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# Predicting Indonesian academician turnover intention: validity and reliability analysis

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**ABSTRACT**

This study evaluates Indonesian academic turnover intention (TOI) by analyzing demographic and work-related factors through feature selection methods and utilizes random forest (RF) as a baseline classifier for TOI prediction, while applying statistical methods to ensure the reliability of the collected primary dataset. The main advantage of this approach is to find out the importance of these factors with statistical validation to reliably investigate Indonesian academicians' TOI. Feature selection methods such as information gain (IG) and SelectKBest were used to find out feature importance, while the reliability of the dataset was assessed through statistical approaches such as Cronbach alpha, confirmatory factor analysis (CFA), average variance extracted (AVE), and consistency ratio (CR). To test the importance of demographic and work-related factors, Python was used as an implementation tool for the Indonesian academic TOI dataset (IRB reference: 19.12.4/UN32.14/PB/2024), comprising 527 samples. The superiority of the importance of work-related factors in contrast to demographic factors was consistently demonstrated by feature selection methods, and a statistical approach confirmed the reliability of the collected primary dataset, consequently ensuring the robustness of the findings. It is envisaged that this approach can be very useful for human resource (HR) departments to pay more attention to the important demographic factors for reducing Indonesian academic TOI.



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## 1. INTRODUCTION

What is the adverse impact of employee turnover intention (TOI) within an organization? Employee turnover is a globally challenging issue for organizations, impacting financial performance, productivity, and workplace culture in a negative way [1]. Thus, it is imperative to retain highly skilled and experienced employees within an organization to eradicate these issues. An employee's real turnover behavior can be predicted by an employee's TOI [2]. Human resource (HR) practices can ameliorate organizational commitment, consequently lowering TOI. This implies that in order to mitigate the negative issues of turnover, organizations should understand the core factors of TOI and address them through HR practices [3].

Numerous studies have been conducted, revealing the fact that Indonesian universities face the challenge of a high turnover rate; in fact, the academic turnover rate in higher education institutes in one Indonesian province reached an astonishing rate of 62%. Despite having high TOI among Indonesian academics, most research works in Indonesia have been conducted based on industries, the manufacturing sector, and garments, whereas there has been a lack of research for Indonesian higher education universities [4]. Additionally, according to [5], academicians in private universities exhibit greater TOI compared to the counterpart public universities. In view of these shortcomings, this study analyzes primary data collected from Indonesian private universities to investigate the factors of TOI, an under-researched issue in the literature.

Although several factors have been explored for employee TOI, most research work deals with factors such as job satisfaction [6], work stress [7], leadership style [8], and organizational commitment [9], which have been evaluated extensively. Yet, despite having high academic turnover in Indonesia, the detailed importance of demographic (age, gender, and work tenure) and work-related factors (workload, compensation, and career growth), and comparison of these factors for TOI is an overlooked issue. Thus, TOI is a significant issue in HR management where unaddressed TOI can significantly hamper effective workforce planning.

The contribution of this research study is threefold. Firstly, in contrast to prior studies employing descriptive or correlational approaches, this study introduces a predictive modeling framework integrated with feature selection, specifically tailored for evaluating the significance of demographic and work-related factors in Indonesian private universities, while comparing the importance of these factors, consequently giving a nuanced understanding of these contextual factors. Secondly, rigorous statistical approaches such as Cronbach's alpha, confirmatory factor analysis (CFA), average variance extracted (AVE), and consistency ratio (CR) are used to validate the psychometric instruments used for TOI, thus improving the reliability of the approach as well as the findings. Thirdly, a random forest (RF) classifier was employed as a baseline predictive model to provide deeper insights into TOI by analyzing top demographic and work-related subgroups, thereby enabling HR practitioners to implement a targeted retention strategy.

In order to position the work, prior studies have examined TOI using demographic and work-related predictors across organizational contexts in isolation. For instance, several work-related factors influencing employee behavior and performance within an organizational setting have been proposed by [10]. Two primary work-related outcomes, such as employee TOI and job performance, have been the core factors for recognizing organizational effectiveness. While our research study focuses on academic TOI, several previous studies focused on actual employee turnover [11], highlighting similar work-related factors, such as job satisfaction and work-life balance of employees, as the top reasons for actual turnover. Job satisfaction, working hours, and performance evaluation were work-related factors, while work tenure was a demographic proxy in identifying employee turnover prediction modeling.

