Data Analysis of Informatics Engineering Students of Islamic University of Kuantan Singingi

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Article Info	ABSTRACT
	Increasing student enrolment is the hope of any study program, including the study program at the Islamic University of Kuantan Singingi, especially the Informatics Engineering study program. During its existence, the Informatics Engineering program has experienced ups and downs in the number of students. This circumstance naturally affects the workload of the Informatics Engineering lecturers and the burden on the university's operating costs. So far, efforts have been made to increase the number of students, but this has not been done by analyzing existing student data. This study aims to analyze the existing student data in the hope that the results of this analysis can be useful for the Informatics Engineering study program at the Kuantan Singingi Islamic University of Kuantan Singingi to make decisions to increase the number of students in the future. Students in the Informatics Engineering study program come from different regions in Kuantan Singingi Regency and the surrounding districts. This is an opportunity for the university to analyze and visualize areas with a large number of enrollees. Using R programming, this student data can be easily visualized and presented.

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Informatics engineering is one of the study programs at the Islamic University of Kuantan Singingi (UNIKS). Currently, the Informatics Engineering study program has 215 students with 10 lecturers, which means that the ratio of lecturers to students is 1:20. Based on the ratio between lecturers and students, the informatics engineering study program still can increase the number of students. If we refer to the standard ratio of 1:30, the number of students to be added is about 100 people. This number will certainly be larger when annual student graduations are taken into account. Currently, almost all students graduate within four years, so the potential for increasing the number of new students is greater than 100 people.

Increasing the number of students to more than 100 people is certainly not easy for the Informatics Engineering study program of UNIKS, especially considering the previous experience that the total number of new students at UNIKS is 500 people and new students. The informatics engineering study program has so far included 70 people. But even that is not an impossibility if looking at the number of high school graduates in Kuantan Singingi Regency, which reaches 2500 to 3000 people every year. Of course, if add to this data the high school graduates in three neighboring districts, this number will be even higher. The opportunity to increase the number of new students is certainly open to the informatics engineering study program, and it is a challenge to achieve this. For this reason, the Informatics Engineering study program must analyze various

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potentials, especially the school where potential new students enroll and choose the Informatics Engineering study program of UNIKS as a place to continue their studies. It is expected that this research will be able to analyze this potential so that the possibility of increasing the number of students in the Informatics Engineering study program can be realized.[1],[2]

Student satisfaction is very important for learning success in the Informatics Engineering study program. Therefore, knowing the satisfaction level of students helps to improve the quality of learning and address their needs. Student satisfaction in Informatics Engineering can be measured by analyzing various aspects of their learning experience. Some aspects that can be considered are learning materials, quality of faculty, facilities, and campus support. Learning materials are one of the factors that can influence student satisfaction. The materials should be easy to understand and have practical use [3], [4] Current problems, it is not known what schools have the potential to increase the Informatics Engineering Study Program of UNIKS, It is not known what changes in school data of students who enter the Informatics Engineering Study Program of UNIKS, It is not known what school majors of origin have the most potential to increase the Informatics Engineering Study Program of UNIKS, It is not known what area of origin of students who enter the Informatics Engineering Study Program of UNIKS, The number of students of the Informatics Engineering Study Program of UNIKS is still low when it comes to the ratio of faculty to students. Among the objectives is to find out which schools have the potential to choose the Informatics Engineering Study Program of UNIKS to continue their studies, to create an analysis that can be used for decision making, and to increase the number of new students of the Informatics Engineering Study Program of UNIKS.

