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Analysis Of Women Empowerment In Ict Institutes Of Pakistan

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Abstract

Information and Communication Technology (ICT) plays an immense role in reappraise and transform human life around the globe. In this digital era, not only men but women are also contributing potentially to the ICT field to end poverty, improve education, and a create decent job market. Hence, it is necessary to encourage women to pursue their careers in the ICT field for the development of the country. Consequently, it is mandatory to evaluate women's contributions to the ICT field. Thus, in this research, women's empowerment in the ICT field was analyzed based on women's designation, and qualification, a field of interest in all ICT institutes of Pakistan. For this purpose, data of women faculty of 124 ICT institutes of Pakistan was collected from online available resources of ICT institutes using web scraping technique. In total, the dataset was consisting of 1515 entries that were mined from different ICT institutes in Pakistan. The attributes included in this dataset were female names, designation, qualifications, area of Interest, department, university, and province. The paper is presenting the first step for performing the gender-based bibliometric analysis. This study is quite beneficial for evaluating Pakistani women's performance in ICT by analyzing their qualifications, designation, and department. It is concluded that most women faculty work in the Computer Science i.e., sub-field of ICT, and women are more interested in Data Science, Image processing, Artificial Intelligence, and Machine Learning research areas.

Keywords: Information Technology (IT); Pakistan University; Female Faculty; Teachers.

Introduction

Women's empowerment is a crucial factor in speeding up the process of a country's growth (Batool et al., 2020). In developing countries, the ICT field is one of the compelling Fields because

it supports and encourages not only men but also women to explore new horizons of technology. As ultimately this contributes to the country's progress(John et al., 2018). ICT is a vast field and comprises sub-fields i.e. Computer Engineering, Software Engineering, Computer Science, Electrical Engineering, Telecommunication, Electronics Engineering, and Biomedical Engineering (Nyanga et al., 2020). It is necessary to analyze the women's empowerment in the ICT field and it will help higher authorities to take necessary actions to empower women to take part in the ICT field.

For this research study, the dataset consists of 1515 women data, who are working in 124 different ICT institutes in Pakistan. This data is based on the Fields which are: Name, Qualification, Designation, Department, Institute Name, Area of Interest, and Province. The data is collected using web scraping from the institute's websites. In total, the dataset consists of 5 excel sheets. The dataset is organized in four excel sheets related to the provinces which are Sindh, Punjab, Khyber Pakhtunkhwa, and Baluchistan while the fifth excel sheet contains the data of the capital Islamabad. This dataset is a baseline for the evaluations of Pakistani women's performance in the ICT field.

To the best of my knowledge, this is the first attempt to present the role of Pakistani women in ICT institutions in Pakistan. The contributions of this study are:

1. To analyze the number of women working in ICT institutes of Pakistan.
2. To analyze the number of women in Sub-Fields of ICT.
3. To analyze designations of women in ICT institutes of Pakistan.
4. To analyze the qualification of Women Faculty in ICT institutes of Pakistan.
5. To analyze the Area of interest of women faculty in ICT institutes of Pakistan.

Literature Review

This section highlights some of the recent studies related to Pakistan. And it is evident from the literature that limited work focusing on Pakistani women has been done. In one of the recent studies, the authors identified key dimensions(Khalil et al., 2016), the authors highlight the female contribution to ICT in KPK province.

(Khalil et al., 2016) present the factors influencing women to pursue their careers in computer science and Information Technology from the perspective of education and employment in the Khyber Pakhtunkhwa (KPK) region of Pakistan. As per the literature study, it came out as a result that women's perception of the technological field is also a key factor. And factors were extracted to develop questionnaires for a survey and in the results, it was analyzed that 15%-20% of women of KPK pursue a career in Computer Science and Information Technology.

(Younus & Sajjad, 2019) presents the investigation has been done on the skills of Library and Information Science (LIS) graduates in Punjab, Pakistan, and identified the market needs. And it was analysed that the graduates have skills that are not fulfilling the market needs. Also identified the list of skills that graduates need to acquire for fulfilling the market needs.

Factors that are affecting the motivation level of Staff serving in the Libraries of Lahore University are discussed (Hussain & Soroya, 2019). As per survey results, it was analyzed that highly paid and the permanent staff was more motivated than less paid and contract based. Also, this was suggested to the university management to consider these factors for motivating libraries' staff.

(Muhammad, 2018) presented an interesting review paper. This review paper discusses how ICTs have changed everyone's life and become an integral part of the Socio-economic growth of Pakistan. The focus of this review was to find out the different factors and roles played by ICT in socio-economic growth in Pakistan. Also discussed two case studies of Mobile Money, and Telemedicine as a witness.

