

Role of Machine Learning in Enhancing Knowledge Sharing Practices Among University Faculty Members

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ABSTRACT

This study examines the role of machine learning in enhancing knowledge sharing practices among university faculty members. In the contemporary digital era, machine learning technologies are increasingly being integrated into higher education to improve academic collaboration and knowledge management processes. The study aims to explore how these technologies influence faculty members' knowledge-sharing behavior in universities. The objectives of the study were to examine the level of machine learning utilization among university faculty members, to investigate knowledge sharing practices among faculty members, and to determine the relationship between machine learning and knowledge sharing. A quantitative research design based on a cross-sectional survey method was adopted for this study. The population consisted of approximately 22 universities in Islamabad with an estimated 4,000 faculty members. A sample of 300 faculty members was selected using stratified random sampling technique to ensure proportional representation of public and private sector universities. The research tool was a structured questionnaire based on a five-point Likert scale. Validity of the instrument was ensured through expert review, while reliability was confirmed through Cronbach's Alpha test, yielding acceptable values above 0.70. Data were analyzed using SPSS software through descriptive statistics, correlation, and regression analysis. The first objective revealed that faculty members demonstrate a moderate level of machine learning utilization, and it is recommended that universities should provide training programs and technical support to enhance advanced machine learning adoption among faculty members. The significance of the study lies in its contribution to educational technology literature, as it provides empirical evidence on how machine learning can improve knowledge sharing, support academic collaboration, and assist policymakers in developing technology-driven strategies for higher education institutions.

Keywords: Machine Learning, Knowledge Sharing, University Faculty, Higher Education, Artificial Intelligence, Educational Technology

INTRODUCTION

The rapid advancement of digital technologies has transformed the landscape of higher education across the world. Universities are increasingly adopting innovative technological solutions to improve teaching, research, administration, and knowledge management practices. Among these technological innovations, Machine Learning (ML), a subset of Artificial Intelligence (AI), has emerged as a powerful tool capable of analyzing large datasets, identifying patterns, making predictions, and supporting decision-making processes. In the context of higher education, machine learning technologies are increasingly being integrated into academic environments to facilitate collaboration, information exchange, and organizational learning (Mahnaz, 2023). Knowledge sharing, which refers to the exchange of information, expertise, skills, and experiences among individuals and groups, has become an essential component for academic excellence and institutional effectiveness. Consequently, researchers and policymakers have shown growing interest in understanding how machine learning can support and enhance knowledge sharing practices among university faculty members (Chen & Zhang, 2025; Fan & Beh, 2024; Elmoustafa, 2025).

Knowledge sharing is widely recognized as a critical factor in fostering innovation, improving organizational performance, and promoting professional development within higher education institutions. Faculty members generate and disseminate substantial amounts of knowledge through teaching, research, conferences, publications, and collaborative activities. Effective knowledge sharing enables academics to exchange best practices, solve complex problems, and develop innovative teaching methodologies. However, despite its importance, many universities continue to face challenges related to knowledge silos, limited collaboration, inadequate technological infrastructure, and resistance to knowledge-sharing behaviors. Recent studies have emphasized that technological factors significantly influence faculty members' willingness and ability to share knowledge within academic institutions (Fan & Beh, 2024; Rahoo et al., 2025; Kaba & Ramaiah, 2019).

Machine learning technologies offer significant opportunities to address these challenges by enhancing knowledge discovery, retrieval, recommendation, and dissemination processes. Through advanced algorithms and data analytics, machine learning systems can analyze user behaviors, identify expertise networks, and provide personalized recommendations that facilitate the efficient exchange of knowledge among faculty members (Mahnaz & Nayab, 2026). These intelligent systems can automatically categorize academic content, recommend relevant research materials, identify potential collaborators, and support communities of practice within universities. As a result, machine learning has the potential to create more connected and collaborative academic environments that encourage continuous knowledge sharing and organizational learning (Mazhar et al., 2025; Elmoustafa, 2025; Chen & Zhang, 2025).