The meta-analysis by [12] offered compelling insight into job-related (workload, stress, and work condition), organizational (organizational justice and autonomy), individual (demographic factors such as age, experience, and grade level), national (collectivist vs individualistic), and team factors (trust in leaders, peer relation between colleagues and administrators) concerning employee TOI. The results demonstrated a stronger correlation between burnout, motivation, age, and employee TOI, whereas strong interpersonal cohesion was shown to have a greater influence in both collective and individualistic cultures. Work-related variables such as job satisfaction, relationship satisfaction, job level, work-life balance, and monthly income were analyzed alongside demographic variables encompassing age, gender, marital status, and education [13]. Both of these features enabled a multidimensional perspective of employee turnover behavior. According to a recent meta-analysis, the three core dimensions of job embeddedness, link, fit, and sacrifice, are negatively associated with nurses' TOI, with sacrifice demonstrating the strongest effect [14]. Furthermore, Setthakorn *et al.* [15] concluded similar observations in the collectivist culture of Southeast Asia, such as Indonesia and Thailand.

However, a contradictory observation was observed among Indonesian government and private officers, where link and fit were not found to have a significant positive effect on TOI [16]. Although Indonesia is faced with high employee turnover, particularly in the private education sector, the predictive role of demographic and work-related factors in Indonesian private academic employees' TOI remains constantly overlooked. Therefore, the predictive role of demographic and work-related factors in Indonesian private academicians' TOI remains underexplored. To address this gap, this study incorporates feature selection methods such as information gain (IG) and SelectKBest combined with a RF classifier as a baseline model for identifying and predicting subgroup patterns of factors to identify TOI. Furthermore, the reliability of the approach is validated through statistical approaches to ensure robustness of the study.

The remaining part of the paper is structured in the following way: in section 2, the method and it is subsequent sections are discussed. Section 3 and it is subsequent sections describe the experimental results and discussion. Finally, section 4 concludes the paper.

## 2. METHOD

The method section includes data collection, sampling participants, instrument design, and encoding. The following subsections outline the data collection procedures and the participant sampling approach. Furthermore, this section also discusses in detail the instrument design and the procedures used to encode work-related and demographic factors.

### 2.1. Data collection

Figure 1 shows the data collection model. Initially, a pilot study of 50 academicians from two Indonesian private universities was conducted. Afterwards, the questionnaire was distributed among academicians for responses. The participants were allowed to withdraw their responses at any time. 527 voluntary responses were collected from the two Indonesian private universities among 1,105 full-time academic employees, with a response rate of 47.7%.

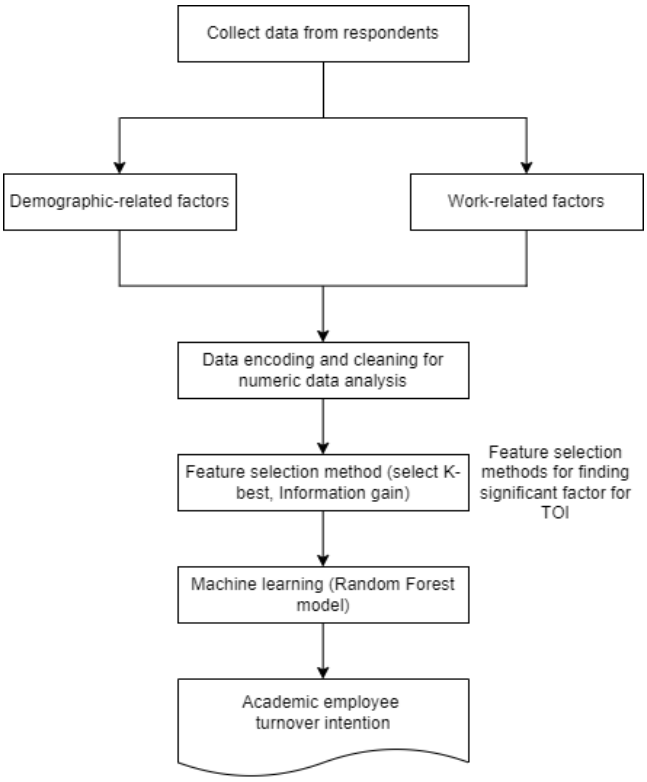


Figure 1. Data collection model

#### 2.1.1. Sampling and participants

Convenience sampling was employed among Indonesian faculty members. Convenience sampling was used in order to ensure simplicity and less implementation time [17]. The respondents included only full-time academicians from Indonesian private universities with a job experience of greater than or equal to 1 year. Academic administrative staff, part-time teachers, and respondents having less than 1 year of job experience were excluded from the study.