In general, data analysis can be interpreted as the process of collecting, transforming, and structuring data to conclude, make predictions, and as a consideration in making a decision. So this analysis will make existing and scattered data where becomes an insight that can be useful in making every decision.[5],[6]

As support in making a decision, data analysis must be carried out properly following the direction of the problem set at the beginning or before the analysis is carried out. Of course, a very important thing in this process is the correctness or validity of the data to be analyzed. If the data is correct, the analysis is good, then the insights obtained will be good, and the decisions to be made will also be right. On the other hand, if the data analysis is incorrect or invalid, then the subsequent analysis process will produce incorrect insights, and in the end, it will also produce a wrong decision.[7],[8]

Data analysis is the process of obtaining information from the collected data. This process begins with the collection of data coming from various sources, such as files, databases, or surveys. Once the data is collected, data analysis can include three phases: data cleansing, information extraction, and information analysis. Data cleansing is the process of filtering out unusable data and removing useless data. Useless data can be corrupted data, data that has invalid values, or data that has changed. Data cleansing can also include the process of simplifying redundant data and removing irrelevant data for specific purposes. Tidying up the collected data will facilitate further data analysis. After the data is cleared, the next process is information extraction. Information extraction is the process of identifying and extracting important information hidden in data.[9,10] This process involves the ability to see patterns in the collected data and make decisions about the information that matters. After the information is collected and extracted, the next phase is information analysis. Information analysis is the process of using the information that has been collected to identify patterns, draw conclusions, and make assumptions about the data. This could involve the application of statistics, data visualization, or other techniques for extracting information from the data. Information analysis can also involve the use of mathematical models to predict outcomes or suggest necessary actions. Data analysis is an important process to help organizations to identify trends and patterns in the collected data. Using data analysis, organizations can make informed decisions, increase efficiency, and make better decisions.

Data Analysis Process [11],[12]

In the process of data analysis, there are several phases that can be performed. The following are six phases of the data analysis process that can be done in order to produce a good insight:

1. Defining problems and objectives by using questions.
2. Considering what data will be needed, then how obtain the data needed, and collect and store the data.
3. Managing the data collected where this process includes data cleaning, transforming data, combining several datasets and others.
4. Analyzing the data that has been managed in the previous phase. At this phase, using the tools to format and transform data, sort and filter data, identify patterns, draw conclusions, make predictions and recommendations and so on.
5. Sharing the discoveries from analysis results by creating effective data visualizations, bringing data to life, using data storytelling, communication and others.
6. Providing recommendations based on insights obtained from the results of the analysis can be in the form of applying insights, solving problems, making decisions and or making new things.

Data Visualization
Data visualization is the presentation of data in an easily understandable form, such as infographics, charts, or diagrams. Data visualization allows people to simplify complex information so that they can more easily understand and use it [13], [14]
To facilitate learning and assimilation of information from data sets, there are several ways, one of which is visualization. Data visualization can be understood as the process of graphically displaying and presenting data or inserting information into images to help people or analysts interpret data correctly. There are several forms of data visualization that are commonly used, including:
1. Bar graphs whose function is to compare two or more values by using contrast measures
2. Line graphs whose function is to help analysts or audiences understand shifts or changes in data
3. Pie charts whose function is to show the number of each part of something forming a whole
4. Maps that serve to help organize or map data by geography.
5. Histogram that serves to show the frequency of data values falling on a certain range.
6. Correlations charts that show relationships between data.

Many other forms of visualization can be used in the analysis of data, but by their nature, we can distinguish them into two, namely static visualizations and dynamic visualizations. Static visualizations do not change over time unless they are edited, while dynamic visualizations are more interactive and can change over time.[15,16]

1. Research Methods

Research methods are systematic processes used to scientifically collect data from a source, analyze data, and draw conclusions. The research includes different types of research, such as qualitative research, quantitative research, and mixed research. Research methods depend on research objectives, data sources, and analysis techniques. These can be grouped into descriptive research methods, experimental research methods, correlational research methods, qualitative research methods, quantitative research methods, and mixed research methods. Each method has its characteristics that determine how data will be collected and analyzed. [17,18] The study was conducted through several phases which can generally be explained as follows:

1. Formulating the problem
In this process, the researcher defines the problem that will later be solved in the analysis process. Of course, this process is carried out by communicating, discussing and getting direct input from the authorities in the Informatics Engineering Study Program of UNIKS. From this process the researcher gets several things that are the basis for carrying out the next analysis process.

