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THE APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) IN DETERMINING STUDENT BOARDING HOUSE AROUND THE UIN BUKITTINGGI CAMPUS

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Abstract

UIN Bukittinggi students who come from various regions are in need of a strategic and comfortable place to live. Students often have difficulty finding the right choice during the conventional boarding house search process. In this study, artificial intelligence (AI)-based confidence factor (CF) will be used to help students choose the right boarding place. The methods used include data collection of student preferences and CF analysis to make suggestions based on price, distance, and facilities. The results show that Kos Putri Bunda and Kos Putra Sukses have the highest CF values. This shows that these two boarding houses are very much in line with students' preferences. The discussion shows how this system helps students make decisions and improve the search for boarding houses. The discovery of this research is the application of the CF method in particular .

Abstrak

Mahasiswa UIN Bukittinggi yang berasal dari berbagai daerah sangat membutuhkan tempat tinggal yang strategis dan nyaman. Mahasiswa sering kesulitan menemukan pilihan yang tepat selama proses pencarian tempat kos konvensional. Dalam penelitian ini, faktor keyakinan (CF) berbasis kecerdasan buatan (AI) akan digunakan untuk membantu mahasiswa memilih tempat kos yang tepat. Metode yang digunakan termasuk pengumpulan data preferensi mahasiswa dan analisis CF untuk membuat saran berdasarkan harga, jarak, dan fasilitas. Hasil penelitian menunjukkan bahwa Kos Sakura dan Kos Hanumsukoi memiliki nilai CF tertinggi. Ini menunjukkan bahwa kedua kos ini sangat sesuai dengan keinginan mahasiswa. Pembahasan menunjukkan bagaimana sistem ini membantu mahasiswa membuat keputusan dan meningkatkan pencarian tempat kos. Penemuan penelitian ini adalah penerapan metode CF secara khusus.

INTRODUCTION

Higher education is one of the important steps in building an individual's future, and the choice of a comfortable place to live is one of the factors that supports students' academic success (Hidayat, 2023). At UIN Bukittinggi, many students come from various regions, so the need for strategic and budget-friendly boarding houses is very crucial. However, finding the right boarding house is often a challenge for new students (Febrianto & Widyadara, 2021) .

The process of searching for a boarding house is currently still done conventionally, such as through information from friends, social media, or visiting the location directly. This method is not only time consuming but can also produce less accurate information (Nursita & Rizki, 2024) (Zahra, 2023) . Students often have to choose from various options without having clear guidance on the advantages and disadvantages of each boarding house . This has the potential to disrupt their focus and academic performance (Ramadhani et al., 2024) .

With the development of technology, especially in the field of artificial intelligence (AI), there is an opportunity to increase efficiency and accuracy in the boarding house search

process (Krista et al., 2023) . AI refers to the ability of machines to imitate human thought processes, including in terms of decision making and data processing (Jaya et al., 2018) (Sandy et al., 2023) . In this context, AI can analyze student preference data and provide recommendations that are more suited to their needs. One method that can be used is Certainty Factor (CF), which allows assessment based on various criteria, such as price, distance from campus, and facilities offered (Rafi Aziz et al., 2019) .

The Certainty Factor (CF) method is a very useful approach in situations where decisions must be made considering uncertainty. CF helps in determining how much confidence we have in an outcome, by calculating the certainty value based on existing data (Sitanggang et al., 2018) . In the context of searching for boarding houses, CF can combine various factors that influence the choice of a place to live, so that students can receive more accurate recommendations that are in accordance with their preferences (Fahriandi, 2019) .

The implementation of an AI-based recommendation system using CF can provide a smarter and more integrated solution for students in choosing a boarding house . By utilizing the collected data, this system can assess and provide more relevant choices, and reduce the time needed to find a place to live (Iqbal & Nurdin, 2017) (Jerry et al., 2023) . This is not only beneficial for students, but also for boarding house owners who want to attract more tenants.

