JOURNAL LA MULTIAPP

VOL. 05, ISSUE 05 (501-523), 2024
DOI: 10.37899/journallamultiapp.v5i5.394

Sentiment Analysis of Support for the DPR's Right to Inquiry on the Issue of 2024 Election Fraud Using the Support Vector Machine Method

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Article Info

Article history:
Received 1 August 2024
Received in revised form 14 August 2024
Accepted 31 August 2024

Keywords:
Support Sentiment,
Support Vector Machine (SVM) Sentiment Analysis

Abstract

This research aims to analyze public sentiment towards supporting the DPR's right to inquiry in the 2024 Election fraud issue using the Support Vector Machine (SVM) method. Data was obtained from the social media application X which has a wide user base and is relevant to the issue under study. Comments on the application are classified into positive and negative sentiments after going through the pre-processing stage. The SVM method was chosen because of its high ability in text classification based on appropriate kernels. This research shows how much influence the X application has in identifying public sentiment and the effectiveness of the SVM method in sentiment classification. It is hoped that the research results will provide in-depth insight into public sentiment regarding the issue of fraud in the 2024 elections and support better decision making in the context of politics and democracy in Indonesia.

Introduction

Based on the confirmation in the 1945 Constitution of the Republic of Indonesia, it is stated that the Indonesian state is a constitutional state , namely a state that is limited by the constitution. As a country limited by the constitution, of course all actions and steps taken by the government and state equipment must be based on the constitution as the basic law of the country. According to Montesquieu, the trias politica theory is legislative, executive and judiciary, so that no one is dominant in running the government, such as the executive in carrying out policies after being monitored by the legislature or in Indonesia it is called the People's Representative Council (DPR) (Simamora & Siallagan, 2020; Taswin, 2022).

There are 3 (three) main functions of the DPR, these three main functions are the legislative function, the budget function and the supervisory function. In essence, the three functions of the DPR have a close relationship and these three functions are always in contact with other functions (Diamantina, 2018). One of the rights that the DPR has in carrying out its function to supervise the government is the Right to Inquiry or the DPR's right to conduct an investigation into important and strategic government policies that have a broad impact on social life which are suspected to be in conflict with statutory regulations (Panggabean, 2022; Hasugian et al., 2023).

General Elections (Pemilu) are a mechanism used to realize people's sovereignty and produce a democratic state government, in accordance with Pancasila and the 1945 Constitution of the Republic of Indonesia. This election aims to elect the President and Vice President, Members of the DPR, DPD, DPRD, and regional heads (Bs & Fadhilillah, 20243). and deputy regional

ISSN: 2716-3865 (Print), 2721-1290 (Online)

heads who are able to reflect democratic values and are able to fight for the aspirations of the people in accordance with the development of national and state life. Elections are carried out with good quality, systematic, legally valid and accountable, involving wider community participation (Adiba & Kaiser, 2020; Hasibuan & Suhardi, 2022).

Election organizers, government officials, election participants, election supervisors, election observers, voters and all related parties are expected to act and act honestly in accordance with applicable laws and regulations. In its implementation, issues often arise related to conditions, political polarization, and varying public opinions towards certain candidates or political parties. Therefore, it is important that voters and election participants are treated fairly and free from unfair conditions or treatment from any party (Puad et al., 2023).

In Tafsir Al-Muyassar it is stated that the great punishment will be for those who cheat in their measures and scales, namely those people who when they buy from humans with measures or scales they measure and weigh in full, but when they weigh and measure for humans, they reduce weights and measures. What is the condition of people who steal and take things that are measured and weighed, and reduce human rights? he is more worthy of being threatened than people who reduce measures and scales (Kinanti, 2020; Gifari et al., 2022).

Thus, quality general elections will guarantee a healthy democratic party (Afrizal & Isnainiyah, 2020; Purnamawati, 2019). Fraud in elections in Indonesia, such as money politics, black campaigns and vote inflating, has become a frequent issue. The public's views can be positive or negative responses to the election. In this context, sentiment analysis via social media is an effective method for identifying public views and sentiments regarding the holding of the 2024 General Election (Putri et al., 2022).

The data on social media is in text form, to extract the information on social media a *Machine Learning approach is used.* This text data is processed and classified using *text mining techniques* (Yu et al., 2020; Singh et al., 2020). For texts related to sentiment, classification is usually carried out to identify whether the text contains positive or negative sentiment. Before carrying out classification, text data must be prepared through a *pre-processing stage*. The *pre-processing* stage also aims to transform text data into a data structure that is suitable for data analysis (Wenando & Fuad, 2019; Adhi Putra, 2021).

In this research, we will analyze comments on the social media application X and divide these comments into positive and negative sentiments using the *Support Vector Machine method. Support Vector Machine* is a new technique compared to other techniques. Choosing the right and appropriate kernel function is very important and necessary, because the function of the kernel will determine *the feature space* where the classifier function will be searched. Based on this description, this research is entitled "Sentiment Analysis of Supporting the DPR's Inquiry Right in the 2024 Election Fraud Issue Using the *Support Vector Machine Method* ". The reason the author raised this topic is because this topic is still widely discussed and has become one of the trending topics in the X social media application.

Methods

This research uses quantitative research methodology. The goal is to measure variables, identify patterns or relationships between variables, and make generalizations that can be applied more widely. Data collection methods can vary, including surveys, interviews, observations, or document analysis. The collected data is then processed to clean, tidy, and organize so that it is ready for further analysis. The preprocessing process involves steps such as removing invalid or outlier data, handling missing values, and normalizing data if necessary. In research involving text analysis, the word weighting stage is important. This involves converting text into a numerical representation that can be processed by a

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classification model. Methods such as TF-IDF *(Term Frequency-Inverse Document Frequency)* are often used to assign weights to words in text based on their frequency and importance in a collection of documents.

Planning

The design stage in sentiment analysis supporting DPR inquiry rights for the 2024 election using the Support Vector Machine (SVM) method includes determining the model architecture, setting parameters, and evaluating the model to ensure optimal performance.

Examples of designing in this context could include:

Model Architecture

Designing an SVM model architecture includes decisions about the type of kernel to use (e.g., linear, polynomial, or radial basis function kernel), as well as other settings such as C and gamma regulation parameters.

Parameter Tuning

Tuning the parameters of an SVM model involves experimenting with various parameter values (such as C and gamma values) to find the combination that provides the best performance on a given dataset.

Model Evaluation

SVM model evaluation is carried out using relevant evaluation metrics such as accuracy, precision, recall, or F1-score, to measure the model's performance in classifying sentiment correctly. With good design, the SVM model can provide accurate and reliable results in analyzing sentiment related to DPR inquiry rights in the context of the 2024 election. Proper design can help ensure that the SVM model is optimized for this specific sentiment classification task. Once the data is processed and represented in numerical form, classification methods such as Support Vector Machine (SVM) can be applied. SVM is a machine learning algorithm used for data classification by identifying optimal decision boundaries between different classes. SVM models are trained using training data to predict classes from test data. The following are the stages in the Support Vector Machine Algorithm.

Implementation

Google Colab and Python play an important role in implementing sentiment analysis to support DPR inquiry rights in the 2024 election using Support Vector Machine (SVM). With Google Colab, it is possible to efficiently process and analyze data in a cloud environment, while Python provides a variety of libraries and tools for performing data pre-processing, feature extraction, SVM model training, and model performance evaluation, enabling the development and training of powerful sentiment analysis models. strong and effective to support the DPR's right to inquiry in the election context.

Testing

The testing stage in sentiment analysis supporting the DPR's right to inquiry for the 2024 election using the Support Vector Machine (SVM) method is an important process in evaluating the performance of the SVM model that has been built. In this stage, test data separate from the training data is used to test the model's ability to predict sentiment related to support or rejection of the DPR's right to inquiry. Through the use of evaluation metrics such as accuracy, precision, recall, and F1-score, the performance of the SVM model is evaluated to ensure that the predictions produced are as expected. Test results are used to identify the strengths and weaknesses of the model, as well as to make necessary adjustments to improve its performance. By carrying out careful testing, we can ensure that the SVM

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model built can provide accurate and relevant sentiment predictions regarding support for or rejection of the DPR's right to inquiry in the context of the 2024 election

Results and Discussion

In the calculation in determining TF-IDF, data is divided into several stages. First, first calculate TF (*Term Frequency*). The following is the calculation of TF and DF values from the previous example document that has been made in the following table.

Table 1. TF and DF scores

Terms	TF						DF
	D1	D2	D3	D4	D5	D6	
DPR	0	0	1	0	0	0	1
Right	1	1	0	1	1	0	4
Support	1	0	0	0	1	0	2
Lost	0	1	0	0	0	0	1
People	0	1	0	0	0	0	1
Cheat	1	0	0	0	0	0	1
Questionnaire	0	0	0	0	1	0	1
Voice	1	0	0	0	0	0	1
Election	1	1	1	1	1	1	6
Official	0	0	0	1	0	0	1
Win	0	0	1	0	0	0	1
Government	1	0	0	0	1	1	3
Results	1	1	1	1	1	1	6
Member	0	1	0	0	0	0	1
Student	0	1	0	0	0	0	1
Voice	0	0	0	1	0	0	1
Chaos	0	0	0	1	0	0	1
Demo	1	0	0	0	0	0	1
Reject	1	1	0	0	0	0	2
Building	0	0	0	0	1	0	1
Action	0	0	0	1	0	0	1
Disabled	1	0	0	0	0	0	1
Suggestion	0	2	0	0	0	0	1
Party	1	1	1	1	1	1	6
History	0	0	0	1	0	0	1
Anti	0	0	0	0	0	1	1
Witness	0	0	0	0	0	1	1
Department	0	0	0	0	0	1	1

After obtaining *the term frequency value* of each word, the next step is to calculate the IDF value. Here is the equation to determine the IDF value.