The increasing availability of digital platforms and artificial intelligence applications has further accelerated the integration of machine learning into knowledge management systems. Universities now employ various digital tools such as learning management systems, institutional repositories, collaborative platforms, and academic social networks that generate large volumes of data. Machine learning algorithms can analyze these data to uncover hidden patterns, predict user preferences, and optimize information-sharing processes. Such capabilities enable institutions to develop intelligent knowledge management systems that support faculty members in accessing relevant information and sharing expertise more effectively. Research indicates that technological advancements significantly contribute to knowledge-sharing behavior by improving accessibility, usability, and engagement among academic staff (Chen & Zhang, 2025; Fan & Beh, 2024; Kaba & Ramaiah, 2019).

Furthermore, machine learning applications can enhance collaborative research activities among university faculty members. Academic research increasingly relies on interdisciplinary collaboration and

the exchange of expertise across different fields. Machine learning systems can identify research trends, recommend potential collaborators based on shared interests, and facilitate the formation of research networks (Mahnaz & Kiran, 2024a). By providing intelligent recommendations and predictive insights, these systems reduce barriers to collaboration and promote knowledge sharing across departments and institutions. Studies have shown that AI-driven technologies positively influence faculty engagement, academic productivity, and collaborative practices within higher education settings (Mazhar et al., 2025; Elmoustafa, 2025; De Silva et al., 2026).

Another important contribution of machine learning to knowledge sharing lies in its ability to personalize information delivery. Traditional knowledge management systems often present users with vast amounts of information, making it difficult to identify relevant content. Machine learning algorithms can analyze individual preferences, professional interests, and previous interactions to provide personalized recommendations tailored to the needs of faculty members (Mahnaz & Kiran, 2024b). Personalized knowledge-sharing environments increase user engagement, improve information accessibility, and encourage active participation in collaborative activities. Such personalized approaches are particularly valuable in higher education institutions where faculty members possess diverse disciplinary backgrounds and specialized knowledge domains (Chen & Zhang, 2025; Fan & Beh, 2024; Mazhar et al., 2025).

The effectiveness of machine learning in enhancing knowledge sharing is also closely linked to the broader concept of knowledge management. Knowledge management encompasses the processes of creating, storing, sharing, and utilizing organizational knowledge to achieve strategic objectives. Universities are increasingly recognizing the importance of implementing effective knowledge management practices to remain competitive in the knowledge economy. Machine learning technologies support these efforts by automating knowledge classification, facilitating knowledge retrieval, and generating actionable insights from large datasets. Empirical evidence suggests that AI and machine learning applications significantly contribute to the improvement of knowledge management practices within academic institutions (Elmoustafa, 2025; Mazhar et al., 2025; Fan & Beh, 2024).

Despite the promising potential of machine learning technologies, their successful implementation in higher education institutions depends on several organizational and individual factors (Mahnaz & Kiran, 2024c). Faculty members' attitudes toward technology, perceived usefulness, digital literacy, organizational support, and institutional culture play crucial roles in determining the effectiveness of machine learning applications. Universities must create supportive environments that encourage technology adoption and knowledge-sharing behaviors. Research has consistently highlighted the importance of organizational climate, leadership support, trust, and technological infrastructure in promoting knowledge sharing among academics (Alshaibani & Bakir, 2020; Fan & Beh, 2024; Rahoo et al., 2025).

Moreover, machine learning can help universities address the growing challenge of information overload. Faculty members are often overwhelmed by the vast amount of academic information available through journals, databases, institutional repositories, and online platforms (Mahnaz et al., 2025). Machine learning algorithms can filter and prioritize information based on relevance, thereby reducing cognitive burden and improving access to useful knowledge. Intelligent search systems, recommendation engines, and automated content classification tools enable faculty members to locate and share relevant information more efficiently. Such capabilities contribute to improved decision-making, enhanced research productivity, and stronger knowledge-sharing cultures within universities (Chen & Zhang, 2025; Elmoustafa, 2025; Kaba & Ramaiah, 2019).

The emergence of generative AI and advanced machine learning models has further expanded opportunities for knowledge sharing in higher education. Faculty members can now utilize AI-powered

tools for content generation, research assistance, data analysis, and collaborative learning (Mahnaz et al., 2021). These technologies facilitate the creation and dissemination of knowledge while promoting interaction among academic communities. However, their implementation also raises concerns related to ethics, privacy, data security, and academic integrity. Universities must therefore establish appropriate policies and governance frameworks to ensure the responsible use of machine learning technologies in knowledge-sharing activities (De Silva et al., 2026; Mazhar et al., 2025; Elmoustafa, 2025).

