CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter reviews existing literature and explores academic research issues, highlighting research issues within the broad scope of global scientific understanding. The chapter begins with a brief introduction to free meal school program, sentiment analysis data, and classification technique, as well as a brief overview of machine learning for classification, which provides a foundation for understanding the research effort.

2.2 Free Meal School Program

The Free Lunch Program or "Free Nutritious Meals" (MBG) initiated by the Prabowo-Gibran pair has officially been discussed in the 2025 budget planning. The Ministry of Finance (Kemenkeu), the Coordinating Ministry for Economic Affairs (Kemenko) and the Prabowo-Gibran transition team have set the MBG budget at IDR 71 trillion in the first phase in 2025. This amount is considered to have taken into account the fiscal deficit target of 2.29% - 2.82% (Prabowo-Gibran, 2023; BBC Indonesia, 2024).

The MBG program in the first phase will focus on targeting elementary, junior high and senior high school students in the quintile 1 and 2 categories in the disadvantaged, outermost and remote areas (3T) in Indonesia (BBC Indonesia, 2024). According to the Prabowo-Gibran transition team, the target targets, budget size and program governance will continue to be evaluated and expanded to eradicate stunting in Indonesia.

The amount of budget to be spent and the effectiveness of the impact that will be generated from this program become the pros and cons of public discourse. Moreover, public budgets and public policies should be accounted for by policy makers. In addition, changes related to program names, targets, budgets and so on are known to civil society only through media coverage. There are no permanent, transparent and sustainable channels and mechanisms for public participation to ensure civil society participation in monitoring program developments. Various public concerns have emerged; from the quality of planning, limited fiscal space, to unclear governance (Suwastoyo, 2024). Given the urgency, the Center for Indonesia's Strategic Development Initiatives (CISDI) took the initiative to conduct a study of the MBG program which is divided into several series. The state budget is expected to be used transparently, measurably and have a positive impact on public health development.

Overall, the free lunch program initiated by Prabowo Subianto and Gibran Rakabuming Raka is an initiative that has the potential to have a significant impact on the Indonesian people. By promising and implementing this program, the presidential and vice presidential candidate pair number 2 have shown their commitment to improving the social and economic welfare of the people.

From a social perspective, this program has a positive impact in reducing hunger levels, increasing access to education, and empowering local communities through the participation of BUMDes, UMKM, and cooperatives in the food supply chain. In addition, this program also provides real assistance to families in difficult economic conditions by reducing their economic burden and increasing access to adequate food. From an economic perspective, this program provides a significant stimulus to the food sector, food processing industry, and distribution sector, which results in local and national economic growth.

The provision of free meals in schools also helps increase consumption of goods and services, creates new business opportunities, and supports the growth of small and medium enterprises. However, to ensure the sustainability and effectiveness of this program, careful evaluation is needed. This evaluation must take into account various aspects, from the quality of the food provided to the efficiency of resource use. The implications of this evaluation will influence the direction and strategy of further

program development, as well as ensuring that the program continues to provide maximum benefits to the Indonesian people as a whole. Thus, the free lunch program is not only a solution to the problem of hunger, but also a progressive step in building inclusive and sustainable social and economic welfare in Indonesia.

With a strong commitment and good cooperation between the government, community, and private sector, this program has the potential to provide a positive impact on the future of the nation and state.

Twitter or currently known as the X application is a social media platform that allows its users to interact through what is called a tweet. Users can share information and views on various topics being discussed. X has features that allow unlimited submission of opinions, search for the latest news, share other people's tweets, and provide comments. In the X application, information can spread quickly and easily, making it a means of finding out someone's opinion sentiment, both positive and negative.

Sentiment analysis is a method for assessing the emotional tone in digital text to determine whether the tone is positive, negative, or neutral. The use of sentiment analysis involves analyzing opinions, feelings, evaluations, emotions, assessments, or attitudes towards a product, figure, organization, issue, service, and event. In addition, sentiment analysis is always related to society because the information obtained comes from social media where society acts as its users.