$IDF = (\frac{|D|+1}{DF+1}) + 1$ ....(4.1)

$IDF = in\frac{5+1}{1+1} + 1 = 2.098612$

Table 2. IDF Scores

Terms	**DF**	**IDF Score**
DPR	1	2.098612289
Right	4	1,182321557
Support	2	1.693147181
Lost	1	2.098612289
People	1	2.098612289
Cheat	1	2.098612289
Questionnaire	1	2.098612289

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Voice	1	2.098612289
Election	5	1
Official	1	2.098612289
Win	1	2.098612289
Government	2	1.693147181
Results	5	1
Member	1	2.098612289
Student	1	2.098612289
Voice	1	2.098612289
Chaos	1	2.098612289
Demo	1	2.098612289
Reject	2	1.693147181
Building	1	2.098612289
Action	1	2.098612289
Disabled	1	2.098612289
Suggestion	1	2.098612289
Party	5	1
History	1	2.098612289
Anti	1	2.098612289
Witness	1	2.098612289
Position	1	2.098612289

After the TF and IDF scores are obtained, the TF-IDF value can be determined using the equation below.

$W_{dt} = TF_{dt} \times IDF$ …… …(4.2)

$W_{dt} = 1 \times 2{,}098612$

Table 3. TF-IDF values

Terms				**TF-IDF**		
	D1	**D2**	**D3**	**D4**	**D5**	**D6**
DPR	0	0	2.098612	0	0	0
Right	1,182322	1,182322	0	1,182322	1,182322	0
Support	0	2.098612	0	0	0	0
Lost	0	2.098612	0	0	0	0
People	2.098612	0	0	0	0	0
Cheat	0	0	0	0	2,09861	0
Questionnaire	2.098612	0	0	0	0	0
Voice	1	1	1	1	1	1
Election	0	0	0	2.098612	0	0
Official	0	0	2.098612	0	0	0
Win	1.693147	0	0	0	1.693147	2,09861
Government	1	1	1	1	1	2,09861
Results	0	2.098612	0	0	0	0
Member	0	2.098612	0	0	0	0
Student	0	0	0	2.098612	0	0
Voice	0	0	0	2.098612	0	0
Chaos	2.098612	0	0	0	0	0
Demo	1.693147	1.693147	0	0	0	0
Reject	0	0	0	0	2,09861	0
Building	0	0	0	2.098612	0	0

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Action	2.098612	0	0	0	0	0
Disabled	0	2.098612	0	0	0	0
Suggestion	1	1	1	1	1	1
Party	0	0	0	2.098612	0	0
History	0	0	0	0	0	2,09861
Anti	0	0	0	0	0	2,09861
Witness	0	0	0	0	0	2,09861

Next, the TF-IDF value is normalized to standardize the weight value so that it is in the same *range. The formula for normalizing the TF-IDF Norm value* is shown in (4.3). The following is the equation for calculating the TF-IDF *Norm* .

TF-IDF $\frac{TF-IDF}{\sqrt{\sum_{i=1}^{n} x_1^2}}norm$ = …… …(4.3)

Norm $=\frac{2,098612}{\sqrt{11,808}} = 0,610714$

The following table presents the results of the TF-IDF normalization calculation from the previous calculation.

Table 4. TF-IDF normalization

Terms				**TF-IDF**		
	D1	**D2**	**D3**	**D4**	**D5**	**D6**
DPR	0	0	0.610714	0	0	0
Right	0.213683	0.218479	0	0.230027	0.271674	0
Support	0.306005	0	0	0	0.389052	0
Lost	0	0.387798	0	0	0	0
People	0	0.387798	0	0	0	0
Cheat	0.379286	0	0	0	0	0
Questionnaire	0	0	0	0	0.48222	0
Voice	0.379286	0	0	0	0	0
Election	0.180732	0.184788	0.291008	0.194556	0.22978	0.22002
Official	0	0	0	0.408297	0	0
Win	0	0	0.610714	0	0	0
Government	0.306005	0	0	0	0.389052	0.34314
Results	0.180732	0.184788	0.291008	0.194556	0.22978	0.22002
Member	0	0.387798	0	0	0	0
Student	0	0.387798	0	0	0	0
Voice	0	0	0	0.408297	0	0
Chaos	0	0	0	0.408297	0	0
Demo	0.379286	0	0	0	0	0
Reject	0.306005	0.312873	0	0	0	0
Building	0	0	0	0	0.48222	0
Action	0	0	0	0.408297	0	0
Disabled	0.379286	0	0	0	0	0
Suggestion	0	0.387798	0	0	0	0
Party	0.180732	0.184788	0.291008	0.194556	0.22978	0.22002
History	0	0	0	0.408297	0	0
Anti	0	0	0	0	0	0.49565
Witness	0	0	0	0	0	0.49565
Position	0	0	0	0	0	0.49565

The dataset used in the manualization process is 6 documents. The documents consist of 4 *Training data documents* and 2 *Testing data*. Of the 4 *Testing data*, there are 2 negative documents and 2 positive documents.

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Before the calculation is done, the TF weighting calculation is done first. The results obtained can be seen in table 5.

Table 5. Term Frequency Results of Training Data

1. Terms	2. TF				3. Class
	4. D1	5. D2	6. D3	7. D4	
8. DPR	9. 0	10. 0	11. 1	12. 0	13. 1
14. Right	15. 1	16. 1	17. 0	18. 1	19. 1
20. Support	21. 1	22. 0	23. 0	24. 0	25. 1
26. Lost	27. 0	28. 1	29. 0	30. 0	31. 1
32. People	33. 0	34. 1	35. 0	36. 0	37. 1
38. Cheat	39. 1	40. 0	41. 0	42. 0	43. 1
44. Voice	45. 1	46. 0	47. 0	48. 0	49. 1
50. Election	51. 1	52. 1	53. 1	54. 1	55. 1
56. Official	57. 0	58. 0	59. 0	60. 1	61. -1
62. Win	63. 0	64. 0	65. 1	66. 0	67. -1
68. Government	69. 1	70. 0	71. 0	72. 0	73. 1
74. Results	75. 1	76. 1	77. 1	78. 1	79. 1
80. Member	81. 0	82. 1	83. 0	84. 0	85. 1
86. Student	87. 0	88. 1	89. 0	90. 0	91. 1
92. Voice	93. 0	94. 0	95. 0	96. 1	97. -1
98. Chaos	99. 0	100. 0	101. 0	102. 1	103. 1
104. Demo	105. 1	106. 0	107. 0	108. 0	109. -1
110. Reject	111. 1	112. 1	113. 0	114. 0	115. -1
116. Action	117. 0	118. 0	119. 0	120. 1	121. -1
122. Disabled	123. 1	124. 0	125. 0	126. 0	127. 1
128. Suggestion	129. 0	130. 1	131. 0	132. 0	133. 1
134. Party	135. 1	136. 1	137. 1	138. 1	139. 1
140. History	141. 0	142. 0	143. 0	144. 1	145. -1

After the TF value is obtained, the next step is to calculate the IDF score. The results can be seen in Table 6.

Table 6. IDF Data *Training Results*

146. Terms	147. TF				148. DF	149. IDF Score
	150. D1	151. D2	152. D3	153. D4		
154. DPR	155. 0	156. 0	157. 1	158. 0	159. 1	160. 2.098612
161. Right	162. 1	163. 1	164. 0	165. 1	166. 3	167. 1,182322
168. Support	169. 1	170. 0	171. 0	172. 0	173. 1	174. 2.098612
175. Lost	176. 0	177. 1	178. 0	179. 0	180. 1	181. 2.098612
182. People	183. 0	184. 1	185. 0	186. 0	187. 1	188. 2.098612
189. Cheat	190. 1	191. 0	192. 0	193. 0	194. 1	195. 2.098612
196. Voice	197. 1	198. 0	199. 0	200. 0	201. 1	202. 2.098612
203. Election	204. 1	205. 1	206. 1	207. 1	208. 4	209. 1
210. Official	211. 0	212. 0	213. 0	214. 1	215. 1	216. 2.098612
217. Win	218. 0	219. 0	220. 1	221. 0	222. 1	223. 2.098612
224. Government	225. 1	226. 0	227. 0	228. 0	229. 1	230. 2.098612
231. Results	232. 1	233. 1	234. 1	235. 1	236. 4	237. 1
238. Member	239. 0	240. 1	241. 0	242. 0	243. 1	244. 2.098612
245. Student	246. 0	247. 1	248. 0	249. 0	250. 1	251. 2.098612
252. Voice	253. 0	254. 0	255. 0	256. 1	257. 1	258. 2.098612
259. Chaos	260. 0	261. 0	262. 0	263. 1	264. 1	265. 2.098612
266. Demo	267. 1	268. 0	269. 0	270. 0	271. 1	272. 2.098612
273. Reject	274. 1	275. 1	276. 0	277. 0	278. 2	279. 1.693147

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280. Action	281. 0	282. 0	283. 0	284. 1	285. 1	286. 2.098612
287. Disabled	288. 1	289. 0	290. 0	291. 0	292. 1	293. 2.098612
294. Suggestion	295. 0	296. 1	297. 0	298. 0	299. 2	300. 2.098612
301. Party	302. 1	303. 1	304. 1	305. 1	306. 4	307. 1
308. History	309. 0	310. 0	311. 0	312. 1	313. 1	314. 2.098612

After the IDF value is obtained, the TF-IDF score is calculated. The results can be seen in Table 7.