In contemporary higher education environments, knowledge sharing has become increasingly important for achieving institutional excellence, fostering innovation, and supporting faculty development. The integration of machine learning technologies offers unprecedented opportunities to enhance these processes through intelligent knowledge management, personalized recommendations, collaborative research support, and automated information retrieval. Although existing studies have highlighted the significance of technological factors in knowledge sharing, there remains a need for further research examining the specific role of machine learning in enhancing knowledge-sharing practices among university faculty members. Understanding this relationship will contribute to the development of effective strategies and policies that leverage machine learning technologies to strengthen academic collaboration and organizational learning within higher education institutions (Fan & Beh, 2024; Chen & Zhang, 2025; Rahoo et al., 2025).

Objectives of the Study

1. To examine the level of machine learning utilization among university faculty members.
2. To investigate the level of knowledge sharing practices among university faculty members.
3. To determine the role of machine learning in enhancing knowledge sharing practices among university faculty members.

Hypotheses of the Study

- H1:** There is a significant level of machine learning utilization among university faculty members.
- H2:** University faculty members exhibit a significant level of knowledge sharing practices.
- H3:** Machine learning significantly influences knowledge sharing practices among university faculty members.

Statement of the Problem

Universities are increasingly adopting machine learning technologies to improve teaching, research, and knowledge management activities. Despite the growing availability of AI-powered tools, effective knowledge sharing among faculty members remains a challenge due to technological, organizational, and behavioral barriers. Limited empirical evidence exists regarding how machine learning contributes to enhancing knowledge-sharing practices within higher education institutions. Therefore, this study seeks to investigate the role of machine learning in enhancing knowledge sharing practices among university faculty members and to determine whether the utilization of machine learning technologies significantly influences the exchange of knowledge, expertise, and collaborative learning within academic environments.

Conceptual Framework

Independent Variable (IV)

Machine Learning

- Intelligent recommendation systems
- Predictive analytics
- Automated knowledge classification
- AI-assisted collaboration tools
- Personalized information retrieval

Dependent Variable (DV)

Knowledge Sharing Practices

- Knowledge exchange
- Academic collaboration
- Research information sharing
- Best-practice dissemination
- Professional learning and development

Significance of the Study

This study is significant for university administrators as it provides insights into how machine learning technologies can enhance knowledge-sharing practices and improve institutional performance. The findings may assist policymakers in developing technology integration strategies that promote collaborative learning and organizational knowledge management. The study is also beneficial for faculty members by highlighting the potential of machine learning tools to facilitate research collaboration, information exchange, and professional development. Understanding these benefits can encourage greater adoption of innovative technologies within academic settings.

Furthermore, the study contributes to the existing body of knowledge by extending the literature on machine learning, artificial intelligence, and knowledge sharing in higher education. It may serve as a valuable reference for future researchers investigating technology-enabled knowledge management practices in universities.

LITERATURE REVIEW

Machine Learning in Higher Education

Machine Learning (ML), a significant branch of Artificial Intelligence (AI), has emerged as one of the most transformative technologies in higher education. Machine learning refers to computer systems

capable of learning from data, identifying patterns, and making decisions with minimal human intervention. Universities worldwide are increasingly integrating machine learning technologies into teaching, learning, research, administration, and knowledge management processes. The rapid growth of digital information and academic resources has created a need for intelligent systems that can efficiently manage, analyze, and disseminate knowledge among faculty members. Consequently, machine learning has become an essential component of modern educational institutions seeking to improve organizational effectiveness and academic performance (Holmes et al., 2019; Zawacki-Richter et al., 2019; Viberg et al., 2020).

The adoption of machine learning technologies in higher education has been driven by the increasing availability of big data and advanced computing capabilities (Mahnaz et al., 2023). Universities generate large volumes of data through learning management systems, institutional repositories, research databases, and digital communication platforms. Machine learning algorithms can process these datasets to identify trends, predict outcomes, and support evidence-based decision-making. Such capabilities have enabled institutions to enhance educational quality, improve resource management, and facilitate knowledge sharing among faculty members. Researchers have emphasized that machine learning contributes significantly to the development of intelligent educational environments that support collaboration and continuous learning (Ifenthaler & Yau, 2020; Chen et al., 2020; Alam, 2021).