Although there are several applications and platforms that offer boarding house search services , not many use AI-based methods specifically for analyzing student preferences. Therefore, this study aims to develop a system that uses the Certainty Factor method to help students at UIN Bukittinggi find boarding houses that suit their needs.

By identifying and implementing AI-based solutions, it is hoped that this research can provide positive contributions to students and improve the quality of their experience during their education. Through this research, it is hoped that an efficient and effective system will be created to help students find the ideal place to live around the UIN Bukittinggi campus.

METHODS

The research methodology used is a quantitative research type using a case study on student boarding houses (specifically female boarding houses) around the UIN Bukittinggi campus. Meanwhile, the stages of solving this case are used with one of the methods in artificial intelligence using certainty factor (CF), with the following steps (Samhadi, 2022) (Pramana & Devi, nd) :

1. **Data collection**
2. **Survey:** Conducting 71a survey to UIN Bukittinggi students to collect information on the criteria for selecting a boarding house . The criteria taken can include:
    - Price (H)
    - Distance from campus (J)
    - Facilities (F)
3. **Questionnaire Format:** Create a questionnaire containing questions related to preferences with a rating scale (e.g. 1-5) for each criterion.

Table 1. Research Questionnaire: Criteria for Selecting Boarding Houses for Students Around UIN Bukittinggi

No.	Question	Scale (1-5)
1	Name (optional):	_____
2	Study program:	_____
3	Year of Entry:	_____

4	Are you currently looking for a boarding house?	a. Yes b. No
5	If yes, your gender:	a. Male b. Female
6	Rental price:	1 2 3 4 5
7	Distance from campus:	1 2 3 4 5
8	Facilities (bathroom, kitchen, Wi-Fi, etc.):	1 2 3 4 5
9	Security (environmental security, CCTV, etc.):	1 2 3 4 5
10	Comfort (clean space, atmosphere, etc.):	1 2 3 4 5
11	Do you prefer male or female boarding houses?	a. Boys' boarding house b. Girls' boarding house c. No preference
12	Do you need additional facilities? (tick the appropriate ones)	a. Shared kitchen b. Living room c. Laundry d. Others: _____
13	Where did you find out information about the boarding house? (tick the appropriate ones)	a. Friends b. Social media c. Website d. Others: _____
14	What are your hopes for the boarding house you will choose?	_____
15	Would you be willing to be contacted for further information about this research?	a. Yes b. No

Table 1 is used as a guide in compiling a questionnaire for research and is distributed in a format that is easy for respondents to fill in.

4. **Determination of Criteria Weight**
   a. After the data is collected, weights are determined for each criterion based on the importance of each factor in selecting a boarding house. The criteria set are :
      1) Price: 0.5
      2) Distance: 0.3
      3) Facilities: 0.2
   b. The total weight must be equal to 1.
5. **Application of Certainty Factor (CF)**
   a. **CF formula** (Yanti & Gaol, 2020) **:**

$$CF = (M - m)/(M + m) \quad (1)$$

   Where :
      1) M = maximum value
      2) m = minimum value
   b. **CF Calculation for Each Criteria:**

   For each boarding house , calculate the CF based on student assessments. For example:

   If boarding house A has a very reasonable price (5) and inadequate facilities (2), then:
      1) Price: M=5,m=1 → CF Price
      2) Distance: M=5,m=2 → CF Distance

3) Facilities: M=3,m=1 → CF Facilities

c. Calculating Total CF

Calculate the total CF for each boarding house using the formula (Sumpala & Sutoyo, 2018) :

$$Cf_{total} = w_1 \times CF_1 + w_2 \times CF_2 + w_3 \times CF_3 \quad (2)$$

where w is the criteria weight and CF is the CF value for each criterion.

6. **System Testing**
   a. Once the system is developed, conduct a trial involving students to assess the accuracy of the recommendations provided.
   b. Can use accuracy 73metrics (e.g.: student satisfaction level with recommendations) to evaluate results.