Table 7. TF-IDF Data *Training Results*

315. Terms	**316. TF-IDF**			
	317. D1	**318. D2**	**319. D3**	**320. D4**
321. DPR	322. 0	323. 0	324. 2.098612	325. 0
326. Right	327. 1,182322	328. 1,182322	329. 0	330. 1,182322
331. Support	332. 2.098612	333. 0	334. 0	335. 0
336. Lost	337. 0	338. 2.098612	339. 0	340. 0
341. People	342. 0	343. 2.098612	344. 0	345. 0
346. Cheat	347. 2.098612	348. 0	349. 0	350. 0
351. Voice	352. 2.098612	353. 0	354. 0	355. 0
356. Election	357. 1	358. 1	359. 1	360. 1
361. Official	362. 0	363. 0	364. 0	365. 2.098612
366. Win	367. 0	368. 0	369. 2.098612	370. 0
371. Government	372. 2.098612	373. 0	374. 0	375. 0
376. Results	377. 1	378. 1	379. 1	380. 1
381. Member	382. 0	383. 2.098612	384. 0	385. 0
386. Student	387. 0	388. 2.098612	389. 0	390. 0
391. Voice	392. 0	393. 0	394. 0	395. 2.098612
396. Chaos	397. 0	398. 0	399. 0	400. 2.098612
401. Demo	402. 2.098612	403. 0	404. 0	405. 0
406. Reject	407. 1.693147	408. 1.693147	409. 0	410. 0
411. Action	412. 0	413. 0	414. 0	415. 2.098612
416. Disabled	417. 2.098612	418. 0	419. 0	420. 0
421. Suggestion	422. 0	423. 2.098612	424. 0	425. 0
426. Party	427. 1	428. 1	429. 1	430. 1
431. History	432. 0	433. 0	434. 0	435. 2.098612

After the TF-IDF value is obtained, the TF-IDF normalization process is carried out. The results can be seen in Table 8.

Table 8. TF-IDF Normalization Results

436. Terms	**437. TF-IDF**			
	438. D1	**439. D2**	**440. D3**	**441. D4**
442. DPR	443. 0	444. 0	445. 0.610714	446. 0
447. Right	448. 0.213683	449. 0.218479	450. 0	451. 0.230027
452. Support	453. 0.306005	454. 0	455. 0	456. 0
457. Lost	458. 0	459. 0.387798	460. 0	461. 0
462. People	463. 0	464. 0.387798	465. 0	466. 0
467. Cheat	468. 0.379286	469. 0	470. 0	471. 0
472. Voice	473. 0.379286	474. 0	475. 0	476. 0
477. Election	478. 0.180732	479. 0.184788	480. 0.291008	481. 0.194556
482. Official	483. 0	484. 0	485. 0	486. 0.408297
487. Win	488. 0	489. 0	490. 0.610714	491. 0

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492. Government	493. 0.306005	494. 0	495. 0	496. 0
497. Results	498. 0.180732	499. 0.184788	500. 0.291008	501. 0.194556
502. Member	503. 0	504. 0.387798	505. 0	506. 0
507. Student	508. 0	509. 0.387798	510. 0	511. 0
512. Voice	513. 0	514. 0	515. 0	516. 0.408297
517. Chaos	518. 0	519. 0	520. 0	521. 0.408297
522. Demo	523. 0.379286	524. 0	525. 0	526. 0
527. Reject	528. 0.306005	529. 0.312873	530. 0	531. 0
532. Action	533. 0	534. 0	535. 0	536. 0.408297
537. Disabled	538. 0.379286	539. 0	540. 0	541. 0
542. Suggestion	543. 0	544. 0.387798	545. 0	546. 0
547. Party	548. 0.180732	549. 0.184788	550. 0.291008	551. 0.194556
552. History	553. 0	554. 0	555. 0	556. 0.408297

Then the SVM calculation process is carried out. Previously, the *training process was carried out* using the Sequential Training SVM method. The following are the stages carried out:

Calculating Kernel Values

The kernel calculation process is carried out after the data is entered into the system. The data is linear, so the kernel function used is **a linear kernel** with the equation:

$K(x, y) = xy$ …….(4.4)

From the results of the TF-IDF normalization calculation in table 9, a data comparison is carried out using the $A\times$ *matrix* X^T. In this method, data is represented through a comparison between a pair of data. Each data will be compared with itself and other data. For example, the test data consists of 5 data, so the comparison becomes as in Table 9.

Table 9. Data Comparison

557.	**558. A1**	**559. A2**	**560. A3**	**561. A4**	**562. A5**
563. B1	564. K(B 1,A 1)	565. K(B 1,A 2)	566. K(B 1,A 3)	567. K(B 1,A 4)	568. K(B 1,A 5)
569. B2	570. K(B 2,A 1)	571. K(B 2,A 2)	572. K(B 2,A 3)	573. K(B 2,A 4)	574. K(B 2,A 5)
575. B3	576. K(B 3,A 1)	577. K(B 3,A 2)	578. K(B 3,A 3)	579. K(B 3,A 4)	580. K(B 3,A 5)
581. B4	582. K(B 4,A 1)	583. K(B 4,A 2)	584. K(B 4,A 3)	585. K(B 4,A 4)	586. K(B 4,A 5)
587. B5	588. K(B 5,A 1)	589. K(B 5,A 2)	590. K(B 5,A 3)	591. K(B 5,A 4)	592. K(B 5,A 5)

The following shows the overall results of the data comparison calculations with the linear kernel.

Table 10. Kernel Calculation Results

593. D	**594. 1**	**595. 2**	**596. 3**	**597. 4**	**598. 5**	**599. 6**
600. 1	601. 0,372971	602. 0	603. 0	604. 0	605. 0	606. 0
607. 2	608. 0	609. 0,146306	610. 0,065388	611. 0,084726	612. 0,084726	613. 0,081047
614. 3	615. 0	616. 0,065388	617. 0,093639	618. 0	619. 0	620. 0,116063
621. 4	622. 0	623. 0,084726	624. 0	625. 0,150388	626. 0,150388	627. 0
628. 5	629. 0	630. 0,084726	631. 0	632. 0,150388	633. 0,150388	634. 0
635. 6	636. 0	637. 0,081047	638. 0,116063	639. 0	640. 0	641. 0,143858

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642. 7	643. 0	644. 0,081047	645. 0,116063	646. 0	647. 0	648. 0,143858
649. 8	650. 0,177723	651. 0,123745	652. 0,055305	653. 0,07166	654. 0,07166	655. 0,068549
656. 9	657. 0	658. 0,093919	659. 0	660. 0	661. 0	662. 0
663. 10	664. 0,372971	665. 0	666. 0	667. 0	668. 0	669. 0
670. 11	671. 0	672. 0,065388	673. 0,093639	674. 0	675. 0	676. 0,116063
677. 12	678. 0,177723	679. 0,123745	680. 0,055305	681. 0,07166	682. 0,07166	683. 0,068549
684. 13	685. 0	686. 0,084726	687. 0	688. 0,150388	689. 0,150388	690. 0
691. 14	692. 0	693. 0,084726	694. 0	695. 0,150388	696. 0,150388	697. 0
698. 15	699. 0	700. 0,093919	701. 0	702. 0	703. 0	704. 0
705. 16	706. 0	707. 0,093919	708. 0	709. 0	710. 0	711. 0
712. 17	713. 0	714. 0,081047	715. 0,116063	716. 0	717. 0	718. 0,143858
719. 18	720. 0	721. 0,133744	722. 0,093639	723. 0,121332	724. 0,121332	725. 0,116063
726. 19	727. 0	728. 0,093919	729. 0	730. 0	731. 0	732. 0
733. 20	734. 0	735. 0,081047	736. 0,116063	737. 0	738. 0	739. 0,143858
740. 21	741. 0	742. 0,084726	743. 0	744. 0,150388	745. 0,150388	746. 0
747. 22	748. 0,177723	749. 0,123745	750. 0,055305	751. 0,07166	752. 0,07166	753. 0,068549
754. 23	755. 0	756. 0,093919	757. 0	758. 0	759. 0	760. 0

To calculate the *Hessian matrix* , parameter values are needed. The parameters used include αi, C, γ, and λ and maximum iteration. Table11, describes the parameter values used.

Table 19. Parameter Values

761. Parameter	**762. Mark**
763. αi	764. 0
765. C	766. 1
767. γ	768. 0.1
769. λ	770. 0.5

Calculating the Hessian Matrix

After that initialize α = 0 and calculate the *Hessian matrix* .