(Ahmed & Rehman, 2016) Present levels of ICT facilities were explored, also investigations have been done about training that was required for introducing these facilities to library professionals. They also mentioned difficulties faced by professionals while acquiring these skills.

The positions of the technical staff of central libraries of top universities in Pakistan were analyzed by Ullah and Idrees. It was analyzed that 50% of the libraries don't have any positions for technical staff and technical tasks performed by library professionals. Vendors also helped them with technical tasks. And it was also analyzed that technical staff working in the libraries have lower ranks as compared to qualified library professionals and this is the main reason most positions remain unfilled (Ullah & Idrees, 2016).

In (Warriach & Tahira, 2014) study, an investigation has been done on the research trends in Pakistani universities and also highlighted the use of Information and communication technologies in those researches. Furthermore, the HEC (Higher Education Commission) actions were inspected for the research output.

The obstacles faced by the Pakistani higher education system (HES) in incorporating information and communication technology (ICT) were presented in (Shaikh & Khoja, 2011). This paper also presented the increasing demand for ICT, along with the relations between the higher education system (HES) performance and Information and Communication Technology (ICT).

Methodology

The methodology of this research study is based on four steps and these are 1) Mapping web pages of ICT institutes of Pakistan, 2) Developing web scraping source code using python and Beautiful soap API, 3) Cleaning and organizing data into excel sheets and 4) visualization of the data.
Before the first step, a list of ICT institutes in different provinces of Pakistan was manually searched online. And variables (Name, Qualification, Designation, Department, Institute Name, Area of Interest) for analysis were also selected. Then, the Mapping of web pages was done by source code of web pages of ICT institutes, and data of 1515 women working in 124 ICT institutes of Pakistan was scraped by developing the code using python and beautiful soap API. Furthermore, data was cleaned and organized into excel sheets. In the last step, data was visualized using charts and graphs as shown in Figure 1.

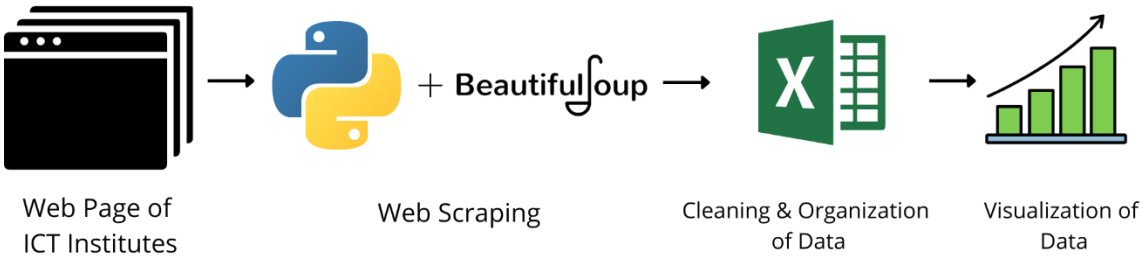

Figure 1 Methodology

Data Analysis & Discussion

- **Number of Women in Different ICT Institutes of Pakistan**

Figure 2 illustrates the total number of women faculty in 43 ICT institutes in Punjab. The highest number of women are working in COMSATS university, Islamabad. Some universities have got campuses in different cities of Punjab like COMSAT University and the University of engineering and technology, that's why their names are repeated in Figure 2. Similarly, Figure 4, Figure 6, Figure 8, and Figure 10 show the number of women faculty in 25 ICT institutes in Sindh, 16 ICT institutes in Capital Islamabad, 15 ICT institutes in Khyber Pakhtunkhwa, and one ICT institute in Baluchistan and two ICT institutes in Azad Jammu Kashmir respectively. From Figure 4 it is evident that in Sindh, the highest number of women are working in Sir Syed University of engineering and technology. Figure 8 shows that the highest number of women in KPK belongs to COMSAT university and figure 10 shows the highest number of women working in Mirpur university of science and technology of Azad Jammu Kashmir.

Figure 3, 5, 7, 9, 11 shows the normal distribution plot of women working in ICT institutes in 4 provinces and the capital Islamabad of Pakistan. It is evident that number of women working in the Province of Punjab are normally distributed with N(14,3), in Sindh with N(20,5), in Islamabad with N(22,4), in Khyber Pakhtunkhwa with N(5,2), Baluchistan and Azad Jammu Kashmir with N(8,3). The normal distribution plots reveal the fact that the highest mean number of women are working in Islamabad and second highest mean number of women are working in Sindh.