2.3 Sentiment Analysis

Sentiment analysis is the process of utilizing text analytics to gather information from various sources on the internet. There are several types of sentiment analysis, such as fine-grained sentiment analysis that focuses on the polarity of opinions, intent sentiment analysis that attempts to find the motivation behind a user's message, and aspect-based sentiment analysis that associates a particular sentiment with an aspect of a product or service.

The goal of sentiment analysis is to evaluate the emotions, attitudes, and opinions expressed by individuals across platforms regarding goods, brands, services, politics, or organizations. This approach includes machine learning and is lexicon-based, which allows grouping data into categories such as very positive, positive, neutral, negative, and very negative.

Sentiment analysis consists of various types such as emotion detection, aspect-based sentiment analysis, and fine-grained sentiment analysis. Fine-grained sentiment analysis is a type of analysis that provides specific assessments and is commonly applied in the field of e-commerce. Emoticon detection is a type of analysis that aims to identify emotions in messages, such as happy, sad, angry, and others. Aspect-based sentiment analysis is a type of analysis that aims to identify influential aspects and assessments from customers.

2.4 Social Media

Social media is a digital platform that is very influential in today's human life. Its main purpose is to facilitate communication between people, share information, and create social interactions without any limitations of space and time. Social media is an online media tool that functions with web-based technology and changes the way of communicating from one way to a dialogic or two-way interaction.

2.5 Classification

Classification stands as one of the frequently utilized techniques in machine learning, involving the identification and differentiation of data classes through the discovery of a set of models. The primary objective of classification is to ascertain the class of forthcoming data objects based on historical information. Typically, a training set is employed in classification to acquire knowledge for the model, which is subsequently tested on a separate test set. Numerous classification algorithms have been introduced in the literature, recognizing the absence of a universal algorithm suitable for all datasets (Gulsoy and Kulluk, 2019).

Classification is a technique in data mining (machine learning) employed to forecast the group affiliation of data instances. Various classification techniques are available for this purpose (Aized and Arshad, 2017).

2.5.1   Method of Classification

Various classification methods are available for use, including decision tree induction (ID3) and the C4.5 Algorithm, Bayesian Networks, K-Nearest Neighbor, and Support Vector Machine (SVM).

2.5.1.1 K-Nearest Neighbor

It is a supervised machine learning approach used for addressing both regression and classification challenges. Although easy to set up and understand, it exhibits a noticeable slowdown as the volume of data increases. Despite its high accuracy, the kNN method can effectively compete with established models. The KNN algorithm is an ideal choice when high precision is required, and a human-readable method is not a priority (M. Poongodi,et.,al, 2021).

2.5.1.2 Decision Tree Classifier

It primarily embodies a procedure that integrates a tree-like growth model of decisions and their potential outcomes, encompassing occurrence implications, cost factors, and performance characteristics. This approach serves as an additional strategy to illustrate a preliminary optimization methodology. One of the most prevalent classification models is the Decision Tree Classifier, characterized by a flowchart-like structure with nodes representing tests on features. As previously mentioned, the Decision Tree Classifier divides classifications into subsets, such as the root, left child, and right child. Among the selected sample group, this approach stands out as the most commonly employed method.(Ramesh et al., 2022)

Classification Techniques	Applications	Reference
ID3	predicting student performance	[20]
	land capability classification	[31]
	tolerance related knowledge acquisition	[32]
	computer crime forensics	[33]

	fraud detection application	[34]
C4.5	Decision making of loan application by debtor	[35]
	Predicting Software Defects	[36]
	Thrombosis collagen diseases	[37]
	Electricity price prediction	[38]
	coal logistics customer analysis	[39]
	Selecting Question Pools	[40]
Bayesian Network	automatic and interactive mode for Image Segmentation	[41]
	traffic incident detection	[42]
	signature verification	[43]
	efficient patrolling of nurses	[44]
	examine dental pain	[45]
	telecommunication and internet networks	[46]
K- Nearest neighbor	Microarray data classification	[47]
	Phoneme Prediction	[48]
	Face recognition	[49]

		Agarwood oil quality grading	[50]
		Classification of nuclear receptors and their subfamilies	[51]
		Short-term traffic flow forecasting	[52]
		Plant Leaf Recognition	[53]
SVM		Scene classification	[54]
		Predict corporate financial distress	[55]
		Induction motors fault diagnosis	[56]
		Analog circuit fault diagnosis	[57]
		enterprise market competition	[58]