$D_{ij} = y_i y_j (K(x_i x_j)) + \lambda^2$ ..... (4.5)

For $i,j = 1,\ldots, n$

Information:

x_i = i-th data

x_j = jth data

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y_i = i-th data class

y_j = jth data class

n = number of data

$(K(x_i x_j))$ = kernel function used

Hessian matrix calculations shown in Table 12

Table 12. *Hessian Matrix*

771.	**772. 1**	**773. 2**	**774. 3**	**775. 4**	**776. 5**	**777. 6**
778. 1	779. 0,622971	780. 0,25	781. 0,25	782. 0,25	783. 0,25	784. 0,25
785. 2	786. 0,25	787. 0,396306	788. 0,184612	789. 0,165274	790. 0,165274	791. 0,168953
792. 3	793. 0,25	794. 0,184612	795. 0,343639	796. 0,25	797. 0,25	798. 0,366063
799. 4	800. 0,25	801. 0,165274	802. 0,25	803. 0,400388	804. 0,400388	805. 0,25
806. 5	807. 0,25	808. 0,165274	809. 0,25	810. 0,400388	811. 0,400388	812. 0,25
813. 6	814. 0,25	815. 0,168953	816. 0,366063	817. 0,25	818. 0,25	819. 0,393858
820. 7	821. 0,25	822. 0,168953	823. 0,366063	824. 0,25	825. 0,25	826. 0,393858
827. 8	828. 0,427723	829. 0,373745	830. 0,194695	831. 0,17834	832. 0,17834	833. 0,181451
834. 9	835. 0,25	836. 0,343919	837. 0,25	838. 0,25	839. 0,25	840. 0,25
841. 10	842. 0,622971	843. 0,25	844. 0,25	845. 0,25	846. 0,25	847. 0,25
848. 11	849. 0,25	850. 0,184612	851. 0,343639	852. 0,25	853. 0,25	854. 0,366063
855. 12	856. 0,427723	857. 0,373745	858. 0,194695	859. 0,17834	860. 0,17834	861. 0,181451
862. 13	863. 0,25	864. 0,165274	865. 0,25	866. 0,400388	867. 0,400388	868. 0,25
869. 14	870. 0,25	871. 0,165274	872. 0,25	873. 0,400388	874. 0,400388	875. 0,25
876. 15	877. 0,25	878. 0,343919	879. 0,25	880. 0,25	881. 0,25	882. 0,25
883. 16	884. 0,25	885. 0,343919	886. 0,25	887. 0,25	888. 0,25	889. 0,25
890. 17	891. 0,25	892. 0,168953	893. 0,366063	894. 0,25	895. 0,25	896. 0,393858
897. 18	898. 0,25	899. 0,116256	900. 0,343639	901. 0,371332	902. 0,371332	903. 0,366063
904. 19	905. 0,25	906. 0,343919	907. 0,25	908. 0,25	909. 0,25	910. 0,25
911. 20	912. 0,25	913. 0,168953	914. 0,366063	915. 0,25	916. 0,25	917. 0,393858
918. 21	919. 0,25	920. 0,165274	921. 0,25	922. 0,400388	923. 0,400388	924. 0,25
925. 22	926. 0,427723	927. 0,373745	928. 0,194695	929. 0,17834	930. 0,17834	931. 0,181451
932. 23	933. 0.25	934. 0.343919	935. 0.25	936. 0.25	937. 0.25	938. 0.25

Example of calculating column 1 row 1

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D_{ij} =$y_i y_j(K(x_i x_j)) + \lambda^2$

D_{11} =$1 * 1(0{,}372971) + 0{,}5^2$

D_{11} = 0.622971

Sequential Training SVM

After the results of the *Hessian matrix calculation* are obtained, calculate the following equation:

$E_i = \sum_{J=1}^{n} \alpha_i D_{ij}$ …… …(4.6)

Information:

E_i = error value

α_i = jth alpha

D_{ij} = *Hessian matrix*

In the initial calculation, iterations are calculated and started from iteration 0. Because the value αobtained from the calculation results is still unknown. In this iteration, the value of E is explained in Table 13.

Table 13. Calculation Results E

939. D	**940. 1**	**941. 2**	**942. 3**	**943. 4**	**944. 5**	**945. 6**	**946. 7**	**947. 8**	**948. 9**	**949. 10**	**950. 11**
951. 1	952. 0	953. 0	954. 0	955. 0	956. 0	957. 0	958. 0	959. 0	960. 0	961. 0	962. 0
963. 2	964. 0	965. 0	966. 0	967. 0	968. 0	969. 0	970. 0	971. 0	972. 0	973. 0	974. 0
975. 3	976. 0	977. 0	978. 0	979. 0	980. 0	981. 0	982. 0	983. 0	984. 0	985. 0	986. 0
987. 4	988. 0	989. 0	990. 0	991. 0	992. 0	993. 0	994. 0	995. 0	996. 0	997. 0	998. 0
999. 5	1000. 0	1001. 0	1002. 0	1003. 0	1004. 0	1005. 0	1006. 0	1007. 0	1008. 0	1009. 0	1010. 0
1011. 6	1012. 0	1013. 0	1014. 0	1015. 0	1016. 0	1017. 0	1018. 0	1019. 0	1020. 0	1021. 0	1022. 0
1023. 7	1024. 0	1025. 0	1026. 0	1027. 0	1028. 0	1029. 0	1030. 0	1031. 0	1032. 0	1033. 0	1034. 0
1035. 8	1036. 0	1037. 0	1038. 0	1039. 0	1040. 0	1041. 0	1042. 0	1043. 0	1044. 0	1045. 0	1046. 0
1047. 9	1048. 0	1049. 0	1050. 0	1051. 0	1052. 0	1053. 0	1054. 0	1055. 0	1056. 0	1057. 0	1058. 0
1059. 10	1060. 0	1061. 0	1062. 0	1063. 0	1064. 0	1065. 0	1066. 0	1067. 0	1068. 0	1069. 0	1070. 0
1071. 11	1072. 0	1073. 0	1074. 0	1075. 0	1076. 0	1077. 0	1078. 0	1079. 0	1080. 0	1081. 0	1082. 0
1083. 12	1084. 0	1085. 0	1086. 0	1087. 0	1088. 0	1089. 0	1090. 0	1091. 0	1092. 0	1093. 0	1094. 0
1095. 13	1096. 0	1097. 0	1098. 0	1099. 0	1100. 0	1101. 0	1102. 0	1103. 0	1104. 0	1105. 0	1106. 0
1107. 14	1108. 0	1109. 0	1110. 0	1111. 0	1112. 0	1113. 0	1114. 0	1115. 0	1116. 0	1117. 0	1118. 0
1119. 15	1120. 0	1121. 0	1122. 0	1123. 0	1124. 0	1125. 0	1126. 0	1127. 0	1128. 0	1129. 0	1130. 0
1131. 16	1132. 0	1133. 0	1134. 0	1135. 0	1136. 0	1137. 0	1138. 0	1139. 0	1140. 0	1141. 0	1142. 0
1143. 17	1144. 0	1145. 0	1146. 0	1147. 0	1148. 0	1149. 0	1150. 0	1151. 0	1152. 0	1153. 0	1154. 0
1155. 18	1156. 0	1157. 0	1158. 0	1159. 0	1160. 0	1161. 0	1162. 0	1163. 0	1164. 0	1165. 0	1166. 0
1167. 19	1168. 0	1169. 0	1170. 0	1171. 0	1172. 0	1173. 0	1174. 0	1175. 0	1176. 0	1177. 0	1178. 0
1179. 20	1180. 0	1181. 0	1182. 0	1183. 0	1184. 0	1185. 0	1186. 0	1187. 0	1188. 0	1189. 0	1190. 0
1191. 21	1192. 0	1193. 0	1194. 0	1195. 0	1196. 0	1197. 0	1198. 0	1199. 0	1200. 0	1201. 0	1202. 0
1203. 22	1204. 0	1205. 0	1206. 0	1207. 0	1208. 0	1209. 0	1210. 0	1211. 0	1212. 0	1213. 0	1214. 0
1215. 23	1216. 0	1217. 0	1218. 0	1219. 0	1220. 0	1221. 0	1222. 0	1223. 0	1224. 0	1225. 0	1226. 0
1227. E_i	1228. 0	1229. 0	1230. 0	1231. 0	1232. 0	1233. 0	1234. 0	1235. 0	1236. 0	1237. 0	1238. 0

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Example of calculating column 1 row 1

$E_i = \sum_{j=1}^{n} \alpha_j D_{ij}$

E_i =0 * 0.622971

E_i =0

After that, the calculation of δα is carried out to obtain the value of α. Table 15 describes the results of the calculation of δα at iteration 0.