#### 2.1.2. Instrument design and adaptation

The instrument (questionnaire) was designed based on the scaling factor range of 1 to 5. A total of 18 items (questionnaires) were designed to assess Indonesian academic TOI. Heo *et al.* [18] demonstrated that each question was assigned a Likert scale value of 1 (strongly disagree) to 5 (strongly agree) for comparative

group analysis across various host and communication attributes. The construct TOI has three items: in the last 3 months, I am thinking of quitting from this office/organization, in the last 3 months, I am searching for an alternative job, in the last 3 months, I have low work motivation, all of which reflect dimensions associated with TOI as conceptualized in the expanded multidimensional turnover intentions scale (EMTIS) dimensions as personal orientation, career growth/expectation, and organizational culture, respectively [19].

#### 2.1.3. Encoding factors

This section explains how the factors were transformed into numerical representations for analysis. Encoding is required because demographic and work-related variables are categorical and cannot be directly used for statistical models. A consistent encoding scheme not only improves reproducibility but also reduces ambiguity and ensures that the correct model interpretation is obtained. The study included multiple demographic factors, including age, gender, work tenure, education level, job position, and average monthly expenditure, for detecting academic employee TOI.

#### 2.1.4. Encoding of turnover intention

The TOI construct was measured with three items. These items reflected the thoughts and behavior of respondents with regard to leaving their current job. The indicators are given as follows: i) "in the last 3 months, I have been thinking of quitting this office/organization", ii) "in the last 3 months, I have been looking for another job", and iii) "I have a low work motivation in the past 3 months". A higher value in the Likert scale indicates a higher probability of TOI.

## 3. RESULTS AND DISCUSSION

The results obtained and analysis are discussed in sections 3.1-3.10. These sections are used to find out reliability of the responses using statistical validation. Furthermore, the importance of work-related and demographic factors is assessed using a feasible classifier model in combination with feature selection methods.

### 3.1. Cronbach's alpha

Internal consistency was analyzed based on self-reported scales, which complies with previous literature employing only brief self-control scale (BSCS) items [20], thus this study only focused on the work-related and TOI constructs using scales for measuring internal consistency. Demographic variables such as age and gender are not subjected to the measurement of internal consistency metrics like AVE, CFA, and CR since these variables are assumed to be measured without error. This is in line with findings of [21]. Internal consistency for the factors of TOI and work-related constructs was ascertained through Cronbach's alpha. Calculation of Cronbach's alpha as shown in (1).

$$\alpha = \frac{N}{N-1}\left(1 - \frac{\sum \sigma_i^2}{\sigma^2}\right) \quad (1)$$

Where N is the number of items (questions or variables) in the construct, $\sigma_i^2$ is the variance of each item, and $\sigma^2$ is the variance of the summed scores (total score).

### 3.2. Cronbach's alpha of turnover intention

This subsection evaluates the internal consistency of the three indicators of TOI. Cronbach's alpha is used since it summarizes how closely the items are related, supporting the reliability of the TOI construct. The following calculations use item variances and the variance of the summed score. The means of the three items are 2.63, 2.66, and 2.70, respectively. Therefore, the Cronbach alpha for TOI:

$$\alpha = \frac{3}{3-1}\left(1 - \frac{1.40+1.44+1.07}{9.18}\right) = 0.86$$

### 3.3. Cronbach alpha of work-related factors

This subsection evaluates the reliability of the work-related factor indicators as a single construct. The computations as follows apply the variances of each item and the variance of the total score. The calculation of Cronbach's alpha is shown across all the items or factors for the work-related construct. The means of the eleven items are 2.50, 3.38, 3.35, 3.47, 3.50, 2.52, 3.50, 3.65, 3.43, 3.52, and 3.60, respectively. Now, the mean of the summed variances is 36.45. Hence:

$$\sigma_x^2 = \frac{1}{10-1}\sum(x_i - 36.45)^2 = 41.8$$

Therefore, the Cronbach alpha for work-related factors:

$$\alpha = \frac{10}{10-1}\left(1 - \frac{1.52+0.99+\cdots+0.94}{41.8}\right) = 0.85$$

The result represented Cronbach's alpha for the constructs of TOI and work-related factors, which are 0.86 and 0.85, respectively, indicating good internal consistency. Reliability and internal consistency are measured via Cronbach's alpha, where a value greater than 0.7 is considered meaningful and acceptable [22]. Both constructs demonstrated a value higher than 0.70, confirming the consistency of the dataset.