2. Data collection
In this process, researchers collect data on Informatics Engineering students of UNIKS through questionnaires sent to all students. This is done because there is no complete data both from the study program and from the Engineering Faculty of UNIKS. This questionnaire was created using a google form which was then sent to students through the Informatics Engineering students whatsapp group. Looking at the data received, all students have sent the data even though not all questionnaire fields are filled in by students.

3. Data cleaning and transformation
In this process, researchers cleaned the data of Informatics Engineering students of UNIKS that had been collected through previous questionnaires. This process includes inconsistent data loss that occurs due to data input errors or the presence of empty fields due to not being filled in by students, deletion of duplicate data and adjustment of data types. This data cleaning needs to be done so that the next data processing becomes easier and gets good analysis results. In addition to data cleaning, data transformation is also carried out to make it easier to make data visualizations.

4. Data visualization
After the data obtained is cleaned, visualization of the data is carried out using R programming. This visualization refers to the problems revealed at the beginning of this study, so that by visualizing the existing data, insights or insights are obtained that can help in the data analysis process.

5. Data analysis

At this phase is the process of analyzing the visualized data to the formulate recommendations that can be used by the Informatics Engineering Study Program of UNIKS in making decisions about strategies for increasing new students in the next period.

2. Result and Discussion

From the results of processing and data visualization of Informatics Engineering students of UNIKS, it can be found as follows:

1. Ranking of the Number of Informatics Engineering students of UNIKS by Student School Origin

From the visualization carried out on student data in the last five years, it can be seen that UNIKS Informatics Engineering students are dominated by SMK graduates both from SMK in Kuantan Singingi Regency and those from SMK outside Kuantan Singingi Regency. The following picture is a visualization of data on Informatics Engineering students of UNIKS based on the student's home school and the district where the school came from. [19]
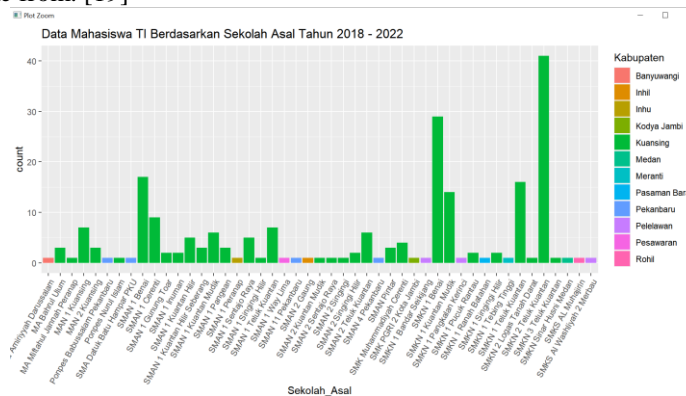

Figure 1. Informatics Engineering Student of UNIKS Data Based on School of Origin

2. Ranking the Number of Informatics Engineering Students of UNIKS based on the student's region of origin

When viewed from the visualization graph that has been carried out in the picture above, it can be seen that overall the majority of UNIKS Informatics Engineering students still come from schools in Kuantan Singingi Regency. Only a small part of these students come from other districts, both those in Riau Province and districts outside Riau Province.[19,20]

3. Number of Informatics Engineering Students of UNIKS based on the study program or major at the student's home school

After being visualized, it turns out that Informatics Engineering students of UNIKS as a whole are still dominated by SMK graduates of the Computer and Network Engineering Department, followed by the Department of Natural Sciences (IPA) from SMA and Madrasa Aliyah both in Kuantan Singingi Regency and those from outside Kuantan Singingi Regency. In the third place, it can be seen that Informatics Engineering students of UNIKS come from Social Science graduates (IPS).[21,22]
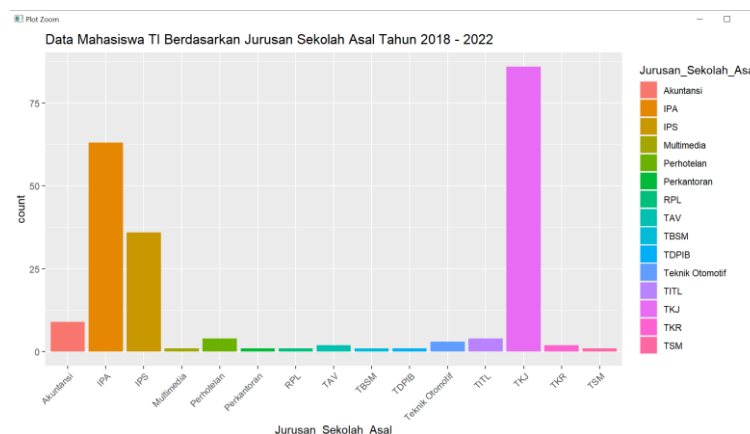