$\delta\alpha_i = \min\{\max[\gamma(1 - E_i), C - \alpha_i\}$…… …(4.7)

Information:

$\delta\alpha_i$ = delta alpha to-i

γ = *learning rate* = constant $\gamma / max_{\{i\}} D_{ii}$

E_i = *error rate*

α_i = alpha i

C = *variable slack*

Table 14. Calculation Results$\delta\alpha_i$

1239.	**1240.**	**1241.**	**1242.**	**1243.**	**1244.**	**1245.**	**1246.**	**1247.**	**1248.**	**1249. 0**	**1250. 1**	**1251. 2**
1252. deltaα_i	1253. 0 .1	1254. 0 .1	1255. 0 .1	1256. 0 .1	1257. 0 .1	1258. 0 .1	1259. 0 .1	1260. 0 .1	1261. 0 .1	1262. 0 .1	1263. 0 .1	1264. 0 .1

Table 15. Calculation Results$\delta\alpha_i$

1265.	**1266. 3**	**1267. 4**	**1268. 5**	**1269. 6**	**1270. 7**	**1271. 8**	**1272. 9**	**1273. 0**	**1274. 1**	**1275. 2**	**1276. 3**	**1277. 4**
1278. deltaα_i	1279. .1	1280. .1	1281. .1	1282. .1	1283. .1	1284. .1	1285. .1	1286. .1	1287. .1	1288. .1	1289. .1	1290. .1

Example of calculating column 1 row 1

$\delta\alpha_i$= min{ max$[\gamma(1 - E_i), C - \alpha_i\}$

$\delta\alpha_i$= min{ max$[0{,}1(1 - 0), C - 0\}$

$\delta\alpha_i$= min{ max$[0{,}1{,}0\}$

$\delta\alpha_i$= 0.1

Then, from the results of δα obtained, calculations are carried out to obtain α_i. Table 16 describes the calculation results.α_i.

$\alpha_i = \alpha_i + \delta\alpha_i$…… …(4.8)

Information:

α_i = alpha i

$\delta\alpha_i$ = delta alpha to-i

Table 16. Calculation Resultsα_i

1291.	**1292. 1**	**1293. 2**	**1294. 3**	**1295. 4**	**1296. 5**	**1297. 6**	**1298. 7**	**1299. 8**	**1300. 9**	**1301. 10**	**1302. 11**	**1303. 12**
1304. (	1305. 0 .1	1306. 0 .1	1307. 0 .1	1308. 0 .1	1309. 0 .1	1310. 0 .1	1311. 0 .1	1312. 0 .1	1313. 0 .1	1314. 0 .1	1315. 0 .1	1316. 0 .1

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Table 17. Results of αi Calculation

1317.	**1318. 13**	**1319. 14**	**1320. 15**	**1321. 16**	**1322. 17**	**1323. 18**	**1324. 19**	**1325. 20**	**1326. 21**	**1327. 22**	**1328. 23**
1329. α	1330. 0 .1	1331. 0 .1	1332. 0 .1	1333. 0 .1	1334. 0 .1	1335. 0 .1	1336. 0 .1	1337. 0 .1	1338. 0 .1	1339. 0 .1	1340. 0 .1

Example of calculating column 1 row 1

$\alpha_i = \alpha_i + \delta\alpha_i$

$\alpha_1 = \alpha_0 + \delta\alpha_1$

$\alpha_i = 0 + 0.1$

$\alpha_i = 0.1$

Repeat step 3 until the 4th iteration, after doing step 3, the calculation is carried out continuously until it reaches the maximum iteration to get the value α_i needed to find *the support vector* . Table 4.27 explains the calculation results $\alpha_i$in the 4th iteration.

Table 18. α_iMaximum Iteration Calculation Results

1341.	**1342. 1**	**1343. 2**	**1344. 3**	**1345. 4**	**1346. 5**	**1347. 6**
1348. α	1349. 0.14 5779	1350. 0.16 5878	1351. 0.15 7571	1352. 0.16 0504	1353. 0.15 6651	1354. 0.15 5675

After the calculation process described previously, calculations are carried out to find *the support vector* of each document. From the $\alpha_i$last value obtained previously, α_i the largest value of each class is taken. Table 19 explains the $\alpha_i$largest selection of each class.

Table 19. Selection of the Largest αi

1355. sv	**1356. F1**	**1357. F2**	**1358. F3**	**1359. F4**	**1360. α_i**	**1361. Kelas**
1362. 1	1363. 0	1364. 0	1365. 0.610714	1366. 0	1367. 0.145779	1368. 1
1369. 2	1370. 0.213683	1371. 0.218479	1372. 0	1373. 0.230027	1374. 0.165878	1375. 1
1376. 3	1377. 0.306005	1378. 0	1379. 0	1380. 0	1381. 0.157571	1382. 1
1383. 4	1384. 0	1385. 0.387798	1386. 0	1387. 0	1388. 0.160504	1389. 1
1390. 5	1391. 0	1392. 0,387798	1393. 0	1394. 0	1395. 0,156651	1396. 1
1397. 6	1398. 0,379286	1399. 0	1400. 0	1401. 0	1402. 0,155675	1403. 1
1404. 7	1405. 0,379286	1406. 0	1407. 0	1408. 0	1409. 0,199671	1410. 1
1411. 8	1412. 0,180732	1413. 0,184788	1414. 0,291008	1415. 0,194556	1416. 0,156426	1417. 1
1418. 9	1419. 0	1420. 0	1421. 0	1422. 0,408297	1423. 0,147526	1424. -1
1425. 10	1426. 0	1427. 0	1428. 0,610714	1429. 0	1430. 0,145779	1431. -1
1432. 11	1433. 0,306005	1434. 0	1435. 0	1436. 0	1437. 0,157571	1438. 1
1439. 12	1440. 0,180732	1441. 0,184788	1442. 0,291008	1443. 0,194556	1444. 0,156426	1445. 1
1446. 13	1447. 0	1448. 0,387798	1449. 0	1450. 0	1451. 0,156651	1452. 1
1453. 14	1454. 0	1455. 0,387798	1456. 0	1457. 0	1458. 0,156651	1459. 1

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1460. 15	1461. 0	1462. 0	1463. 0	1464. 0,408297	1465. 0,147526	1466. -1
1467. 16	1468. 0	1469. 0	1470. 0	1471. 0,408297	1472. 0,155675	1473. 1
1474. 17	1475. 0,379286	1476. 0	1477. 0	1478. 0	1479. 0,150441	1480. -1
1481. 18	1482. 0,306005	1483. 0,312873	1484. 0	1485. 0	1486. 0,147526	1487. -1
1488. 19	1489. 0	1490. 0	1491. 0	1492. 0,408297	1493. 0,147526	1494. -1
1495. 20	1496. 0,379286	1497. 0	1498. 0	1499. 0	1500. 0,155675	1501. 1
1502. 21	1503. 0	1504. 0,387798	1505. 0	1506. 0	1507. 0,156651	1508. 1
1509. 22	1510. 0,180732	1511. 0,184788	1512. 0,291008	1513. 0,194556	1514. 0,156426	1515. 1
1516. 23	1517. 0	1518. 0	1519. 0	1520. 0,408297	1521. 0,147526	1522. -1

After that, the value is used to calculate the kernel function of each class. Table 20 shows the calculation results.

Table 20. Kernel Calculation α_i from Largest

1523. sv	**1524. k(x,xi +)**	**1525. k(x,xi -)**
1526. 1	1527. 0	1528. 0
1529. 2	1530. 0.081046843	1531. 0.081047
1532. 3	1533. 0.116063378	1534. 0.116063
1535. 4	1536. 0	1537. 0
1538. 5	1539. 0	1540. 0
1541. 6	1542. 0.143857565	1543. 0.143858
1544. 7	1545. 0,143857565	1546. 0,143858
1547. 8	1548. 0,068548901	1549. 0,068549
1550. 9	1551. 0	1552. 0
1553. 10	1554. 0	1555. 0
1556. 11	1557. 0,116063378	1558. 0,116063
1559. 12	1560. 0,068548901	1561. 0,068549
1562. 13	1563. 0	1564. 0
1565. 14	1566. 0	1567. 0
1568. 15	1569. 0	1570. 0
1571. 16	1572. 0	1573. 0
1574. 17	1575. 0,143857565	1576. 0,143858
1577. 18	1578. 0.116063378	1579. 0.116063
1580. 19	1581. 0	1582. 0
1583. 20	1584. 0.143857565	1585. 0.143858
1586. 21	1587. 0	1588. 0
1589. 22	1590. 0.068548901	1591. 0.068549
1592. 23	1593. 0	1594. 0

Then the calculation of b is performed which is needed in the *hyperplane calculation* . The value of b is obtained from Equation 4.9.

$b = -\frac{1}{2}[w.x^{+} + w.x^{-}]$

$b = -\frac{1}{2}[\sum_{i=1}^{m} \alpha_i y_i x_i x^{+} + \sum_{i=1}^{m} \alpha_i y_i x_i x^{-}]$

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$b = -\frac{1}{2}[\sum_{i=1}^{m} \alpha_i y_i \emptyset(x_i)\emptyset(x^+) + \sum_{i=1}^{m} \alpha_i y_i \emptyset(x_i)\emptyset(x^-)]$

$b = -\frac{1}{2}[\sum_{i=1}^{m} \alpha_i y_i K(x_i, x^+) + \sum_{i=1}^{m} \alpha_i y_i K(x_i, x^-)]$ ....(4.9)

Information:

α_i = alpha i

y_i = i-th data class

$K(x_i, x^+)$ = positive class kernel

$K(x_i, x^-)$ = negative class kernel

The results of the calculation w. x^++ w. x^-can be seen in table 21.