### 3.4. Confirmatory factor analysis

To further establish the construct validity of the measurement model, a CFA was conducted for each latent construct [23]. CFA allows the evaluation of the relationship between the indicators of a construct and establishes consistency. The analysis was performed using standardized factor loadings, AVE [24], and CR [25] as indicators of convergent validity and reliability.

#### 3.4.1. Factor loadings: turnover intention

Table 1 shows that the TOI construct was modeled using three observed items that captured employees' intentions to leave their current organization, search for alternative employment, and their motivational decline. All standardized factor loadings exceeded the recommended threshold of 0.70, indicating strong indicator reliability. The computation of standardized loading enables the measurement of AVE for later calculation. The AVE was 0.7899, indicating that 78.99% of the variance in the items was explained by the construct. The CR was 0.9179, which exceeds the 0.70 threshold and confirms high internal consistency.

Table 1. Standard loadings for TOI

| Item | Standardized loading |
|---|---|
| TOI1–"Thinking of quitting the organization." | 0.960 |
| TOI2–"Searching for an alternative job." | 0.934 |
| TOI3–"Having low work motivation." | 0.773 |

#### 3.4.2. Factor loadings: work-related factors

All standardized loadings were above 0.70, showing that the observed variables adequately represented the latent factor. Each item contributes meaningfully to the construct, supporting the use of work-related factors as a reliable latent variable for subsequent analysis. Table 2 shows the standardized factor loadings used for measuring AVE and CR for the work-related factors construct.

Table 2. Standard loading for work-related factors

| Item | Standardized loading ($\lambda$) |
|---|---|
| Satisfaction with workload | 0.852 |
| Satisfied with compensation | 0.750 |
| Good relationship with peers | 0.775 |
| Satisfied with career and opportunity | 0.830 |
| Satisfied with the job profession | 0.866 |
| Satisfied with work–life balance | 0.810 |
| Work is meaningful | 0.845 |
| Family support | 0.790 |
| Mentally well and do not have anxiety | 0.805 |
| Weekly working hour | 0.802 |

#### 3.4.3. Measurement of AVE and CR

In order to evaluate the convergent validity and internal consistency of the measurement model, AVE and CR were computed. While AVE measures the average proportion of variance in observed measurement items, CR assesses the internal consistency of the items by using their standardized loadings. In (2) and (3), $\lambda_i$ is the standardized factor loading. Here, $n$ represents the number of observed items for the construct. AVE is computed as the mean of the squared standardized loadings ($\sum\lambda_i^2/n$), representing the proportion of variance captured by the construct with respect to measurement error. CR summarizes internal consistency by combining standardized loadings with their error variances (commonly $1-\lambda_i^2$), indicating that a higher CR has stronger construct reliability.

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum (1 - \lambda_i^2)} \quad (2)$$

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum (1 - \lambda_i^2)} \quad (3)$$

The values of $\lambda$ have been taken from CFA results presented in Table 2. The AVE for work-related factors was 0.70, and the CR was 0.9538, both surpassing the minimum recommended thresholds for adequate convergent validity and acceptable construct reliability, respectively (AVE ≥0.50; CR ≥0.70). This indicates that the construct exhibits strong convergent validity and excellent internal reliability.

### 3.4.4. Overall model fit

The CFA demonstrated acceptable overall fit ($\chi^2$/degrees of freedom ($df$) < 3, comparative fit index (CFI) ≥0.90, Tucker–Lewis index (TLI) ≥0.90, root mean square error of approximation (RMSEA) ≤0.08), which meets recommended threshold for a satisfactory measurement model. Collectively, these findings indicate the measurement of reliability and construct validity. In accordance, the model structure is feasible for interpreting construct-level results.