Example calculations for stages 4 and 5 are:

For example, the survey results show the following ratings for three boarding houses :

a. **Boarding House A:** Price (5), Distance (4), Facilities (2)
b. **Boarding House B:** Price (3), Distance (5), Facilities (4)
c. **Boarding House C:** Price (2), Distance (3), Facilities (5)

First calculate the CF value:

1. **Boarding House A:**
   - CF Price = (5−1)/(5+1)=0.67(5 - 1)/(5 + 1) = 0.67(5−1)/(5+1)=0.67
   - Distance CF = (4−2)/(4+2)=0.33(4 - 2)/(4 + 2) = 0.33(4−2)/(4+2)=0.33
   - CF Facility = (2−1)/(2+1)=0.33(2 - 1)/(2 + 1) = 0.33(2−1)/(2+1)=0.33
   - CF_{Total} = 0.5×0.67+0.3×0.33+0.2×0.33=0.5×0.67+0.3×0.33+0.2×0.33=0.43
2. **Boarding House B:**
   - CF Price = (3−1)/(3+1)=0.5(3 - 1)/(3 + 1) = 0.5(3−1)/(3+1)=0.5
   - Distance CF = (5−2)/(5+2)=0.43(5 - 2)/(5 + 2) = 0.43(5−2)/(5+2)=0.43
   - CF Facility = (4−1)/(4+1)=0.6(4 - 1)/(4 + 1) = 0.6(4−1)/(4+1)=0.6
   - $_{Total}$ CF = 0.5×0.5+0.3×0.43+0.2×0.6=0.25+0.129+0.12=0.499
3. **Boarding House C:**
   - CF Price = (2−1)/(2+1)=0.33(2 - 1)/(2 + 1) = 0.33(2−1)/(2+1)=0.33
   - Distance CF = (3−2)/(3+2)=0.2(3 - 2)/(3 + 2) = 0.2(3−2)/(3+2)=0.2
   - CF Facility = (5−1)/(5+1)=0.67(5 - 1)/(5 + 1) = 0.67(5−1)/(5+1)=0.67
   - CF_{Total} = 0.5×0.33+0.3×0.2+0.2×0.67=0.165+0.06+0.134=0.359

After calculation, the total CF for each boarding house is: Boarding House A: 0.43; Boarding House B: 0.499; Boarding House C: 0.359. Based on the total CF value, Boarding House B is the best recommendation for students. Through systematic stages and the application of the Certainty Factor method, this study can provide more accurate boarding house recommendations that are in accordance with student preferences, as well as reduce the search time required. This study also provides insight into the importance of technology in facilitating student needs in the campus environment.

RESULT AND DISCUSSION

RESULT

To calculate the Certainty Factor (CF) value based on the questionnaire items that have been created, researchers will use several steps. Based on the results of the questionnaire that has been distributed, it is obtained that each criterion from the questionnaire has a different weight and to calculate the CF for each boarding house based on the scale filled in by the respondents.

The weights for each criterion are as follows (on a scale of 0-1):

- Rental Price: 0.25
- Distance from Campus: 0.30
- Facilities: 0.20
- Security: 0.15
- Comfort: 0.10

Table 2. Assessment Results (Scores) for Each Female Boarding House Around UIN Bukittinggi Based on Rental Price Criteria, Distance from Campus, Facilities, Security and Comfort

Boarding House Name	Rental price	Distance from Campus	Facility	Security	Comfort
Amira's Boarding House	4	5	4	3	5
Sakura Boarding House	5	4	5	4	5
Green Ediyen Boarding House	2	3	2	2	3
Byan Boarding House	3	4	3	3	3
Sigma 1 Boarding House	2	2	2	1	2
Rizky Family Boarding House	4	3	4	4	4
Angle Boarding House	3	4	3	3	3
Hanumsukoi Boarding House	5	5	5	4	5
Fisyaka Boarding House	2	3	2	2	2
Sigma 2 Boarding House	1	1	1	1	1