Table 2.2 Classification Technique Applications

2.5.1.3 Bayesian Networks

It is a supervised learning classifier designed for solving regression and classification tasks, utilizing Bayesian statistics. The fundamental principle of least squares is the foundation for both binary (two-class) and multi-class classification. The method is particularly intuitive for binary classification and adaptable to variable input data . The Naive Bayes framework is simple and highly compatible with large datasets. In comparison to other machine learning methods, it achieves superior precision(Ramesh et al., 2022)

Classification Approach	Issue	Solution/technique	Reference
Decision tree (ID3 and	multi valued attributes	Algorithm by combining ID3 and association	[62]
C4.5)	Complex information entropy and attribute with	function(AF)	
		modification to the attribute selection	[63]
	more values	methods, pre pruning strategy and rainforest	
	Noisy data classification	approach	
		Enhanced algorithm with Taylor formula	[64]
		Credal-C4.5 tree	[65]

Bayesian Network	Attributes conditional density estimation	Gaussian kernel function	[24]
		decision-tree structured conditional probability	[66]
	Inference (large domain discrete and continuous		[67]
	variables)	greedy learning algorithm	
	Multi-dimensional data		
K nearest neighbor	space requirement	Prototype selection	[68]
	time requirement	feature selection and extraction methods	[69]
	KNN scaling over multimedia dataset	finding R-Tree index	[70]
		multimedia KNN query processing system	[30]
SVM	controlling the false positive rate	Risk Area SVM (RA-SVM)	[71]

	low sparse SVM classifier	Cluster Support Vector Machine (CLSVM)	[72]
	multi-label classification	fuzzy SVMs (FSVMs)	[73]

Table 2.3 Classification Techniques Issue and Solutions (Soofi and Awan, 2017)

2.5.1.4 Support Vector Machines

It is a supervised machine learning method based on classification that can be applied to address various regression and classification tasks. Additionally, it is commonly employed to tackle challenging regression and classification assignments. The approach is examined as a transitional stage within an n-dimensional neighborhood, where n represents the number of features. It is particularly useful for solving intricate problems that cannot be addressed linearly. A "kernel trick" function is employed in SVM to efficiently find non-linear solutions to various problems. In SVM, data points are mapped into a high-dimensional space where sequential separation of challenges is feasible. The classifier selects a division line with the maximum margin. Each point is treated as a support vector. A thoroughly trained classification algorithm can effectively categorize any test sequence and predict outcomes beyond the training examples (generalization).(A. Garg,et.,al, 2021)

2.5.1.5 Convolutional Neural Networks (CNN)

The Convolutional Neural Network (CNN) was initially utilized in deep learning for image processing. CNN has the capability to capture crucial elements in images and exhibits a robust ability to extract and share weights. In 2015, Kim suggested the application of CNN to text processing and sentence segmentation (Kim, Y. 2014). CNN is a prevalent type of deep learning network, consisting of an input layer, convolution layer, pooling layer, fully connected layer, and output layer.

The convolution layer consists of numerous convolution kernels, where these kernels function as filters and matrices with associated weights. Subsequently, the convolution operation for the i window can be represented as:

$$Y_i = g(x_i \cdot W + b)$$

The convolutional neural network excels in extracting essential content from articles and leveraging shared weights, making it advantageous for image processing. However, text often contains words with meanings distinct from those in images, and some words rely on contextual interpretation. The convolutional neural network may fall short in conveying extensive information and establishing sufficient contextual connections. Hence, a complementary understanding of recurrent neural networks becomes necessary (Wang, Q., et al., 2021).

Table 2.3 shows that comparative analysis of different classification method including their benefits, limitations and references.

