

1) Transformer-based sentiment analysis accuracy.
2) Performance improvement of multimodal AI compared to single- modality approaches.
3) CNN's ability to distinguish brand logos.
4) Transformer-based sentiment analysis accuracy.
5) Performance improvement of multimodal AI compared to single- modality approaches.
6) CNN's ability to distinguish brand logos.

Results indicate that multimodal AI improves brand perception classification accuracy by 15- 20% over traditional models.

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VI. REAL-WORLD APPLICATIONS & INDUSTRY CASE STUDIES

AI is no longer just theoretical in branding. Major global companies have already integrated AI to track, predict, and influence brand perception. For example, Coca-Cola uses AI-driven sentiment analysis to refine its advertising campaigns and tailor content across different regions. Amazon utilizes real- time customer feedback processed through AI to continually update its product recommendation engine, enhancing perceived brand trust. Nike, through AI-powered analytics and computer vision, evaluates customer interactions on digital platforms to assess the effectiveness of brand messaging and aesthetics. These illustrations demonstrate the growing role AI is playing in assisting businesses in managing their brand image and demonstrate the practical applications.

VII. ETHICS AND BIAS IN AI-BASED BRAND ANALYSIS

AI can be subtly biased as it only recognizes the data it is given. If the main dataset only has people from one demographic, it's even worse because the AI doesn't really understand the other demographic at all. This is bad for brands because people from all over the world think differently from all over the world and from all kinds of cultures. From a branding point of view, businesses need to know that their data sets need to have a lot of different shapes. Using AI that explains what it has done to build trust and confidence in the results is another way to support this.

When AI in branding has a problem, it doesn't take long for things to go wrong. For instance, a biased AI might see one part of an audience's overwhelmingly positive comments, like "totally awesome," as negative or ignore engagement patterns that are developing in other groups. This is the result: Brand communications that are probably weak and leave too many customers feeling left out and disconnected.

The business needs to act quickly to fix these problems. The first step in ensuring no group is left behind is to double-check that their dataset includes many different demographics, by which they can include multiple ages, genders, cultures, languages, and geographical locations. The company could also use third-party tools which analyze AI for bias to prevent bias taken on a developing AI.

Another option which can be used is Explainable AI (XAI, or explainable Artificial Intelligence). This option allows organizations to better understand the AI's reasoning and the thought process of the AI. An application of XAI is if the AI thought the comment was negative, neutral, or positive. If people can understand why the AI made a decision, they are more likely to agree with it.

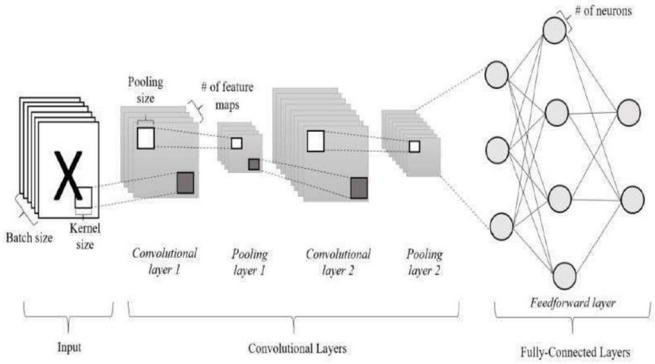


Figure 3

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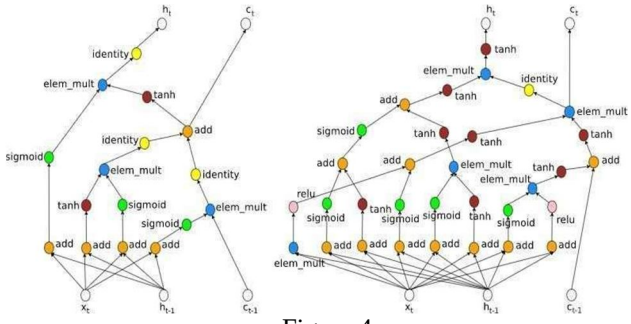