### 3.4.5. Descriptive statistics

This subsection examine descriptive patterns of TOI across the most important demographic and work-related factors. Firstly, the topmost demographic factors for employees' TOI are examined. Figure 2 represents the age range for higher TOI-related patterns, suggesting that younger academicians show relatively higher TOI than older groups, implying that early-career faculty members are more vulnerable to withdrawal, possibly due to assessing career fit, institutional support, and longer-term opportunities.

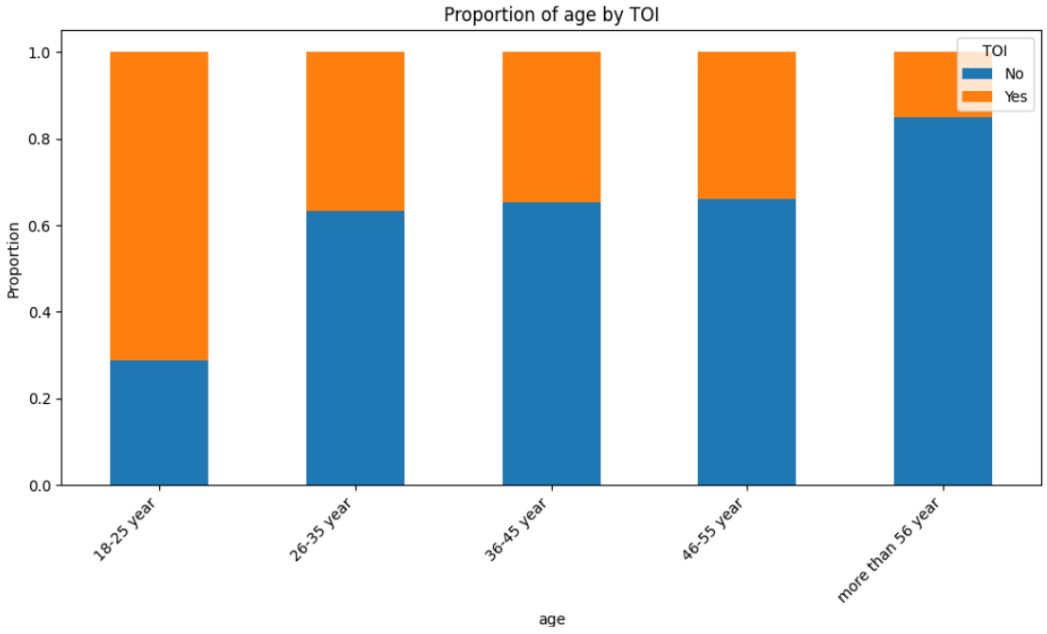


Figure 2. Descriptive statistics of the demographic factor age

### 3.4.6. Demographic-gender

Next, TOI patterns among male and female academicians are examined. It can be clearly seen from Figure 3 that TOI among female respondents is higher. This suggests that turnover experiences may vary across subgroups in Indonesian private universities.

### 3.4.7. Work related factors-satisfaction with workload

Since workload satisfaction is treated as an ordinal factor (from 1 to 5) and it is ranked as the topmost predictor of TOI, this descriptive factor provides meaningful insights into the model-based

descriptions of the subgroups. Figure 4 clearly reveals that TOI is higher among respondents with lower workload satisfaction. Higher workload satisfaction is associated with lower TOI.