Figure 2. Informatics Engineering Student of UNIKS Data Based on The School of Origin

4. Patterns or trends in the development of the number of students based on the school of origin in the last
    5 years

From the visualisation of the pupil data for the last five years, it is evident that the number of newly admitted pupils from all categories of schools has increased. The highest increase in numbers is in the graduates of vocational high schools (SMK). For Senior High Schools (SMA) and Madrasah Aliyah (MA), the increase does not yet appear to be significant. The graph shows that over the last 5 years, the number of SMK graduates entering the Informatics Engineering study program has decreased in 2019, then increased significantly in 2020, 2021 and 2022. The increase in SMK graduates entering the Informatics Engineering study program is also in line with the increase in the number of Informatics Engineering study program. Meanwhile, for high school and MA graduates who enter the Informatics Engineering of UNIKS, the increase is not too significant, even for high school graduates, there is a decrease in the number in 2020 when the number of Informatics Engineering students of UNIKS increases. It can be concluded that the increase in the number of Informatics Engineering students in the range of 2020 to 2022 is due to an increase in the number of SMK graduates who enter the Informatics Engineering of UNIKS.[23,24]
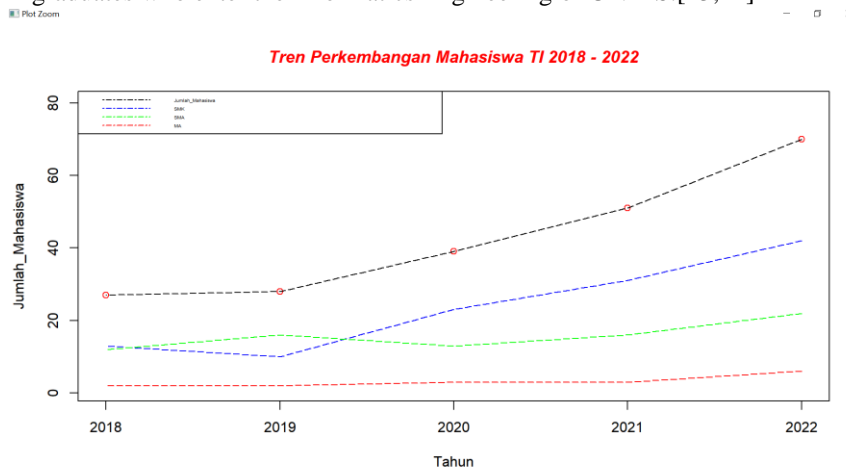

Figure 3. Development Trends of Informatics Engineering Students of UNIKS

Looking at the top five vocational schools whose graduates apply to informatics engineering of UNIKS, we get the information that for SMK Negeri 2 Teluk Kuantan, there is always an increase in graduates applying, with the largest increase occurring in 2021 and 2022. At SMK Negeri 1 Benai, there has been an increase in the last two years after a decrease in the previous year. Graduates of SMK Negeri 1 Kuantan Mudik, SMK Negeri 1 Teluk Kuantan, and SMK Muhammadiyah Cerenti experienced ups and downs over the past five years. [24]
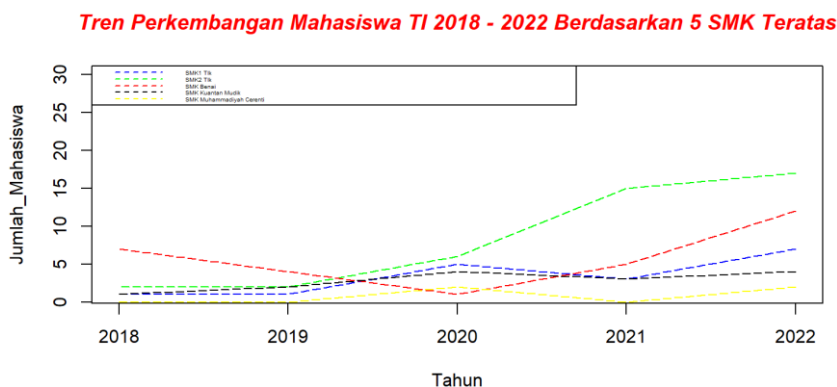