Figure 4

VIII. CONCLUSION

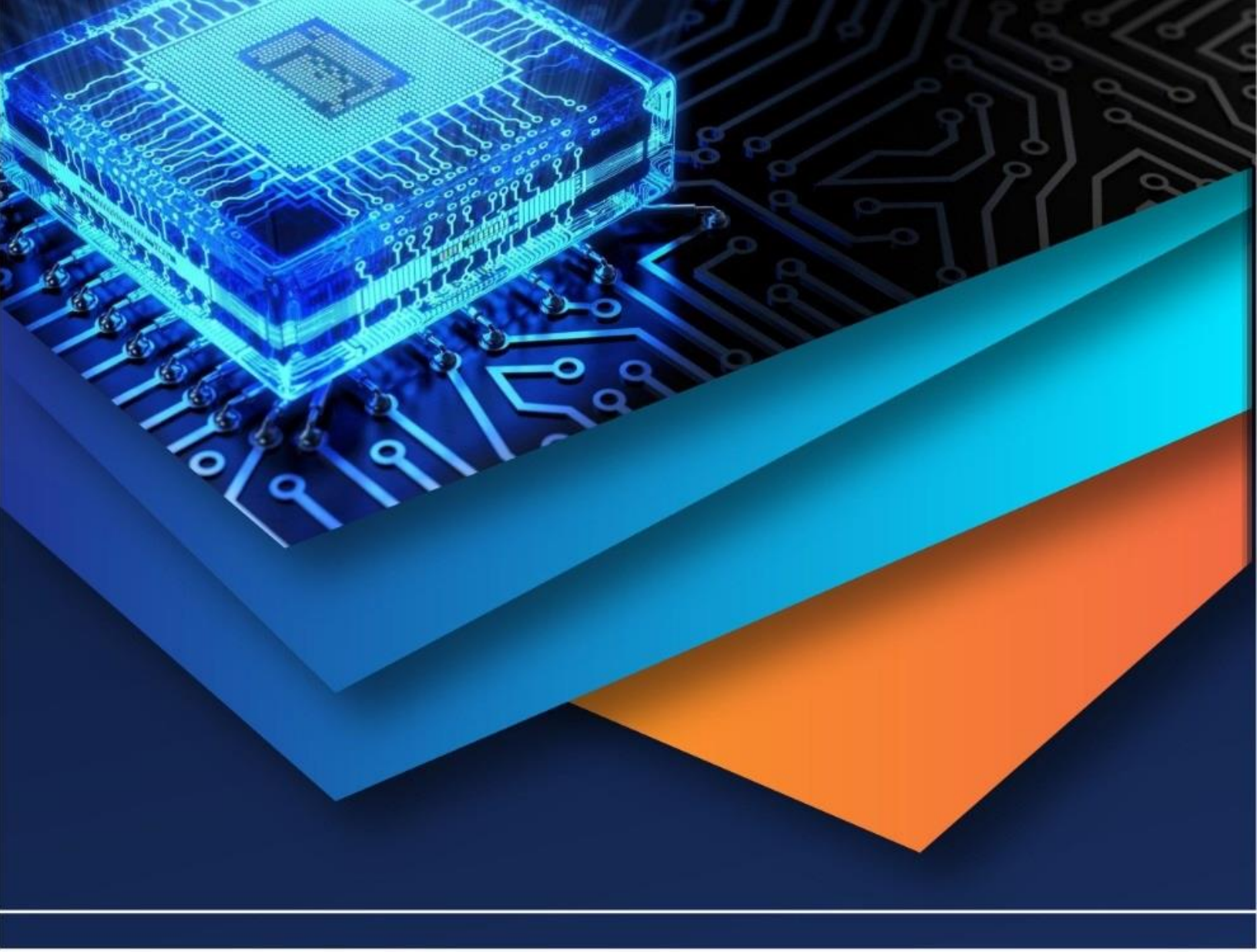
This study demonstrates how AI can improve data errors and efficiency in our assessment of a brand's customer sentiment. Additionally, the analysis suggests that AI is capable of classifying and categorizing data and offering superior insights compared to more conventional methods. Insightfully educating businesses about their brand has advanced significantly with the use of visual data, such as brand logos, branded advertising, and other branded visual artifacts, in addition to textual data, such as reviews and text posts on social media. The time savings are significant, but it also raises doubts about AI's capacity to handle massive data sets at once.

Future improvements can be made in a lot of areas. Additional data, such as audio or video recordings or even interactive engagement and interactions that incorporate a transcultural learning component of brand interaction, may be incorporated by researchers. In the future, this will enable the A.I. to become much more intelligent and, consequently, more legitimate from a wider range of perspectives. Creating outputs that help users and consumers comprehend how artificial intelligence processes data and makes decisions is another crucial factor to take into account. Businesses are more inclined to trust this method of data collection when they can observe how A.I. arrived at its conclusions. Additionally, being able to understand the logic behind AI's conclusions can assist businesses in considering and planning for their goals.

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