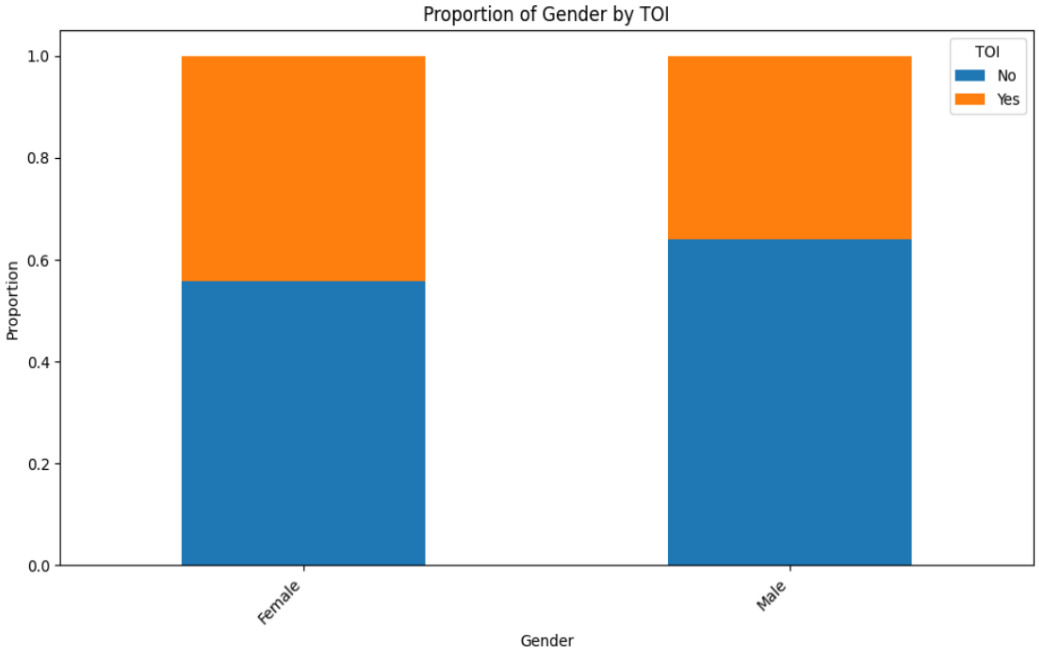


Figure 3. Descriptive statistics of demographic factor gender

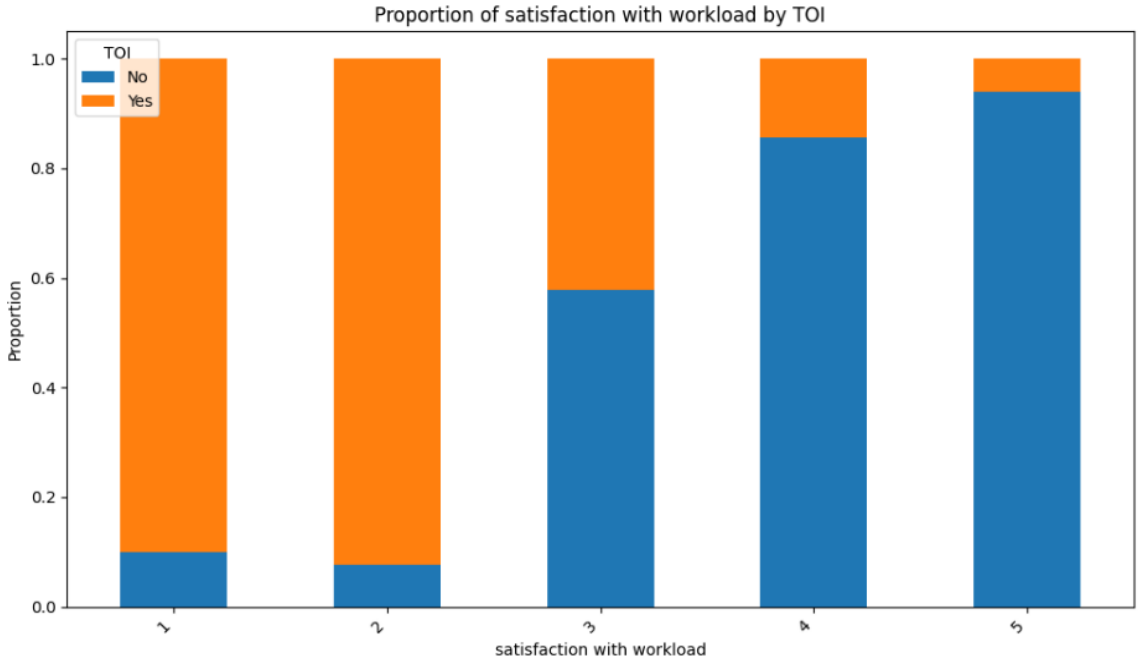


Figure 4. Descriptive statistics of Work-related factor: workload satisfaction

### 3.5. Comparison of several classifier models

RF was compared with other classifier models using consistent performance metrics for unbiased evaluation. Table 3 represents the performance metrics across different classifier models revealing that RF achieved the best overall performance with an accuracy of 0.9623 and precision, recall, and F1-score all

equal to 0.96, while logistic regression (LR) and CatBoost performed less strongly. Support vector machine (SVM), AdaBoost, XGBoost, and decision tree (DT) produced lower results. RF is suitable since the relationship between encoded demographic and work-related predictors and TOI is likely nonlinear, which the model captures effectively, leading to superior model performance.