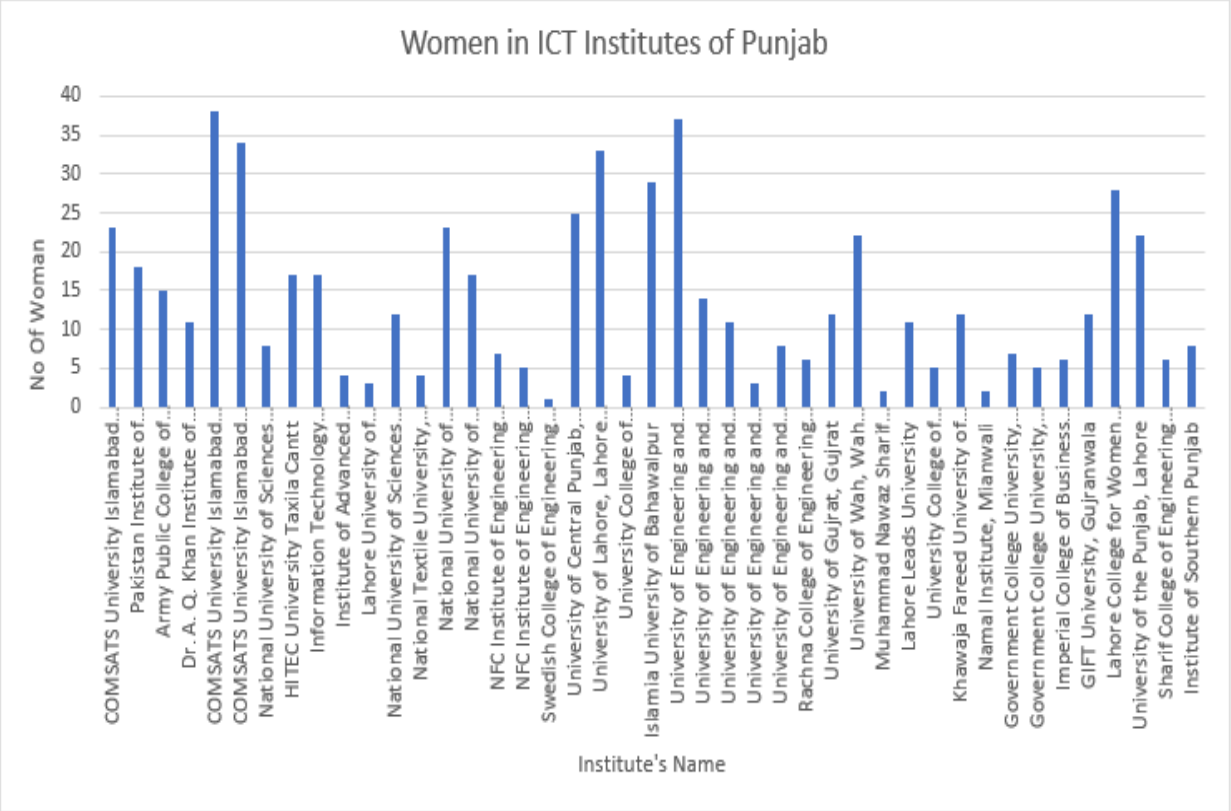

Figure 2 Number of women working in different ICT institutes in Punjab

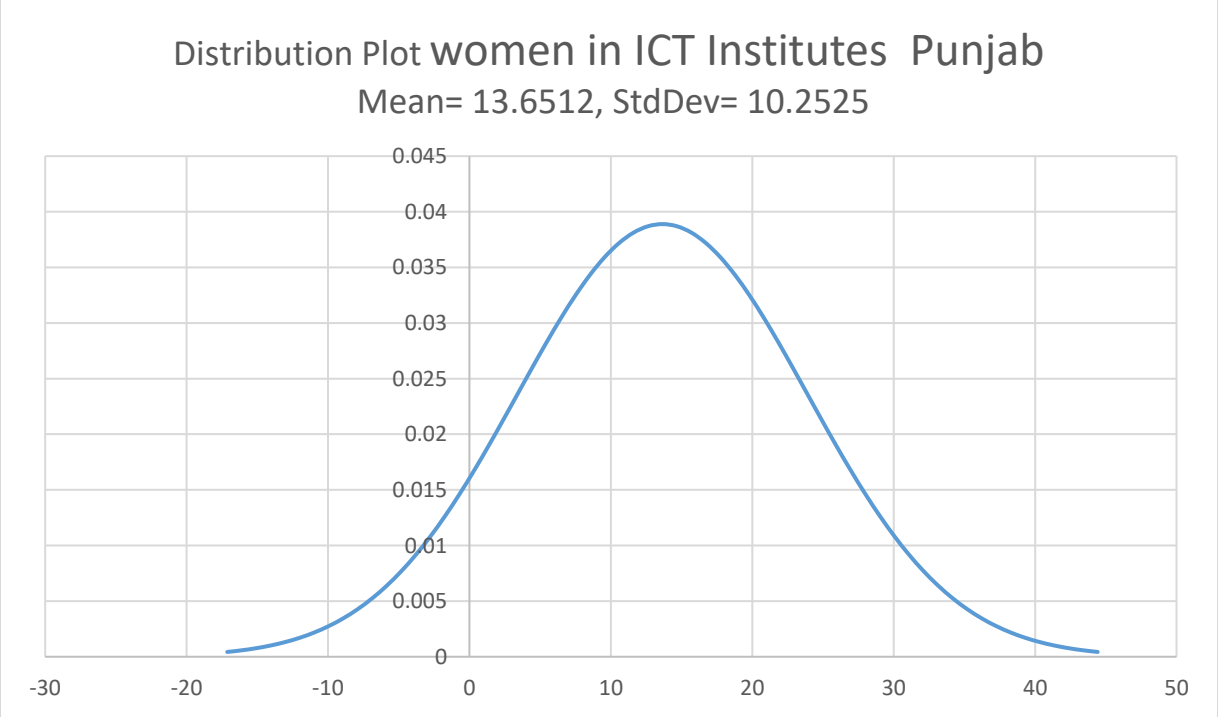