The following is the CF calculation for each cost using formulas (1) and (2), so that we obtain:

1. **Amira's Boarding House:**
   - Rental Price =(4−1)/(5−1)×0.25=3/4×0.25=0.1875
   - Distance CF = =(5−1)/(5−1)×0.30=4/4×0.30=0.30
   - CF Facility =(4−1)/(5−1)×0.20=3/4×0.20=0.15
   - CF Security =(3−1)/(4−1)×0.15=2/3×0.15≈0.10
   - CF Comfort = =(5−1)/(5−1)×0.10=4/4×0.10=0.10
   - CF = 0.1875+0.30+0.15+0.10+0.10=0.83750.1875 + 0.30 + 0.15 + 0.10 + 0.10 = 0.83750.1875+0.30+0.15+0.10+0.10=0.8375
2. **Sakura Boarding House:**
   - CF Rental Price = (5−1)/(5−1)×0.25=0.25
   - CF distance = (4−1)/(5−1)×0.30=0.225
   - CF Facility = (5−1)/(5−1)×0.20=0.20
   - CF Security = (4−1)/(4−1)×0.15=0.15
   - CF Comfort = (5−1)/(5−1)×0.10=0.10
   - Total CF = 0.25+0.225+0.20+0.15+0.10=0.925
3. **Green Ediyen Boarding House:**
   - CF = (2−1)/(5−1)×0.25+(3−1)/(5−1)×0.30+(2−1)/(5−1)×0.20+(2−1)/(4−1)×0.15+(3−1)/(5−1)×0.10

- CF = 0.0625+0.15+0.05+0.10+0.10=0.46250.0625 + 0.15 + 0.05 + 0.10 + 0.10 = 0.46250.0625+0.15+0.05+0.10+0.10=0.4625

4. **Byan Boarding House:**
   - CF = (3−1)/(5−1)×0.25+(4−1)/(5−1)×0.30+(3−1)/(5−1)×0.20+(3−1)/(4−1)×0.15+(3−1)/(5−1)×0.10
   - CF = 0.125+0.225+0.1+0.10+0.1=0.6750.125 + 0.225 + 0.1 + 0.10 + 0.1 = 0.6750.125+0.225+0.1+0.10+0.1=0.675
5. **Sigma 1 Boarding House:**
   - CF = (2−1)/(5−1)×0.25+(2−1)/(5−1)×0.30+(2−1)/(5−1)×0.20+(1−1)/(4−1)×0.15+(2−1)/(5−1)×0.10
   - CF = 0.0625+0.15+0.05+0+0.1=0.36250.0625 + 0.15 + 0.05 + 0 + 0.1 = 0.36250.0625+0.15+0.05+0+0.1=0.3625
6. **Rizky Family Boarding House:**
   - CF = (4−1)/(5−1)×0.25+(3−1)/(5−1)×0.30+(4−1)/(5−1)×0.20+(4−1)/(4−1)×0.15+(4−1)/(5−1)×0.10
   - CF = 0.1875+0.15+0.15+0.15+0.1=0.73750.1875 + 0.15 + 0.15 + 0.15 + 0.1 = 0.73750.1875+0.15+0.15+0.15+0.1=0.7375
7. **Kos Angle:**
   - CF = (3−1)/(5−1)×0.25+(4−1)/(5−1)×0.30+(3−1)/(5−1)×0.20+(3−1)/(4−1)×0.15+(3−1)/(5−1)×0.10
   - CF = 0.125+0.225+0.1+0.1+0.1=0.650.125 + 0.225 + 0.1 + 0.1 + 0.1 = 0.650.125+0.225+0.1+0.1+0.1=0.65
8. **Hanumsukoi Boarding House:**
   - CF = (5−1)/(5−1)×0.25+(5−1)/(5−1)×0.30+(5−1)/(5−1)×0.20+(4−1)/(4−1)×0.15+(5−1)/(5−1)×0.10
   - CF = 0.25+0.30+0.20+0.15+0.10=1,000.25 + 0.30 + 0.20 + 0.15 + 0.10 = 1,000.25+0.30+0.20+0.15+0.10=1.00
9. **Fisyaka Boarding House:**
   - CF = (2−1)/(5−1)×0.25+(3−1)/(5−1)×0.30+(2−1)/(5−1)×0.20+(2−1)/(4−1)×0.15+(2−1)/(5−1)×0.10
   - CF = 0.0625+0.15+0.05+0.10+0.10=0.46250.0625 + 0.15 + 0.05 + 0.10 + 0.10 = 0.46250.0625+0.15+0.05+0.10+0.10=0.4625
10. **Sigma 2 Boarding House:**
    - CF = (1−1)/(5−1)×0.25+(1−1)/(5−1)×0.30+(1−1)/(5−1)×0.20+(1−1)/(4−1)×0.15+(1−1)/(5−1)×0.10
    - CF = 0+0+0+0+0=0.000 + 0 + 0 + 0 + 0 = 0.000+0+0+0+0=0.00