Figure 4. Informatics Engineering Student of UNIKS Development Trends Based on the Top 5 Vocational Schools

For students who come from high school graduates, it can be seen in the graph that the increase occurred in SMA Negeri 1 Kuantan Mudik and SMA Negeri 1 Cerenti while for SMA Negeri 1 Teluk Kuantan and SMA

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Negeri 1 Benai tended to decrease even zero for the last two years. In general, high school graduates do not significantly increase the number of Informatics Engineering students of UNIKS.
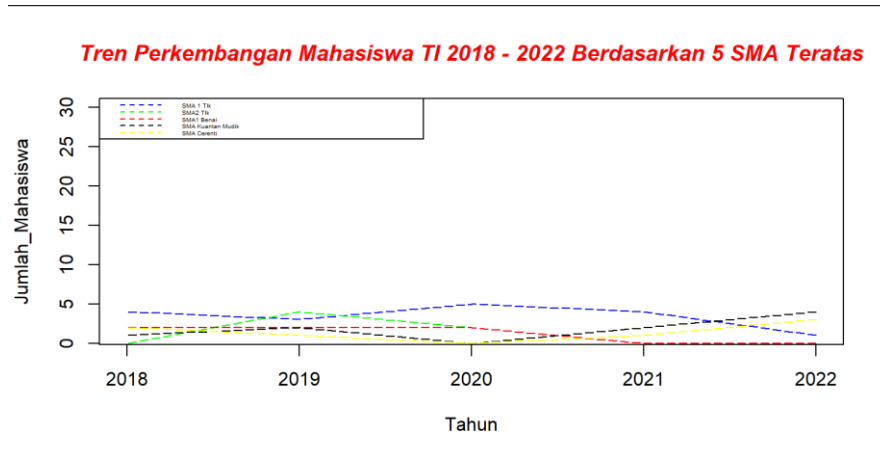

Figure 5. Informatics Engineering Student of UNIKS Development Trends Based on Top 5 High Schools

The following is the percentage of the number of Informatics Engineering students of UNIKS per year entered for the last five-year time period. From the graph, it can be seen that the largest percentage of students of the Informatics Engineering Study Program of UNIKS is in the class of 2021 and 2022, which totals 56.3%.
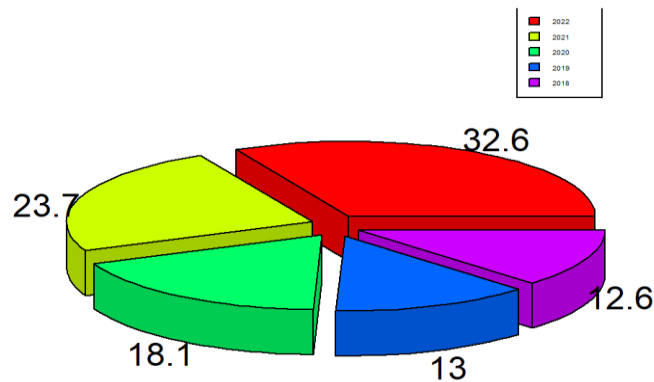

Figure 6. Percentage of Infprmatics Engineering Students of UNIKS in the Last 5 Years