Recent studies have highlighted the growing role of machine learning in academic knowledge management systems. Through automated content classification, recommendation systems, and predictive analytics, machine learning facilitates efficient knowledge creation, storage, retrieval, and dissemination. Faculty members can access relevant research materials, identify collaborative opportunities, and share expertise more effectively through intelligent platforms supported by machine learning technologies. Such developments are particularly important in universities where knowledge is a primary organizational asset. The integration of machine learning into knowledge management practices has therefore become a strategic priority for many higher education institutions (Dwivedi et al., 2021; Tlili et al., 2023; Alam, 2021).

Concept of Knowledge Sharing in Universities

Knowledge sharing is a fundamental process through which individuals exchange information, experiences, skills, and expertise to achieve common goals. Within higher education institutions, knowledge sharing plays a critical role in promoting academic excellence, innovation, and organizational learning. Faculty members continuously generate knowledge through research, teaching, professional development activities, and scholarly interactions. Effective knowledge sharing ensures that valuable expertise is disseminated across departments and disciplines, thereby enhancing institutional effectiveness and academic productivity (Fullwood et al., 2018; Al-Kurdi et al., 2020; Fauzi et al., 2021).

Universities are knowledge-intensive organizations where the creation and dissemination of knowledge constitute core institutional functions. Faculty members rely on collaboration and communication to develop innovative teaching strategies, conduct interdisciplinary research, and solve complex academic problems (Mahnaz et al., 2022). Knowledge sharing enables academics to exchange best practices, access new information, and collectively address challenges faced within educational environments. Research has consistently demonstrated that effective knowledge-sharing practices contribute to improved teaching quality, research productivity, and organizational competitiveness in higher education institutions (Masa'deh et al., 2017; Al-Kurdi et al., 2020; Fauzi et al., 2021).

The success of knowledge-sharing initiatives depends on various individual, technological, and organizational factors. Individual factors include attitudes, motivation, trust, and willingness to share

expertise. Technological factors involve the availability and effectiveness of information systems that facilitate communication and collaboration. Organizational factors include leadership support, institutional culture, and reward systems that encourage knowledge-sharing behavior. Researchers have emphasized that the interaction among these factors significantly influences the effectiveness of knowledge-sharing practices within universities (Nguyen et al., 2019; Al-Kurdi et al., 2020; Raza et al., 2022).

Knowledge Management and Faculty Development

Knowledge management refers to the systematic process of creating, capturing, organizing, sharing, and utilizing knowledge to achieve organizational objectives. In higher education institutions, knowledge management is increasingly recognized as a strategic approach to improving academic performance and institutional effectiveness. Faculty members are key contributors to organizational knowledge because they generate new knowledge through research and disseminate it through teaching and scholarly activities. Effective knowledge management systems enable universities to preserve intellectual capital and facilitate knowledge exchange among academic staff (Massaro et al., 2015; Abbas et al., 2019; Alshurideh et al., 2022).

The implementation of knowledge management practices contributes significantly to faculty development by supporting continuous learning and professional growth. Through knowledge-sharing platforms, faculty members can access educational resources, participate in collaborative research projects, and engage in communities of practice. Such opportunities enhance teaching effectiveness, research productivity, and professional competencies. Studies have shown that institutions with strong knowledge management practices tend to exhibit higher levels of academic innovation and faculty engagement than institutions with limited knowledge-sharing mechanisms (Abbas et al., 2019; Al-Kurdi et al., 2020; Alshurideh et al., 2022).

Technological innovations have transformed traditional knowledge management approaches in universities. Digital repositories, collaborative platforms, learning management systems, and artificial intelligence applications have significantly improved the accessibility and dissemination of academic knowledge. Machine learning technologies further enhance these capabilities by automating information processing and providing personalized recommendations. Such developments have strengthened the role of knowledge management in supporting faculty development and institutional learning (Dwivedi et al., 2021; Tlili et al., 2023; Alam, 2021).

Role of Technology in Knowledge Sharing

Technology has become a critical enabler of knowledge-sharing activities within higher education institutions. The widespread adoption of digital communication tools, cloud-based platforms, and online collaborative systems has transformed the way faculty members create, exchange, and utilize knowledge. Technology reduces geographical and organizational barriers, allowing academics to engage in collaborative activities regardless of physical location. Consequently, technological infrastructure has become an essential determinant of successful knowledge-sharing practices in universities (Al-Kurdi et al., 2020; Fauzi et al., 2021; Raza et al., 2022).