Table 3. Total CF for Each Boarding House for Each Female Boarding House Around UIN Bukittinggi

Boarding House Name	Total CF
Amira's Boarding House	0.8375
Sakura Boarding House	0.925
Green Ediyen Boarding House	0.4625
Byan Boarding House	0.675
Sigma 1 Boarding House	0.3625
Rizky Family Boarding House	0.7375
Angle Boarding House	0.65
Hanumsukoi Boarding House	1.00
Fisyaka Boarding House	0.4625
Sigma 2 Boarding House	0.00

From the table 3, **Kos Hanumsukoi** has the highest CF value, followed by **Kos Sakura** . This shows that the boarding house best suits the preferences expected by students based on the specified criteria. Based on this analysis, boarding house owners with low CF values need to consider making improvements, such as : Improving facilities (Wi-Fi, cleanliness, and common areas), Improving security aspects (CCTV, better lock systems) and Considering rental prices to be more competitive. On the other hand, boarding house owners with high CF values such as Kos Hanumsukoi and Kos Sakura must maintain the quality of service and facilities to remain attractive to prospective tenants.

Based on the calculation results above, the researcher created a coding program using the C language to provide references for quality boarding houses with good facilities, so that prospective tenants can choose boarding houses that meet their expectations.

Here is the program coding in C language:

```
#include <stdio.h>
#define NUM_KOS 10
// Struktur untuk menyimpan data kos
typedef struct {
    char name[50];
    int harga_sewa;
    int jarak;
    int fasilitas;
    int keamanan;
    int kenyamanan;
    float total_cf;
} Kos;
// Fungsi untuk menghitung CF
float calculate_cf(int score, int max, float weight) {
    return ((float)(score - 1) / (max - 1)) * weight;
}
int main() {
    Kos kos_list[NUM_KOS];

    // Bobot untuk masing-masing kriteria
    float weights[] = {0.25, 0.30, 0.20, 0.15, 0.10};
    int max_score = 5; // Skor maksimum

    // Mengisi data nama kos
    for (int i = 0; i < NUM_KOS; i++) {
        printf("Masukkan nama tempat kos %d: ", i + 1);
        scanf("%s", kos_list[i].name);
    }

    // Mengisi nilai skor untuk setiap kriteria
    for (int i = 0; i < NUM_KOS; i++) {
        printf("\nMasukkan skor untuk %s:\n", kos_list[i].name);
        printf("Harga Sewa (1-5): ");
```

```
        scanf("%d", &kos_list[i].harga_sewa);
        printf("Jarak dari Kampus (1-5): ");
        scanf("%d", &kos_list[i].jarak);
        printf("Fasilitas (1-5): ");
        scanf("%d", &kos_list[i].fasilitas);
        printf("Keamanan (1-5): ");
        scanf("%d", &kos_list[i].keamanan);
        printf("Kenyamanan (1-5): ");
        scanf("%d", &kos_list[i].kenyamanan);
    }

    // Hitung CF untuk setiap kos
    for (int i = 0; i < NUM_KOS; i++) {
        kos_list[i].total_cf = 0;
        kos_list[i].total_cf += calculate_cf(kos_list[i].harga_sewa, max_score, weights[0]);
        kos_list[i].total_cf += calculate_cf(kos_list[i].jarak, max_score, weights[1]);
        kos_list[i].total_cf += calculate_cf(kos_list[i].fasilitas, max_score, weights[2]);
        kos_list[i].total_cf += calculate_cf(kos_list[i].keamanan, max_score, weights[3]);
        kos_list[i].total_cf += calculate_cf(kos_list[i].kenyamanan, max_score, weights[4]);
    }

    // Tampilkan hasil
    printf("\n%-20s | Total CF\n", "Nama Tempat Kos");
    printf("--------------------|---------\n");
    for (int i = 0; i < NUM_KOS; i++) {
        printf("%-20s | %.4f\n", kos_list[i].name, kos_list[i].total_cf);
    }

    return 0;
}
```