With this visualization process, it can be seen the trends or developments of Informatics engineering students of UNIKS based on their home schools year by year in the range of 2019 to 2022. From the graph, it can be seen that the number of SMK Negeri 2 Teluk Kuantan has been increasing consistently from year to year.[25]
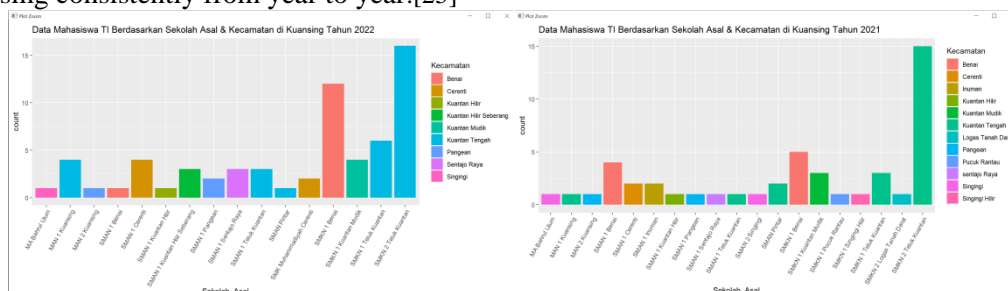
Figure 7. Informatics Engineering Student of UNIKS Development 2019, 2020, 2021, 2022

Looking at the ratio of lecturers to the number of students, Informatics Engineering study program still has the opportunity to increase the number of students. The faculty-to-student ratio is currently 1:20; to reach a standard ratio of 1:30, the informatics engineering study program would need to increase the number of students about 100. Subtracting 20-50 people from the Informatics Engineering students who graduate each year, there is a potential for an increase in student enrollment of 100-150 people for next year's intake of students.

3. Conclusion

Overall, the number of students of Informatics Engineering of UNIKS has increased over the past 5 years, with the largest increase in students coming from SMK Negeri 2 Teluk Kuantan. Of all the students coming from SMK, the majority of their majors are Computer and Network Engineering. There is no significant increase in the number of Informatics Engineering students coming from public schools and madrasas, also because some schools tend not to apply for the Informatics Engineering study program. While the majority of public school students enrolling in the informatics engineering study program of UNIKS come from the science department, the Informatics Engineering of UNIKS still has the opportunity to increase the number of students, both in terms of the ratio of lecturers to students and in terms of potential opportunities from prospective students from the original school, especially from the computer and network engineering department. The number of public school graduates, who previously made up the largest proportion of the number of Informatics Engineering students of UNIKS from public schools, has declined.

Acknowledgement

References

[1] Ahmad Riyadh Al Faathin, Eko Sakti Pramukantoro, Fariz Andri Bakhtiar. (2019). Pengembangan Personal Data Analitik Menggunakan PHP-ML dan Apache Spark pada IoT Cloud Apps. Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer, 3911-3921.

[2] Annisa Rahmala, Don Ardhito, Leo Riska. (2022). Analitik Big Data: Social Media Mining. Jurnal Creative Education of Research in Information Technology and Artificial informatics, 164 - 170.

[3] Arfhan Prasetyo, Numan Musyaffa, Ricki Sastra. (2020). Implementasi Data Mining Untuk Analisis Data Penjualan Menggunakan Algoritma Apriori Studi Kasus Dapoerin's. Jurnal Khatulistiwa Informatika, VIII, 94 - 99.

[4] Darono, A. (2020). Data Analytics Dalam Administrasi Pajak Di Indonesia : Kajian Institutional Arrangement. Jurnal Teknik Informatikan dan Sistem Informasi, 6, 195 - 2011.

[5] Dewanti Anggrahini, Nani Kurniati, Abiyyu Dimas Prasanto, Mohammad Imron, Muhammad Ainul Yaqin. (2020). Implementasi Data Analitik Untuk Penentuan Jadwal Pemeliharaan Mesin Pada Perusahaan Manufaktur Kontinu Skala Besar. Jurnal Sisfo, 9, 21 - 28.

[6] Febrian. (2021). Audit Data Analytics Dengan MS-Excel : Use Case Pemeriksaan Pajak. Jurnal Pajak Indonesia, 5, 49 - 56.