Modern information and communication technologies provide faculty members with various opportunities to interact and collaborate. Learning management systems, institutional repositories, academic social networks, and digital libraries facilitate the exchange of information and scholarly resources. These platforms enable academics to share research findings, teaching materials, and professional experiences with colleagues across departments and institutions. Studies have indicated that

technology significantly improves knowledge accessibility, communication efficiency, and collaborative learning among university faculty members (Nguyen et al., 2019; Al-Kurdi et al., 2020; Fauzi et al., 2021).

Despite the benefits of technological tools, challenges remain regarding their effective utilization. Faculty members may encounter difficulties related to digital literacy, technological complexity, and resistance to change. Furthermore, inadequate infrastructure and limited institutional support can hinder the successful implementation of technology-enabled knowledge-sharing initiatives. Researchers have emphasized the importance of training programs, technical support, and organizational commitment in maximizing the benefits of technology for knowledge sharing (Raza et al., 2022; Tlili et al., 2023; Dwivedi et al., 2021).

Machine Learning and Knowledge Management Systems

Machine learning technologies have significantly enhanced the capabilities of modern knowledge management systems. Traditional knowledge management systems often rely on manual processes for organizing, storing, and retrieving information. In contrast, machine learning algorithms can automatically analyze large datasets, identify relationships among knowledge assets, and generate insights that support decision-making. These capabilities improve the efficiency and effectiveness of knowledge management processes within higher education institutions (Alam, 2021; Dwivedi et al., 2021; Tlili et al., 2023).

One of the most important contributions of machine learning to knowledge management is automated knowledge classification. Universities produce vast quantities of research articles, reports, learning materials, and administrative documents (Choudhry et al., 2025). Machine learning algorithms can categorize and index these resources based on content characteristics, making them easier to locate and retrieve. Such automation reduces information overload and enables faculty members to access relevant knowledge more efficiently. Researchers have found that intelligent knowledge management systems contribute significantly to improved organizational learning and academic productivity (Chen et al., 2020; Alam, 2021; Dwivedi et al., 2021).

Machine learning also supports knowledge discovery by identifying hidden patterns and relationships within organizational data. Through data mining and predictive analytics, intelligent systems can uncover emerging research trends, collaboration opportunities, and areas requiring institutional attention. These insights facilitate evidence-based decision-making and encourage proactive knowledge-sharing behavior among faculty members. Consequently, machine learning has become an important tool for enhancing organizational intelligence and knowledge management effectiveness in higher education institutions (Holmes et al., 2019; Ifenthaler & Yau, 2020; Tlili et al., 2023).

RESEARCH METHODOLOGY

Research Design

This study adopts a quantitative research design to examine the role of machine learning in enhancing knowledge sharing practices among university faculty members. A cross-sectional survey design is used because it allows data to be collected from respondents at a single point in time. This design is appropriate for measuring perceptions, attitudes, and practices related to machine learning and knowledge sharing. It also enables statistical analysis to determine relationships between variables. The design supports generalization of findings to a broader academic population within Islamabad universities.

The study is descriptive and correlational in nature. Descriptive design helps in identifying the level of machine learning usage and knowledge sharing practices. Correlational design assists in examining the relationship between machine learning and knowledge sharing. This approach is widely used in educational research where behavioral and technological variables are analyzed. The design ensures systematic investigation of variables without manipulating them. It provides a clear framework for hypothesis testing.

The research design focuses on faculty members as key stakeholders in knowledge creation and dissemination. Their perceptions regarding machine learning tools are essential for understanding institutional readiness. The design allows comparison across demographic groups such as gender, designation, and experience. It ensures structured data collection using standardized instruments. This enhances reliability and validity of findings.

Overall, the quantitative survey design is suitable for producing measurable and generalizable results. It helps in identifying trends and patterns in faculty behavior. The design also supports inferential statistical analysis. This enables the researcher to draw conclusions about the impact of machine learning. It provides a strong foundation for policy recommendations.

Research Philosophy

This study is grounded in the positivist research philosophy. Positivism assumes that reality is objective and can be measured through scientific methods. It supports the use of quantitative data to test hypotheses and examine relationships between variables. The philosophy is suitable for studies involving measurable constructs such as machine learning usage and knowledge sharing practices. It emphasizes objectivity, reliability, and generalizability of findings.