Table 21. WX Calculation Results

1595. sv	**1596. Positive**	**1597. Negative**
1598. 1	1599. 0	1600. 0
1601. 2	1602. 0.013444	1603. 0.013444
1604. 3	1605. 0.018288	1606. 0.018288
1607. 4	1608. 0	1609. 0
1610. 5	1611. 0	1612. 0
1613. 6	1614. 0,022395	1615. 0,022395
1616. 7	1617. 0,028724	1618. 0,028724
1619. 8	1620. 0,010723	1621. 0,010723
1622. 9	1623. 0	1624. 0
1625. 10	1626. 0	1627. 0
1628. 11	1629. 0,018288	1630. 0,018288
1631. 12	1632. 0,010723	1633. 0,010723
1634. 13	1635. 0	1636. 0
1637. 14	1638. 0	1639. 0
1640. 15	1641. 0	1642. 0
1643. 16	1644. 0	1645. 0
1646. 17	1647. -0.0224	1648. -0.0224
1649. 18	1650. -0.01746	1651. -0.01746
1652. 19	1653. 0	1654. 0
1655. 20	1656. 0.022395	1657. 0.022395
1658. 21	1659. 0	1660. 0
1661. 22	1662. 0.010723	1663. 0.010723
1664. 23	1665. 0	1666. 0
1667. sigma	1668. 0.115847	1669. 0.093452

From this value, the value of b can then be found using equation 4.9.

$b = -\frac{1}{2}[w.x^+ + w.x^-]$

$b = -\frac{1}{2}(0.11587 + 0.093452)$

b = -0.10465

After getting the bias value, the next step is to determine the training data class into the positive or negative class. The training data that will be tested for its class is in table 22. The first step is to calculate the kernel value using the TF-IDF value of the training data and test data.

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Table 22. TF-IDF Values of Training Data

1670. Terms	1671. TF-IDF				
	1672. D1	**1673. D2**	**1674. D3**	**1675. D4**	**1676. D5**
1677. DPR	1678. 0	1679. 0	1680. 0.610714	1681. 0	1682. 0
1683. Right	1684. 0.213683	1685. 0.218479	1686. 0	1687. 0.230027	1688. 0.271674
1689. Support	1690. 0.306005	1691. 0	1692. 0	1693. 0	1694. 0.389052
1695. Lost	1696. 0	1697. 0.387798	1698. 0	1699. 0	1700. 0
1701. People	1702. 0	1703. 0.387798	1704. 0	1705. 0	1706. 0
1707. Cheat	1708. 0.379286	1709. 0	1710. 0	1711. 0	1712. 0
1713. Questionnaire	1714. 0	1715. 0	1716. 0	1717. 0	1718. 0.48222
1719. Voice	1720. 0.379286	1721. 0	1722. 0	1723. 0	1724. 0
1725. Election	1726. 0.180732	1727. 0.184788	1728. 0.291008	1729. 0.194556	1730. 0.22978
1731. Official	1732. 0	1733. 0	1734. 0	1735. 0.408297	1736. 0
1737. Win	1738. 0	1739. 0	1740. 0.610714	1741. 0	1742. 0
1743. Government	1744. 0.306005	1745. 0	1746. 0	1747. 0	1748. 0.389052
1749. Results	1750. 0.180732	1751. 0.184788	1752. 0.291008	1753. 0.194556	1754. 0.22978
1755. Member	1756. 0	1757. 0.387798	1758. 0	1759. 0	1760. 0
1761. Student	1762. 0	1763. 0.387798	1764. 0	1765. 0	1766. 0
1767. Voice	1768. 0	1769. 0	1770. 0	1771. 0.408297	1772. 0
1773. Chaos	1774. 0	1775. 0	1776. 0	1777. 0.408297	1778. 0
1779. Demo	1780. 0.379286	1781. 0	1782. 0	1783. 0	1784. 0
1785. Reject	1786. 0.306005	1787. 0.312873	1788. 0	1789. 0	1790. 0
1791. Building	1792. 0	1793. 0	1794. 0	1795. 0	1796. 0.48222
1797. Action	1798. 0	1799. 0	1800. 0	1801. 0.408297	1802. 0
1803. Disabled	1804. 0.379286	1805. 0	1806. 0	1807. 0	1808. 0
1809. Suggestion	1810. 0	1811. 0.387798	1812. 0	1813. 0	1814. 0
1815. Party	1816. 0.180732	1817. 0.184788	1818. 0.291008	1819. 0.194556	1820. 0.22978
1821. History	1822. 0	1823. 0	1824. 0	1825. 0.408297	1826. 0

Table 23. TF-IDF Values of Test Data

1827. Terms	**1828. TF**	**1829. DF**	**1830. IDF**	**1831. TF-IDF**	*1832. Norm*
1833. Right	1834. 1	1835. 1	1836. 1,182322	1837. 1,182322	1838. 0.294909
1839. Questionnaire	1840. 1	1841. 1	1842. 2.098612	1843. 2.098612	1844. 0.523461
1845. Election	1846. 1	1847. 1	1848. 1	1849. 1	1850. 0.249432
1851. Government	1852. 1	1853. 1	1854. 1.693147	1855. 1.693147	1856. 0.422325

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1857. Results	1858. 1	1859. 1	1860. 1	1861. 1	1862. 0.249432
1863. Building	1864. 1	1865. 1	1866. 2.098612	1867. 2.098612	1868. 0.523461
1869. Party	1870. 1	1871. 1	1872. 1	1873. 1	1874. 0.249432

Next, the kernel calculation is performed from each test data with the training data that has been set. The following are the results of the calculation of the training data kernel against the test data.

Table 4. 1 Kernel Calculation Results of Training Data Against Test Data

1875.	**1876. 1**	**1877. 2**	**1878. 3**	**1879. 4**	**1880. 5**	**1881. 6**	**1882. 7**
1883. 1	1884. 0.180105	1885. 0.319684576	1886. 0.152331	1887. 0.25792	1888. 0.152331	1889. -0.31968	1890. 0.152331
1891. 2	1892. 0.195285	1893. -0.34662988	1894. 0.165171	1895. -0.279659	1896. -0.165171	1897. 0,34663	1898. 0,165171
1899. 3	1900. 0,090244	1901. 0,160181693	1902. 0,076327	1903. 0,129234	1904. 0,076327	1905. 0,160182	1906. 0,076327
1907. 4	1908. 0,114365	1909. -0,20299714	1910. -0,096729	1911. 0,163777	1912. 0,096729	1913. -0,20299	1914. 0,096729
1915. 5	1916. 0,114365	1917. -0,20299714	1918. 0,096729	1919. 0,163777	1920. 0,096729	1921. -0,20299	1922. 0,096729
1923. 6	1924. 0,111855	1925. 0,19854108	1926. 0,094606	1927. 0,160182	1928. 0,094606	1929. 0,198541	1930. 0,094606
1931. 7	1932. 0,111855	1933. 0,19854108	1934. 0,094606	1935. 0,160182	1936. 0,094606	1937. 0,198541	1938. 0,094606
1939. 8	1940. -0,25099	1941. -0,44550875	1942. -0,212287	1943. -0,359434	1944. -0,212287	1945. -0,44550	1946. -0,212287
1947. 9	1948. 0,12041	1949. -0,21372734	1950. 0,101842	1951. 0,172434	1952. 0,101842	1953. -0,21372	1954. 0,101842
1955. 10	1956. 0,180105	1957. -0,31968457	1958. 0,152331	1959. 0,25792	1960. 0,152331	1961. -0,31968	1962. 0,152331
1963. 11	1964. 0,090244	1965. 0,160181693	1966. 0,076327	1967. 0,129234	1968. 0,076327	1969. 0,160182	1970. 0,076327
1971. 12	1972. -0,25099	1973. -0,44550875	1974. -0,212287	1975. -0,359434	1976. -0,212287	1977. -0,44550	1978. -0,212287
1979. 13	1980. 0,114365	1981. -0,20299714	1982. 0,096729	1983. 0,163777	1984. 0,096729	1985. -0,20299	1986. 0,096729
1987. 14	1988. 0,114365	1989. -0,20299714	1990. 0,096729	1991. 0,163777	1992. 0,096729	1993. -0,20299	1994. 0,096729
1995. 15	1996. 0,12041	1997. -0,21372734	1998. -0,101842	1999. 0,172434	2000. 0,101842	2001. -0,21372	2002. 0,101842
2003. 16	2004. 0,12041	2005. -0,21372734	2006. 0,101842	2007. 0,172434	2008. 0,101842	2009. -0,21372	2010. 0,101842
2011. 17	2012. 0,111855	2013. 0,19854108	2014. 0,094606	2015. 0,160182	2016. 0,094606	2017. 0,198541	2018. 0,094606
2019. 18	2020. 0,182513	2021. -0,32395850	2022. 0,154368	2023. -0,261368	2024. -0,154368	2025. -0,32395	2026. 0,154368
2027. 19	2028. 0,12041	2029. -0,21372734	2030. 0,101842	2031. 0,172434	2032. 0,101842	2033. -0,21372	2034. 0,101842
2035. 20	2036. 0,111855	2037. 0,19854108	2038. 0,094606	2039. 0,160182	2040. 0,094606	2041. -0,19854	2042. 0.094606
2043. 21	2044. 0.114365	2045. -0.20299714	2046. 0.096729	2047. 0.163777	2048. 0.096729	2049. -0.20299	2050. 0.096729
2051. 22	2052. -0.25099	2053. -0.44550875	2054. 0.212287	2055. -0.359434	2056. -0.212287	2057. -0.44550	2058. -0.212287
2059. 23	2060. 0.12041	2061. -0.21372734	2062. 0.101842	**2063.** 0.172434	2064. 0.101842	2065. -0.21372	2066. 0.101842