Classification method	Strengths	Limitations	Reference
SVM (Supervised Vector Machine)	(i) Training is relatively straightforward. (ii) Data with high dimensionality. (iii) The error can be easily controlled. (iv) Non-parametric technique. (v) Very high prediction accuracy and strong performance. (vi) Distinct minimum value.	(i) Due to the extended training duration, its performance diminishes when handling extensive datasets. (ii) Identifying the appropriate kernel function can be challenging. SVM's efficacy is compromised in the presence of noisy datasets. (iii) SVM lacks the capability to provide probability calculations, making the interpretation of the final SVM model challenging.	(Sheth et al., 2022)

ANN (Artificial Neural Networks)	(i) It can be employed for solving both linear and nonlinear programming problems. (ii) No prior knowledge of the data-generating process is required. (iii) It does not necessitate reprogramming.	(i) The effectiveness of the model relies on the quality of the data. (ii) There are no explicit guidelines for determining the optimal artificial neural network architecture as the process involves trial and error. (iii) It should never be considered a universal solution to all real-world problems.	(Hamal & Senvar, 2021)
Decision Tree	(i) Decision Tree is a non-parametric tool, eliminating the need for any functional form specification. (ii) Decision Tree adeptly manages outliers and missing values. (iii) It is efficient for both regression and classification problems, offering ease of	(i) Showing instability, (ii) Managing tree size proves challenging, (a) Prone to errors in sampling, (iii) Offering a locally optimal answer rather than a globally ideal solution.	(Hamal & Senvar, 2021)

	interpretation, the capability to fill in incomplete data with the most probable values, and handling both categorical and quantitative values.		
Naïve Bayes	(i) Its primary strength lies in its efficiency, allowing both training and classification to be completed in a single pass over the data. (ii) It exhibits robustness to noise features. (iii) The method demands only a small amount of training data to estimate the necessary parameters for classification. (iv) It effectively handles a small dataset and is capable of managing multiple classes. (v) Setting up is straightforward. (vi) It consistently produces good results.	(i) The assumption of conditional independence may be breached by actual data from the real world. (ii) Exhibit suboptimal performance in situations where features are strongly correlated. (iii) Fails to account for the frequency of word occurrences. (iv) Vulnerable to variations based on how the input data is prepared.	(Sheth et al., 2022)

	(vii) It scales proportionally with the number of predictors and data points. (viii) It requires less training data, is adept at handling both discrete and continuous data, and can address both binary and multi-class classification problems, providing stochastic recommendations. (ix) Data can be processed in a continuous or discontinuous manner.		
KNN (K-Nearest Neighbourd)	(i) The training phase is exceptionally rapid, and it incurs zero cost. (ii) Straightforward and easily implementable. (iii) Capable of handling noisy data. (iv) A straightforward technique that allows for quick implementation.	(i) It exhibits high sensitivity to irrelevant features. (ii) Being a lazy algorithm, it has an extended runtime. (iii) It demands substantial memory capacity to store all training examples.	(Sheth et al., 2022)

		(v) An extremely flexible categorization technique suitable for multi-modal classes.			(iv) It is relatively expensive to classify unknown records. (v) It involves the computation of distances between k-nearest neighbors.		

Table 2.4   Comparison of Existing Classification Method and Implementation in Existing Work.

Problems / Issues	References	Algorithms / Policies / Strategies / Frameworks	Performance Parameters	Simulation / Experimental Tools	Comparison Results	Advantages	Disadvantage / Limitations
Analyzing Netizen Responses to the Free Lunch Program	(FN Zaman et al., 2023)	Applying NP and NAÏVE BAYES Method	Classification and Sentiment Analysis from Twitter or X Application	Text-based classification from X Application	This study uses the Naive Bayes algorithm to analyze public sentiment towards the free lunch program. The study uses Twitter data with specific	Positive sentiment dominates, but criticism was found regarding the implementation of the program.	Adjustments and improvements need to be made to the model to improve its performance on the test data and reduce overfitting on the training data.