Table 3. Comparison of performance metrics among different machine learning classifier models

| Model | Accuracy | Precision | Recall | F1-score |
|---|---|---|---|---|
| RF | 0.9623 | 0.96 | 0.96 | 0.96 |
| LR | 0.8962 | 0.90 | 0.88 | 0.89 |
| SVM | 0.8774 | 0.90 | 0.84 | 0.86 |
| CatBoost | 0.8962 | 0.90 | 0.88 | 0.89 |
| AdaBoost | 0.8774 | 0.88 | 0.86 | 0.87 |
| XGBoost | 0.8868 | 0.88 | 0.88 | 0.88 |
| DT | 0.7925 | 0.78 | 0.78 | 0.78 |

### 3.6. Sub-group-wise random forest

Table 4 shows the subgroup analysis adds practical insight. RF performed less strongly in 18–25 age group than in 26-35 and 36-45 groups. Suggesting that TOI among younger academicians may be more heterogeneous and harder to classify.

Table 4. Subgroup analysis of demographic and work-related factor for RF model

| Category | Subgroup | Accuracy | Precision | Recall | F1-score |
|---|---|---|---|---|---|
| Age (18–25) | | 0.7000 | 0.8333 | 0.6250 | 0.7143 |
| Age (26–35) | | 0.9286 | 0.9125 | 0.9125 | 0.9125 |
| Age (36–45) | | 0.8529 | 0.8536 | 0.8474 | 0.8505 |
| Age (46–55) | | 1.0000 | 1.0000 | 1.0000 | 1.000 |
| Age (≥ 56) | | 1.0000 | 1.0000 | 1.0000 | 1.000 |
| Female | | 0.8529 | 0.8542 | 0.8529 | 0.8536 |
| Male | | 0.9306 | 0.9167 | 0.9259 | 0.9213 |

## 4. CONCLUSION

In this study, the aim was to assess the importance of demographic and work-related factors accurately in different subgroups to predict Indonesian private academic TOI while maintaining the reliability of the collected primary dataset. The study uses several statistical methods to investigate the reliability and validity of the collected primary dataset. The observations from this study suggest that work-related factors such as workload satisfaction, job satisfaction, and compensation satisfaction are the most important features, whereas demographic factors, i.e, age and tenure, are of lesser importance in contrast to work-related factors in predicting TOI in Indonesian private universities. Additionally, it confirms the reliability of the predictive model approach of RF by analyzing the data on top work-related and demographic subgroups for HR managers to take necessary retention strategies for academicians. In the future, the incorporation of a predictive framework within a real-time dashboard for higher-level administrators, such as deans or department heads, would enable universities to monitor academic employees' TOI dynamically at the institutional level, consequently benchmarking among universities to find out the importance of factors for TOI. Furthermore, the results of this study can be implemented by the Ministry of Higher Education to provide data-driven insights into HR and employee retention programs. This research focuses on private academic employees because of high TOI; however, a comparative study between private and public universities can be conducted to analyze the key distinguishing features of these two sectors in a longitudinal context. Furthermore, this study only looks at the Indonesian academic context by collecting data through convenience sampling, which opens the door for future researchers to deal with more generalized TOI with different sampling procedures to mitigate any sampling issues.

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**AUTHOR CONTRIBUTIONS STATEMENT**

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

**CONFLICT OF INTEREST STATEMENT**

All authors confirm that they have disclosed any affiliations, funding sources, or involvement with organizations that might be perceived to influence the work reported in this paper. No external entity had any role in the design of the study, data collection, analysis, interpretation, or decision to submit the manuscript for publication.

**ETHICAL APPROVAL**

This study was conducted in accordance with all applicable national regulations and institutional policies. Ethical approval was obtained from the Institutional Review Board of Universitas Negeri Malang, Indonesia (approval no. 19.12.4/UN32.14/PB/2024). The research utilized aggregated and anonymized traffic data, and no personally identifiable information was involved. All procedures adhered to established ethical standards for data usage, privacy, and research integrity.

**DATA AVAILABILITY**

The dataset supporting the findings of this research work is publicly available in the Mendeley Data repository at http://doi.org/10.17632/m7fprjt84z.2.

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