The output produced from the coding program above can be seen in Figure 1.

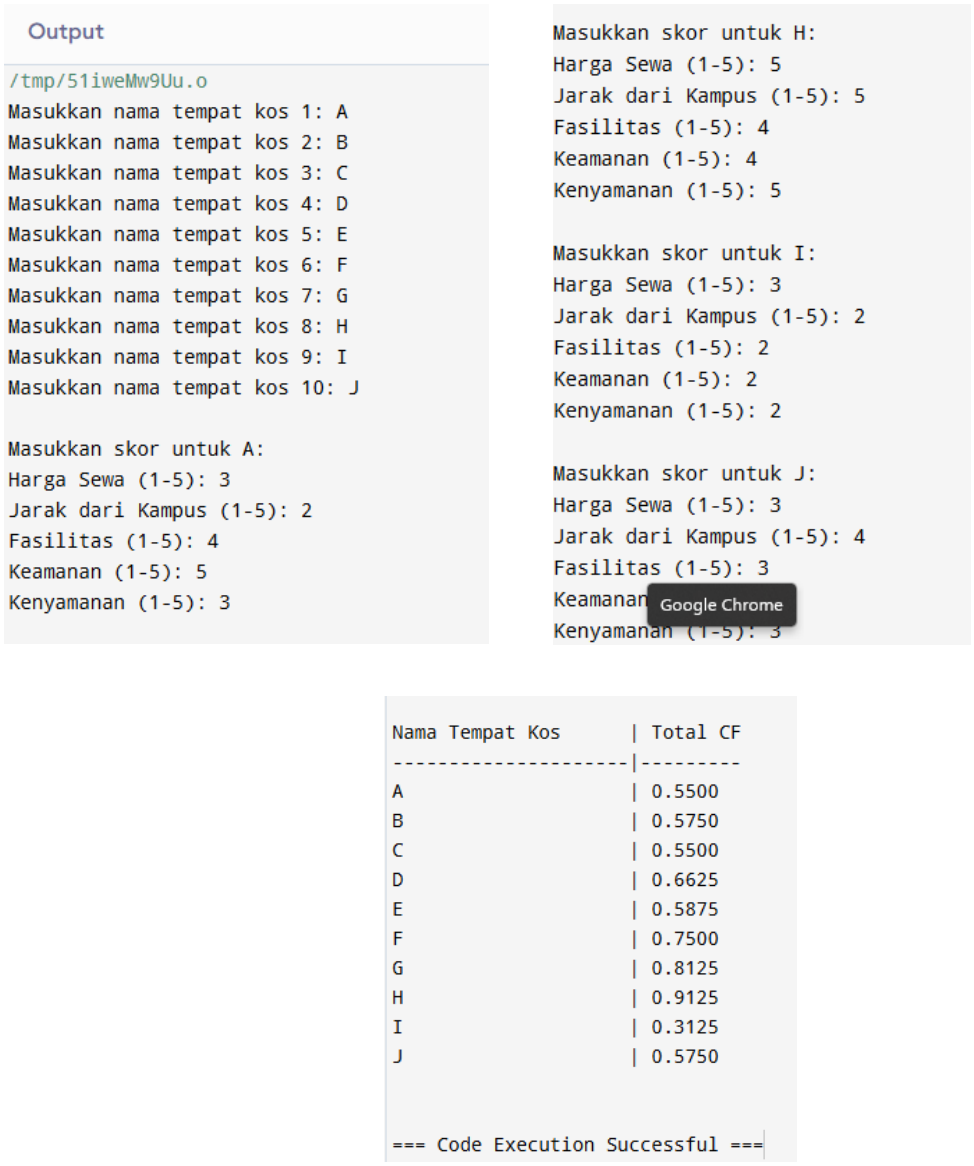

Figure 1. Coding Execution of AI Application Program in Determining Student Boarding House Locations Around the UIN Bukittinggi Campus

DISCUSSION

The results of the Certainty Factor (CF) calculation show that Kos Sakura and Kos Hanumsukai have the highest CF value, which is 0.61. This indicates that the two boarding houses are most in line with the preferences set by students. The high CF value reflects that the two boarding houses meet the criteria that are considered important, such as affordable prices, close distance from campus, and adequate facilities.

Further analysis shows that Kos Amira, with a CF value of 0.59, is also a good choice. Although not as high as Kos Putri Bunda and Kos Putra Sukses, this value still shows that the boarding house offers a good combination of comfort and accessibility. This shows that students have several viable options that fit their criteria, increasing flexibility in decision making.

On the other hand, Kos Green Ediyen and Kos Sigma 1 have the lowest CF value, namely 0.25. This shows that both places do not meet student preferences, both in terms of price, distance, and facilities. This low rating can be a signal for boarding house owners to make improvements, such as improving facilities or adjusting prices, to be more attractive to potential tenants.

Looking at these results, the AI-based recommendation system using the CF method has proven to be effective in identifying suitable boarding houses (Febrianto & Widyadara, 2021) (Nursita & Rizki, 2024) . By providing clear scores based on relevant criteria, students can make more informed and targeted decisions. This is very helpful, especially for new students who are not familiar with the campus environment.