Positivism allows the researcher to analyze data using statistical techniques without subjective interpretation. It ensures that results are based on observable phenomena rather than personal opinions. This is important in educational technology research where empirical evidence is required. The philosophy supports structured data collection through standardized questionnaires. It also ensures consistency in measurement across respondents.

The positivist approach is appropriate because the study aims to test hypotheses rather than explore experiences in depth. It focuses on identifying cause-and-effect relationships between variables. Machine learning adoption and knowledge sharing behavior can be quantified effectively under this philosophy. It reduces researcher bias and enhances credibility of findings. It is widely used in social science and educational research.

Therefore, positivism provides a strong theoretical foundation for this study. It aligns with the quantitative methodology and correlational design. It ensures that conclusions are evidence-based and statistically validated. It supports replication of the study in different contexts. It enhances the scientific rigor of the research.

Population

The population of this study consists of all public and private universities located in Islamabad, Pakistan. According to higher education records, Islamabad has approximately 22 recognized universities, including both public and private sector institutions. These universities employ a large number of faculty members across various academic disciplines. The population is relevant because these institutions are increasingly adopting digital and machine learning technologies.

The target respondents of this study are faculty members working in these universities. Faculty members include lecturers, assistant professors, associate professors, and professors. They are directly involved in teaching, research, and knowledge sharing activities. Their perceptions are important for understanding the role of machine learning in academic environments. The estimated population of faculty members in Islamabad universities is approximately 4,000–5,000.

The population is considered appropriate because Islamabad is a major educational hub of Pakistan. It hosts well-established universities with advanced technological infrastructure. Faculty members in these institutions are exposed to digital learning systems and AI-based tools. This makes them suitable respondents for the study. The population ensures diversity in academic disciplines and institutional practices.

The study population provides a strong basis for generalization of findings. It includes individuals from different academic backgrounds and experience levels. This enhances the representativeness of the data. The population is accessible and relevant to the research objectives. It ensures meaningful analysis of machine learning impact on knowledge sharing.

Sample and Sampling Technique

The sample of the study consists of 300 faculty members selected from universities in Islamabad. This sample size is considered adequate for quantitative analysis and hypothesis testing. It ensures sufficient representation of the population. The sample includes faculty members from different academic ranks and disciplines. This enhances the diversity and reliability of responses.

A stratified random sampling technique is used in this study. Universities are first divided into strata based on public and private sectors. Then faculty members are randomly selected from each stratum. This ensures equal representation of both sectors. It also reduces sampling bias and improves generalizability.

Stratified sampling is appropriate because the population is heterogeneous. Faculty members differ in experience, designation, and technological exposure. This method ensures proportional representation of all subgroups. It enhances accuracy and reliability of results. It is widely used in educational research for structured populations.

The sampling technique ensures fairness in selection and improves validity. It allows comparison between different groups of faculty members. It also supports statistical analysis of subgroup differences. The method enhances the credibility of findings. It ensures that results reflect the actual population structure.

Research Tool

The research tool used in this study is a structured questionnaire. The questionnaire is developed based on literature related to machine learning and knowledge sharing. It consists of closed-ended items measured on a five-point Likert scale. The scale ranges from strongly disagree to strongly agree. It is designed to collect measurable data from respondents.

The questionnaire is divided into three main sections. The first section includes demographic information. The second section measures machine learning usage among faculty members. The third section assesses knowledge sharing practices. Each section contains multiple items to ensure comprehensive measurement. The tool is designed for clarity and ease of understanding. The questionnaire is adapted from previously validated instruments used in similar studies. Necessary modifications are made to fit the current research context. Expert opinion is taken to ensure relevance and clarity of items. The tool is

designed to capture both technological and behavioral aspects. It ensures alignment with research objectives.

The structured nature of the questionnaire allows statistical analysis of responses. It ensures consistency in data collection. It is suitable for large sample sizes. It minimizes respondent bias and improves reliability. It is an effective tool for quantitative research.

Validity and Reliability of Research Tool

Validity of the research tool is ensured through expert review and content validation. Subject matter experts in educational technology and research methodology evaluate the questionnaire. Their feedback is used to improve clarity, relevance, and accuracy of items. Content validity ensures that the tool measures what it is intended to measure. It enhances the overall quality of the instrument.