K(B 1,UI) = ((B1*U1)+(B2*U1)+(B3*U1)+(B4*U1))

K(B 1,UI) = ((0*0.294909)+(0*0.294909)+(0.610714*0.294909)+(0*0.294909))

K(B 1,UI) = 0.180105

$\sum x_i$= 0.8903

After getting the kernel value, the next calculation is the calculation of the test data weight. The calculation of the test data weight is obtained by multiplying the last *alpha value* of the data with the class of the data and also with the training data kernel against the test data. Table 24 shows the results of the weight calculation. from each data using the following formula.

wx =$\alpha_i y_i K(x_i, x_j)$

wx = 0.1458*1*0.1801

wx = 0.02626

Table 24. Results of Calculation of Weight Addition on Each Data

2067.	**2068. 1**	**2069. 2**	**2070. 3**	**2071. 4**	**2072. 5**	**2073. 6**	**2074. 7**
2075. 1	2076. 0,02626	2077. 0,0466	2078. 0,02221	2079. 0,0376	2080. 0,02221	2081. 0,0466	2082. 0,02221

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2083. 2	2084. 0,03 2394	2085. 0,05 7498	2086. 0,02 7398	2087. 0,04 6389	2088. 0,02 7398	2089. 0,05 7498	2090. 0,02 7398
2091. 3	2092. 0,01 422	2093. 0,02 524	2094. 0,01 2027	2095. 0,02 0363	2096. 0,01 2027	2097. 0,02 524	2098. 0,01 2027
2099. 4	2100. 0,01 8356	2101. 0,03 2582	2102. 0,01 5525	2103. 0,02 6287	2104. 0,01 5525	2105. 0,03 2582	2106. 0,01 5525
2107. 5	2108. 0,01 7915	2109. 0,03 18	2110. 0,01 5153	2111. 0,02 5656	2112. 0,01 5153	2113. 0,03 18	2114. 0,01 5153
2115. 6	2116. 0,01 7413	2117. 0,03 0908	2118. 0,01 4728	2119. 0,02 4936	2120. 0,01 4728	2121. 0,03 0908	2122. 0,01 4728
2123. 7	2124. 0,02 2334	2125. 0,03 9643	2126. 0,01 889	2127. 0,03 1984	2128. 0,01 889	2129. 0,03 9643	2130. 0,01 889
2131. 8	2132. 0,03 9262	2133. 0,06 9689	2134. 0,03 3207	2135. 0,05 6225	2136. 0,03 3207	2137. 0,06 9689	2138. 0,03 3207
2139. 9	2140. -0,01776	2141. -0,03153	2142. -0,01502	2143. -0,02544	2144. -0,01502	2145. -0,03153	2146. -0,01502
2147. 10	2148. -0,02626	2149. -0,0466	2150. -0,02221	2151. -0,0376	2152. -0,02221	2153. -0,0466	2154. -0,02221
2155. 11	2156. 0,01 422	2157. 0,02 524	2158. 0,01 2027	2159. 0,02 0363	2160. 0,01 2027	2161. 0,02 524	2162. 0,01 2027
2163. 12	2164. 0,03 9262	2165. 0,06 9689	2166. 0,03 3207	2167. 0,05 6225	2168. 0,03 3207	2169. 0,06 9689	2170. 0,03 3207
2171. 13	2172. 0,01 7915	2173. 0,03 18	2174. 0,01 5153	2175. 0,02 5656	2176. 0,01 5153	2177. 0,03 18	2178. 0,01 5153
2179. 14	2180. 0,01 7915	2181. 0,03 18	2182. 0,01 5153	2183. 0,02 5656	2184. 0,01 5153	2185. 0,03 18	2186. 0,01 5153
2187. 15	2188. -0,01776	2189. -0,03153	2190. -0,01502	2191. -0,02544	2192. -0,01502	2193. -0,03153	2194. -0,01502
2195. 16	2196. 0,01 8745	2197. 0,03 3272	2198. 0,01 5854	2199. 0,02 6844	2200. 0,01 5854	2201. 0,03 3272	2202. 0,01 5854
2203. 17	2204. -0,01683	2205. -0,02987	2206. -0,01423	2207. -0,0241	2208. -0,01423	2209. -0,02987	2210. -0,01423
2211. 18	2212. -0,02693	2213. -0,04779	2214. -0,02277	2215. -0,03856	2216. -0,02277	2217. -0,04779	2218. -0,02277
2219. 19	2220. -0,01776	2221. -0,03153	2222. -0,01502	2223. -0,02544	2224. -0,01502	2225. -0,03153	2226. -0,01502
2227. 20	2228. 0,01 7413	2229. 0,03 0908	2230. 0,01 4728	2231. 0,02 4936	2232. 0,01 4728	2233. 0,03 0908	2234. 0,01 4728
2235. 21	2236. 0,01 7915	2237. 0,03 18	2238. 0,01 5153	2239. 0,02 5656	2240. 0,01 5153	2241. 0,03 18	2242. 0,01 5153
2243. 22	2244. 0,03 9262	2245. 0,06 9689	2246. 0,03 3207	2247. 0,05 6225	2248. 0,03 3207	2249. 0,06 9689	2250. 0,03 3207
2251. 23	2252. -0.01776	2253. -0.03153	2254. -0.01502	2255. -0.02544	2256. -0.01502	2257. -0.03153	2258. -0.01502
2259. Sigma	2260. 0.2297	2261. 0.4078	2262. 0.1943	2263. 0.3289	2264. 0.1943	2265. 0.4078	2266. 0.1943

Next, the sum of the test data weights is used to find the value of the function f(x). It can be seen that in the test data classification function, the value obtained is 1 so that it is classified as class 1 data which is included in the **positive class**.

Table 25. TF-IDF Values of Second Test Data

2267. Terms	**2268. TF**	**2269. DF**	**2270. IDF**	**2271. TF-IDF**	***2272. Norm***
2273. Party	2274. 1	2275. 1	2276. 1	2277. 1	2278. 0.220021
2279. Government	2280. 1	2281. 1	2282. 1.559616	2283. 1.559616	2284. 0.343148
2285. Results	2286. 1	2287. 1	2288. 1	2289. 1	2290. 0.220021
2291. Election	2292. 1	2293. 1	2294. 1	2295. 1	2296. 0.220021
2297. Official	2298. 1	2299. 1	2300. 2.252763	2301. 2.252763	2302. 0.495655
2303. Action	2304. 1	2305. 1	2306. 2.252763	2307. 2.252763	2308. 0.495655
2309. Suggestion	2310. 1	2311. 1	2312. 2.252763	2313. 2.252763	2314. 0.495655

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Next, the kernel calculation is performed from each test data with the training data that has been set. The following are the results of the calculation of the training data kernel against the test data.

Table 4. 2 Kernel Calculation Results of Training Data Against Second Test Data

2315.	**2316. 1**	**2317. 2**	**2318. 3**	**2319. 4**	**2320. 5**	**2321. 6**	**2322. 7**
2323. 1	2324. 0.259124	2325. 0.404133	2326. 0.259124	2327. 0.259124	2328. 0.583744	2329. 0.583744	2330. 0.583744
2331. 2	2332. 0.296985	2333. 0.436481	2334. 0.286553	2335. 0.286553	2336. 0,645536	2337. 0,645536	2338. 0,645536
2339. 3	2340. -0,20785	2341. -0,32417	2342. -0,48349	2343. 0,20785	2344. -0,46824	2345. 0,46824	2346. -0,46824
2347. 4	2348. 0,17117	2349. -0,24402	2350. -0,4468	2351. 0,17117	2352. -0,3856	2353. -0,3856	2354. -0,3856
2355. 5	2356. -0,12971	2357. -0,24402	2358. -0,4468	2359. 0,17117	2360. -0,3856	2361. -0,3856	2362. -0,3856
2363. 6	2364. -0,20494	2365. -0,31963	2366. -0,015082	2367. -0,20494	2368. -0,46168	2369. 0,46168	2370. -0,46168
2371. 7	2372. -0,20494	2373. -0,31963	2374. 0,015082	2375. -0,20494	2376. 0,46168	2377. -0,46168	2378. 0,46168
2379. 8	2380. 0,279159	2381. 0,435381	2382. 0,074905	2383. -0,29492	2384. -0,66439	2385. -0,66439	2386. -0,66439
2387. 9	2388. 0,274178	2389. 0,427612	2390. 0,054157	2391. 0,274178	2392. 0,617657	2393. 0,617657	2394. 0,617657
2395. 10	2396. 0,259124	2397. 0,404133	2398. 0,039103	2399. 0,259124	2400. 0,583744	2401. 0,583744	2402. 0,583744
2403. 11	2404. -0,20785	2405. -0,32417	2406. 0,012168	2407. -0,20785	2408. -0,46824	2409. -0,46824	2410. -0,46824
2411. 12	2412. -0,279159	2413. 0,435381	2414. 0,074905	2415. 0,294926	2416. 0,664398	2417. 0,664398	2418. 0,664398
2419. 13	2420. -0,20425	2421. -0,31856	2422. 0,048855	2423. -0,17117	2424. -0,3856	2425. -0,3856	2426. -0,3856
2427. 14	2428. -0,20425	2429. -0,31856	2430. 0,048855	2431. -0,17117	2432. -0,3856	2433. -0,3856	2434. -0,3856
2435. 15	2436. 0,274178	2437. 0,427612	2438. 0,054157	2439. 0,274178	2440. -0,61765	2441. 0,617657	2442. -0,61765
2443. 16	2444. 0,274178	2445. 0,427612	2446. 0,054157	2447. 0,274178	2448. 0,61765	2449. -0,61765	2450. 0,617657
2451. 17	2452. -0,20494	2453. -0,31963	2454. 0,015082	2455. -0,20494	2456. -0,46168	2457. -0,46168	2458. -0,46168
2459. 18	2460. -0,19513	2461. -0,30433	2462. 0,051584	2463. -0,16844	2464. -0,37945	2465. -0,37945	2466. -0,37945
2467. 19	2468. 0,274178	2469. 0,427612	2470. 0,054157	2471. 0,274178	2472. -0,61765	2473. -0,61765	2474. 0,617657
2475. 20	2476. -0,20494	2477. -0,31963	2478. 0,015082	2479. -0,20494	2480. -0,46168	2481. -0,46168	2482. -0,46168
2483. 21	2484. -0,20425	2485. -0,31856	2486. 0,048855	2487. -0,17117	2488. -0,3856	2489. -0,3856	2490. -0,3856
2491. 22	2492. 0,279159	2493. 0,435381	2494. 0,074905	2495. 0,294926	2496. 0,664398	2497. 0,664398	2498. 0,664398
2499. 23	2500. 0,274178	2501. 0,427612	2502. 0,054157	2503. 0,274178	2504. 0,617657	2505. 0,617657	2506. 0,617657