Problems / Issues	References	Algorithms / Policies / Strategies / Frameworks	Performance Parameters	Simulation / Experimental Tools	Comparison Results	Advantages	Disadvantage / Limitations
					keywords related to free lunch.		
Implementation of Naive Bayes Algorithm for Sentiment Analysis	(Tedo & Dea, 2024)	Naive Bayes	Classification and Sentiment Analysis from Twitter or X Application	This study uses text mining methods with the Naive Bayes algorithm to evaluate community reactions to free lunches. This program aims to reduce stunting and malnutrition.	Positive sentiment is higher than negative sentiment.	The Naive Bayes algorithm provides an accuracy of 86.95%, which indicates that the model is able to classify sentiment quite well.	The relatively low recall value of 61% indicates that the model has limitations in identifying all existing negative sentiments.
Sentiment Analysis Using Text Mining of Indonesia Tourism Reviews via Social Media	(Dini et al., 2021)	Text Mining	The purpose of this study is to create a priority map of tourist attractions that can be utilized by	Sentiment analysis was used 413,175 netizen comments via the social media platforms Instagram and Google reviews	Data was collected from January 2018-February 2019. The results show that the number of positive comments is significantly higher than the	Private sector tourism managers and other ministries must collaborate with the government.	Criticism of infrastructure is important to note, because local infrastructure problems are considered the most serious in Garut Regency.

Problems / Issues	References	Algorithms / Policies / Strategies / Frameworks	Performance Parameters	Simulation / Experimental Tools	Comparison Results	Advantages	Disadvantage / Limitations
			local governments		number of negative comments		
Fast Food Restaurant Marketing Strategy in Indonesia: Social Network Analysis on Twitter	(Fauline et al., 2023)	Social network analysis (SNA) method using qualitative descriptive research design	Collected statistics using secondary data sources from twitter discussing McDonald's and Burger King between 2017 and 2022.	This study is qualitative in nature and uses secondary data from social media platforms such as Twitter.	Based on Twitter interactions on promotional content, menus, and flavors, the study findings compare McDonald's marketing efforts with Burger King.	Burger King has the most nodes and edges, indicating that its menu, promotions, and flavors have a larger data distribution, as indicated by the number of interactions among its customers compared to McDonald's.	This study simply looked at how words relate to each other from the Twitter period 2017–2022.
Analysis of Twitter Data on Public	(Manuel & Arbi, 2022)	Utilizing R programming, the data was	The feelings and thoughts of the world	27,894 tweets with the hashtag #UkraineRussia	Showed more negative thoughts than positive	Since Twitter has developed into a forum for social,	This research focuses only on emotions and

Problems / Issues	References	Algorithms / Policies / Strategies / Frameworks	Performance Parameters	Simulation / Experimental Tools	Comparison Results	Advantages	Disadvantage / Limitations
Attitudes and Feelings Regarding Russia's 2022 Invasion of Ukraine		gathered, processed, and examined.	community regarding Russia's invasion of Ukraine are examined.	that were uploaded during the first day were examined.	thoughts, with sadness being the most prominent emotion. The idea that no one wins in a conflict is another sign that public opinion is shifting toward the aggressor nation.	political and information interaction, it is known that social media can function as a mass communication medium.	hashtags #Ukraine

2.6 Research Gap

In this section, the classification processes that are widely used are the Support Vector Machine, Naive Bayes, and also K-Nearest Neighbors methods. And several research results show that the Support Vector Machine (SVM) method has performance compared to other classification methods. Apart from that, several research results in table 2.3 also show that the Support Vector Machine (SVM) method has many advantages and very few disadvantages compared to other methods.

In order to make the classification results of this method more accurate, several studies have combined it with several other algorithms such as Artificial Neural Network (ANN) or Convolutional Neural Networks (CNN). Based on a comparison of several related works carried out by previous researchers as in table 2.4, it shows that the Convolutional Neural Networks (CNN) algorithm or method is more suitable for being developed with a Support Vector Machine (SVM) and obtains a higher process accuracy compared to others.

So in this case study, researcher will develop a data classification process using the Support Vector Machine (SVM), Naive Bayes, and K-Nearest Neighbors. Researcher will implement all classification method and compare it to get the best result.

2.7 Summary

This chapter includes a literature review of ongoing research regarding classification and sentiment analysis using social media. This chapter presents an analysis of the similarities and differences between various methods, policies, and algorithms. Apart from that, this chapter also provides an in-depth discussion regarding the Free Meal Program from Indonesia's Government. The next chapter will discuss the research methodology and outline the main strategies used in this thesis.