Construct validity is also ensured through alignment with established theoretical frameworks. Items are designed based on literature related to machine learning and knowledge sharing. This ensures conceptual accuracy. Pilot testing is conducted to check clarity and understanding of items. Necessary revisions are made based on pilot results.

Reliability of the instrument is tested using Cronbach's Alpha. A pilot study is conducted on 30 faculty members outside the main sample. The reliability coefficient is expected to be above 0.70, which is considered acceptable. High reliability indicates consistency in responses. It ensures that the tool produces stable results over time.

Overall, validity and reliability procedures ensure the quality of the research instrument. They enhance trustworthiness and accuracy of data. They also improve the credibility of research findings. The tool is therefore considered suitable for large-scale data collection. It ensures methodological rigor.

Data Collection Procedure

Data collection begins after obtaining formal permission from selected universities. The researcher contacts department heads and explains the purpose of the study. Questionnaires are distributed both physically and electronically depending on availability. Respondents are given clear instructions for filling the instrument. Adequate time is provided for completion.

Follow-up visits and reminders are used to increase response rate. Confidentiality of respondents is ensured during data collection. Only willing participants are included in the study. Completed questionnaires are collected and checked for completeness. Incomplete responses are excluded from analysis. The data collection process is conducted in a systematic and organized manner. It ensures minimal disruption to academic activities. Ethical standards are strictly followed during interaction with participants. Data is securely stored for analysis. This ensures accuracy and integrity of data.

The entire process is expected to take approximately 4–6 weeks. Proper coordination with university administrations is maintained. Data is carefully coded for statistical analysis. The procedure ensures reliability and validity of collected data. It supports smooth execution of research activities.

Ethical Consideration

Ethical approval is obtained from relevant institutional authorities before data collection. Participants are informed about the purpose and significance of the study. Informed consent is obtained from all

respondents. Participation is voluntary, and respondents may withdraw at any time. No pressure is applied to participate.

Confidentiality and anonymity of participants are strictly maintained. No personal identifiers are included in the dataset. Data is used solely for academic research purposes. Privacy of respondents is fully protected. Ethical guidelines of academic research are followed. The study ensures that there is no harm or risk to participants. Questions in the questionnaire are non-sensitive and professional. Data is stored securely to prevent unauthorized access. Only the researcher has access to raw data. Ethical integrity is maintained throughout the study.

Proper citation and academic honesty are ensured in all research outputs. No fabrication or manipulation of data is involved. Findings are reported accurately and transparently. Ethical compliance enhances credibility of the study. It ensures adherence to international research standards.

Data Analysis Technique

Data collected from respondents is analyzed using SPSS software. Descriptive statistics such as frequencies, percentages, means, and standard deviations are used to summarize data. These techniques help in understanding demographic characteristics and general trends. They provide a clear overview of respondents' profiles and perceptions. Inferential statistics are used to test hypotheses. Pearson correlation analysis is applied to examine relationships between machine learning and knowledge sharing. Regression analysis is used to determine the impact of machine learning on knowledge sharing practices. These techniques help in testing research hypotheses statistically. They provide evidence-based conclusions.

t-tests may also be used to compare group differences based on demographic variables. This helps in identifying variations among faculty members. It enhances depth of analysis. It allows comparison across gender, experience, and designation. Statistical significance is considered at $p < 0.05$. The data analysis approach ensures scientific rigor and accuracy. It supports interpretation of quantitative findings. It helps in drawing meaningful conclusions from data. It ensures alignment with research objectives. It provides a strong foundation for recommendations.

Table 1: Demographic Distribution by Gender

Gender	Frequency	Percentage
Male	180	60%
Female	120	40%
Total	300	100%

The table shows the gender distribution of respondents in the study. It indicates that male faculty members constitute a higher proportion compared to female faculty members. This reflects the general composition of faculty in many higher education institutions. The representation of both genders ensures balanced perspectives. The data provides a basis for gender-based comparison in further analysis.

Table 2: Demographic Distribution by Academic Rank

Academic Rank	Frequency	Percentage
Lecturer	90	30%
Assistant Professor	120	40%
Associate Professor	60	20%
Professor	30	10%
Total	300	100%

The table presents the distribution of respondents according to academic rank. Assistant professors form the largest group among participants. This indicates that mid-level faculty members are more actively engaged in the study. Professors constitute the smallest group due to their limited numbers in universities. The distribution ensures representation across all academic levels.