[7] Hartama, D. (2018). Analisa Visualisasi Data Akademik Menggunakan Tableau Big Data. Jurnal

Riset Sistem Informasi Dan Teknik Informatika (JURASIK), 3, 46 - 55.

[8] Maskur, Mohammad Agung A. M., Wildan Soeharso. (2019). Analisis Dan Perancangan Data Warehouse Evaluasi Mahasiswa Studi Kasus Pada Jurusan Teknik Informatika UMM. Repositor, 1, 59 - 68.

[9] Narendra, A. P. (2015). Data Besar, Data Analisis, dan Pengembangan Kompetensi Pustakawan. Record and Library, 1, 83 - 93.

[10] Rahadian, Muhammad Izman Herdiansyah. (2022). Membangun Model Data Analitik Green Logistik di Toko Pengrajin Batiq Colet Jumputan Tuan Kentang Palembang. Jurnal Mantik, 6, 2495-2501.

[11] Rima Tamara Aldisa, Pandu Maulana, Mohammad Aldinugroho Abdullah. (2022). Penerapan Big Data Analytic Terhadap Strategi Pemasaran Job Portal di Indonesia dengan Karakteristik Big Data 5V. Jurnal Sistem Komputer dan Informatika (JSON), 3, 267−272.

[12] Rina Dewi Sari Indah, Yuwono Sindunata. (2014). Penerapan Data Mining untuk Analisa Pola Prilaku Nasabah dalam Pengkreditan Menggunakan Metode C.45 Studi Kasus Pada KSU Insan Kamil Demak. Jurnal Ilmiah Teknologi dan Informasi ASIA, 8, 10 - 16.

[13] Rizqi Putri Nourma Budiarti, Firman Yudianto. (2019). Penerapan Analisa Big Data pada Klasifikasi Kondisi Jalan untuk Mendukung Smart City. Applied Technology and Computing Science Journal, 2, 79 - 88.

[14] Sinung Suakanto, Aldi Christy, Ventje J. L. Engel, Dina Angela. (n.d.). Pengembangan Sistem Prediksi Harga Pasar Properti Menggunakan Big Data Platform. Jurnal Telematika, 13, 19 - 25.

[15] Sri Mahrani, Ira Daniah Pasi, Andi Karina Mutmainnah, Sri Wulan Purnama Samosir, Indra Gunawan. (2021). Proses Pembangunan Smart City di Indonesia Menggunakan Metode Big Data Analystis Dalam Penerapan E-Commerce. Media Jurnal Informatika, 13, 57 - 63.

[16] Nikmatur Ridha (2021). Proses Penelitian, Masalah, Variabel dan Paradigma Penelitian. Hikmah, 14, 62 – 70.

[17] Arikunto, Suharsimi. (2012). Prosedur Penelitian Suatu Pendekatan Praktek. Cet. 12. Jakarta: PT. Rineka Cipta.

[18] Arikunto, Suharsimi. (2013). Manajemen Penelitian. Cet. 12. Jakarta: PT. Rineka Cipta.

[19] Emzir, (2007). Metodologi Penelitian Pendidikan Kuantitatif & Kualitatif. Jakarta: PT. Raja Grafindo Persada.

[20] Putra, Nusa. (2013). Research & Development, Penelitian dan Pengembangan: Suatu Pengantar, Cet. 2. Jakarta: PT. RajaGrafindo Persada.

[21] Sanjaya, Wina. (2014). Penelitian Pendidikan, Jenis, Metode, dan Prosedur. Cet. 2. Jakarta: Kencana Prenada Media Group.

[22] Sedarmayanti dan Hidayat, (2011). Metodologi Penelitian. Bandung: CV Mandar Maju.

[23] Aprizal,(2018). Sistem Informasi Rekapitulasi Nilai Siswa Pada Smpn 9 Benai, 1, 80 – 91.

[24] Alvendo Wahyu Aranski, Koko Handoko,(2019). Data Mining dalam Pengelompokan Nilai IQ Siswa, 2, 13 - 22.

[25] Muhamad Tabrani,(2022). Implementation of Prototype Method in School Payment Information System of SMP AL-Mushlis Karawang, 5, 64 – 72.

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