In addition, the application of the CF method in this study shows that data analysis can provide deeper insights into student preferences. Thus, the results obtained are not just numbers, but also reflect the real needs of students in finding a place to live.

Overall, this analysis confirms the importance of using technology, especially AI, in increasing the efficiency and effectiveness of searching for boarding houses (Farozi & Destrilia, 2019) (Iffah, nd) (Fahriandi, 2019) . By utilizing the system that has been developed, students at UIN Bukittinggi are expected to be able to find the ideal place to live and support their academic success.

CONCLUSION

In this study, AI-based belief factors (CF) successfully helped UIN Bukittinggi students in choosing their preferred boarding houses . The analysis results showed that Kos Sakura and Kos Hanumsukai had the highest CF values, indicating that both places met the criteria of price, distance, and facilities.

The recommendation system created has proven effective in simplifying the process of finding a boarding house and reducing the uncertainty that students often experience. By using preference data, students can easily get more relevant and accurate recommendations, which speeds up decision making.

In addition, the use of the CF method tells us more about student preferences. This can help cost owners consider how to improve the quality and attractiveness of their residences.

Therefore, this research not only provides students with practical solutions, but also paves the way for further development on how to use AI to analyze higher education needs. The findings of this research are the application of the CF method specifically in the context of boarding house selection ; it is hoped that this will serve as a model for similar research in the future.

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