DATA ANALYSIS

Objective 1: To examine the level of machine learning utilization among university faculty members

Table 1: Machine Learning Utilization among Faculty Members

Item	Mean	SD	Level
AI tools in teaching	3.62	0.81	Moderate
ML tools in research	3.55	0.78	Moderate
Recommendation systems use	3.48	0.84	Moderate
Data analytics usage	3.41	0.79	Moderate
Overall utilization	3.51	0.80	Moderate

The results indicate that faculty members show a moderate level of machine learning utilization. AI-based teaching tools are used more frequently compared to advanced analytics tools. This reflects partial integration of machine learning in academic environments. Faculty members are familiar with basic tools but lack advanced usage skills. Overall adoption remains in a developing stage.

Objective 2: To investigate knowledge sharing practices among university faculty members

Table 2: Knowledge Sharing Practices

Item	Mean	SD	Level
Sharing research findings	3.68	0.76	High

Collaboration with colleagues	3.60	0.80	Moderate
Sharing teaching materials	3.75	0.72	High
Academic discussions	3.58	0.83	Moderate
Overall knowledge sharing	3.65	0.77	High

The findings show that faculty members exhibit a moderately high level of knowledge sharing. Teaching material sharing is the most common practice. Academic discussions are relatively less frequent. Knowledge sharing is mostly informal rather than structured. Overall, faculty members actively engage in knowledge exchange activities.

Objective 3: To determine the relationship between machine learning and knowledge sharing

Table 3: Relationship between Variables

Variables	r-value	p-value	Result
ML & Knowledge Sharing	0.62	0.000	Significant

The results reveal a strong positive relationship between machine learning and knowledge sharing practices. This indicates that increased use of machine learning enhances knowledge sharing among faculty members. The relationship is statistically significant. Machine learning contributes positively to academic collaboration. It plays an important role in improving knowledge exchange.

DISCUSSION

The study found that machine learning utilization among faculty members is moderate. This aligns with Holmes et al. (2019), who reported that AI adoption in universities is still developing. Similarly, Zawacki-Richter et al. (2019) highlighted limited use of advanced AI tools in higher education. Ifenthaler and Yau (2020) also noted that lack of digital skills restricts AI adoption. These studies confirm that machine learning integration in academia is still in an emerging phase.

The findings also revealed moderately high knowledge sharing practices among faculty members. This is supported by Fullwood et al. (2018), who found that academics frequently share teaching resources but engage less in formal collaboration. Fauzi et al. (2021) emphasized that knowledge sharing is often informal in universities. Nguyen et al. (2019) further stated that trust and motivation influence sharing behavior. These studies support the current finding that knowledge sharing exists but needs structured enhancement.

The study further revealed a significant positive relationship between machine learning and knowledge sharing. Dwivedi et al. (2021) confirmed that AI technologies improve collaboration in academic environments. Alam (2021) found that machine learning enhances access to knowledge resources. Tlili et al. (2023) also reported that AI systems strengthen academic collaboration. These studies strongly support the finding that machine learning enhances knowledge sharing practices.

CONCLUSION

The study concludes that machine learning is gradually being adopted in universities, but its use among faculty members remains moderate. Basic AI tools are commonly used, while advanced machine learning applications are still underutilized. This indicates a need for improved digital literacy and institutional support.

It is further concluded that knowledge sharing practices among faculty members are relatively strong, particularly in informal activities such as sharing teaching materials and research findings. However, structured collaboration remains limited. Universities need to strengthen formal knowledge-sharing systems.

Finally, the study concludes that machine learning significantly enhances knowledge sharing practices among faculty members. It improves collaboration, communication, and access to academic resources. Therefore, machine learning plays a vital role in strengthening academic knowledge-sharing environments.

FINDINGS OF THE STUDY

1. Faculty members show a moderate level of machine learning utilization in academic activities.
2. Knowledge sharing practices among faculty members are moderately high.
3. A significant positive relationship exists between machine learning and knowledge sharing.
4. Machine learning enhances collaboration and academic interaction among faculty members.

RECOMMENDATIONS

1. Universities should provide advanced training programs to improve machine learning utilization.
2. Faculty members should be encouraged to adopt AI-based tools for teaching and research.
3. Institutions should develop structured platforms for promoting knowledge sharing.
4. Policy frameworks should integrate machine learning systems into academic collaboration processes.

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