After getting the kernel value, the next calculation is the calculation of the test data weight. The calculation of the test data weight is obtained by multiplying the last *alpha value* of the data with the data class and also with the training data kernel against the test data.

Table 26. Results of Calculation of Weight Addition on Each Second Test Data

2507.	**2508. 1**	**2509. 2**	**2510. 3**	**2511. 4**	**2512. 5**	**2513. 6**	**2514. 7**
2515. 1	2516. 0.037775	2517. 0.058914	2518. 0.037775	2519. 0.037775	2520. 0.085098	2521. 0.085098	2522. 0.085098
2523. 2	2524. 0.049263	2525. 0,072403	2526. 0,047533	2527. 0,047533	2528. 0,10708	2529. 0,10708	2530. 0,10708
2531. 3	2532. -0,03275	2533. -0,05108	2534. -0,07618	2535. -0,03275	2536. -0,07378	2537. -0,07378	2538. -0,07378
2539. 4	2540. -0,02747	2541. -0,03917	2542. -0,07171	2543. -0,02747	2544. -0,06189	2545. -0,06189	2546. -0,06189
2547. 5	2548. -0,02032	2549. -0,03823	2550. -0,06999	2551. -0,02681	2552. -0,0604	2553. -0,0604	2554. -0,0604
2555. 6	2556. -0,0319	2557. -0,04976	2558. 0,002348	2559. -0,0319	2560. -0,07187	2561. -0,07187	2562. -0,07187
2563. 7	2564. -0,04092	2565. -0,06382	2566. 0,003011	2567. -0,04092	2568. -0,09218	2569. -0,09218	2570. -0,09218
2571. 8	2572. 0,043668	2573. 0,068105	2574. 0,011717	2575. 0,046134	2576. 0,103929	2577. 0,103929	2578. 0,103929
2579. 9	2580. -0,04045	2581. -0,06308	2582. -0,00799	2583. -0,04045	2584. -0,09112	2585. -0,09112	2586. -0,09112
2587. 10	2588. -0,03777	2589. -0,05891	2590. -0,0057	2591. -0,03777	2592. -0,0851	2593. -0,0851	2594. -0,0851

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2595. 11	2596. -0,03275	2597. -0,05108	2598. 0,00 1917	2599. -0,03275	2600. -0,07378	2601. -0,07378	2602. -0,07378
2603. 12	2604. 0,04 3668	2605. 0,06 8105	2606. 0,01 1717	2607. 0,04 6134	2608. 0,10 3929	2609. 0,10 3929	2610. 0,10 3929
2611. 13	2612. -0,032	2613. -0,0499	2614. 0,00 7653	2615. -0,02681	2616. -0,0604	2617. -0,0604	2618. -0,0604
2619. 14	2620. -0,032	2621. -0,0499	2622. 0,00 7653	2623. -0,02681	2624. -0,0604	2625. -0,0604	2626. -0,0604
2627. 15	2628. -0,04045	2629. -0,06308	2630. -0,00799	2631. -0,04045	2632. -0,09112	2633. -0,09112	2634. -0,09112
2635. 16	2636. 0,04 2683	2637. 0,06 6568	2638. 0,00 8431	2639. 0,04 2683	2640. 0,09 6154	2641. 0,09 6154	2642. 0,09 6154
2643. 17	2644. 0,03 0831	2645. 0,04 8085	2646. -0,00227	2647. 0,03 0831	2648. 0,06 9455	2649. 0,06 9455	2650. 0,06 9455
2651. 18	2652. 0,02 8787	2653. 0,04 4897	2654. -0,00761	2655. 0,02 4849	2656. 0,05 5978	2657. 0,05 5978	2658. 0,05 5978
2659. 19	2660. -0,04045	2661. -0,06308	2662. -0,00799	2663. -0,04045	2664. -0,09112	2665. -0,09112	2666. -0,09112
2667. 20	2668. -0,0319	2669. -0,04976	2670. 0,00 2348	2671. -0,0319	2672. -0,07187	2673. -0,07187	2674. -0,07187
2675. 21	2676. -0,032	2677. -0,0499	2678. 0,00 7653	2679. -0,02681	2680. -0,0604	2681. -0,0604	2682. -0,0604
2683. 22	2684. 0,04 3668	2685. 0,06 8105	2686. 0,01 1717	2687. 0,04 6134	2688. 0,10 3929	2689. 0,10 3929	2690. 0,10 3929
2691. 23	2692. -0,04045	2693. -0,06308	2694. -0,00799	2695. -0,04045	2696. -0,09112	2697. -0,09112	2698. -0,09112
2699. Si gma	2700. -0,19324	2701. -0,30866	2702. -0,10395	2703. -0,18245	2704. -0,41102	2705. -0.41102	2706. -0.41102

Next, the sum of the weighted test data is used to find the value of the function f(x).

$f(x) = w . x_i + b$

$f(x)$ = -2, 0214 . 0.7642 + (-0.10465)

$f(x)$ = -1.6494

From the *hyperlane value* that has been obtained, the following provisions are used to determine the test data class.

Data will have a positive value when:

$w . x_i + b = 1$

Data will be negative when:

$w . x_i + b = -1$

Classification function = *sign* (-1.6494) = -1

It can be seen that in the second test data classification function, the value obtained is -1 so that it is classified as class -1 data which is included in the **negative class**.

After completing the data analysis process, the results of the data analysis are obtained in the form of values or labels on the data selected as *testing data* using the *Support Vector Machine method* according to the sentiment analysis system built based on the learning process that has been carried out. In this study, *the confusion matrix* can calculate *the accuracy* , *precision, recall, and f1-score values* as the results of the sentiment analysis and classification system using the *Support Vector Machine method.* The following is a table of *confusion matrix* in this study.

Table 27. *Confusion Matrix* of Classification Results

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2707. ij		2708. Prediction Class (*j*)	
		2709. Negative	2710. Positive
2711. Current Class (*i*)	2712. Negative	2713. 66	2714. 11
	2715. Positive	2716. 8	2717. 55

From the table above, we can calculate the value of *accuracy*, *precision*, *recall*, and *f1-score* respectively using the following equation:

Accuracy $= \frac{55+66}{55+8+66+11} \times 100\% = 86.43\%$

Precision $= \frac{55}{55+11} \times 100\% = 83.33\%$

Recall $= \frac{55}{55+8} \times 100\% = 87.30\%$

F1-Score $= \frac{2 \times 87,30 \times 83,33}{87,30+83,33} \times 100\% = 85.27\%$

From the *confusion matrix value* obtained from the classification process that can be used to determine the value of *precision, recall* , and *f1-score* and to determine the level of accuracy of the system that has been built. Overall, the above values can be presented in *a classification report* . The following is *a classification report* from *the confusion matrix* for testing test data with the *Support Vector Machine method* . The system built in this study is applied to conduct sentiment analysis and classification of public opinion data regarding support for the DPR's right to inquiry into the issue of election fraud in 2024 on social media X. *Support Vector Machine is used as a method of classification and testing the level of accuracy. The system in this study also aims to help and facilitate students, this study shows that the Support Vector Machine* classification method produces quite high accuracy in processing data where in this study it is processing sentiment data in the X application.

Conclusion

The level of accuracy of the Support Vector Machine method in classifying sentiment (public opinion) has proven to be very good. By using a crawled dataset of 1234 data, after manual filtering to remove sentences of sarcasm, SARA, and duplicate data, 700 tweets (opinions) were obtained with the keywords "support the DPR's inquiry rights", and "#Support for the DPR's inquiry rights". From 700 data, with a training data and test data ratio of 8:2, namely 560 training data and 140 testing data, an accuracy value of 86.43%, precision of 83.33%, recall of 87.30%, and f1-score of 85.27% were obtained.

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