Figure 3 Normal distribution Plot of women working in different ICT institutes in Punjab

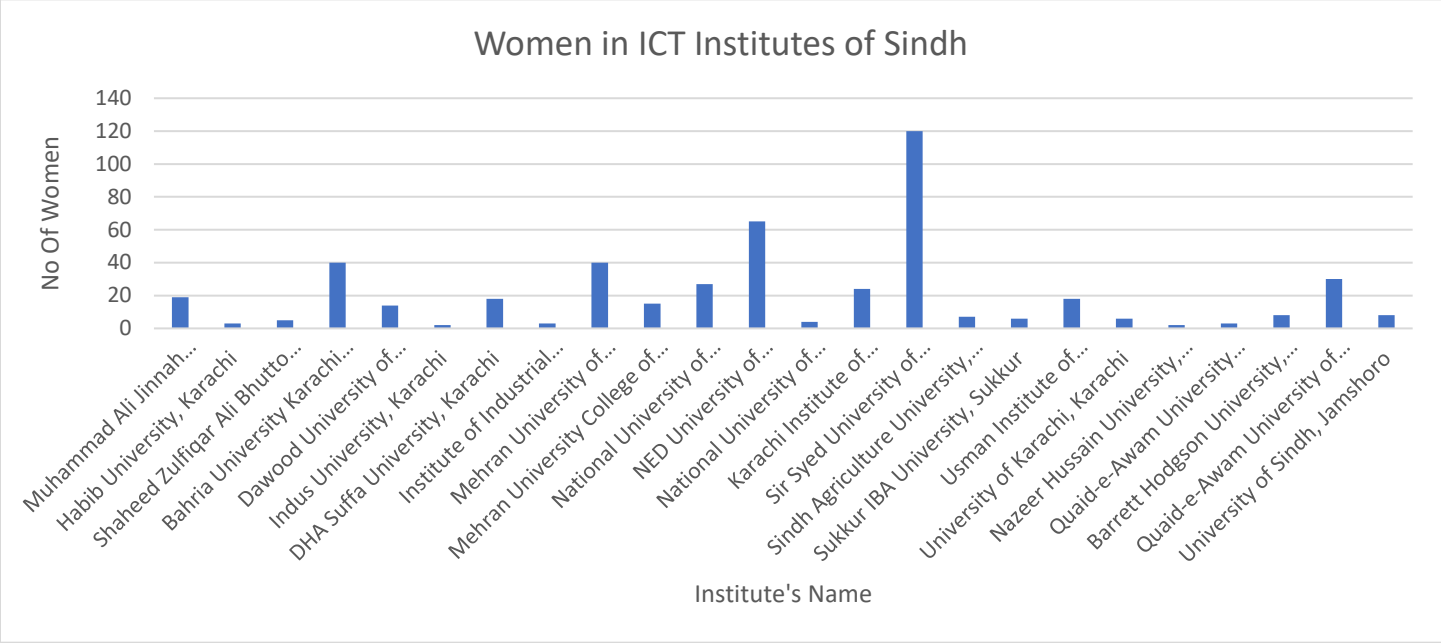

Figure 4 Number of women working in different ICT institutes in Sindh

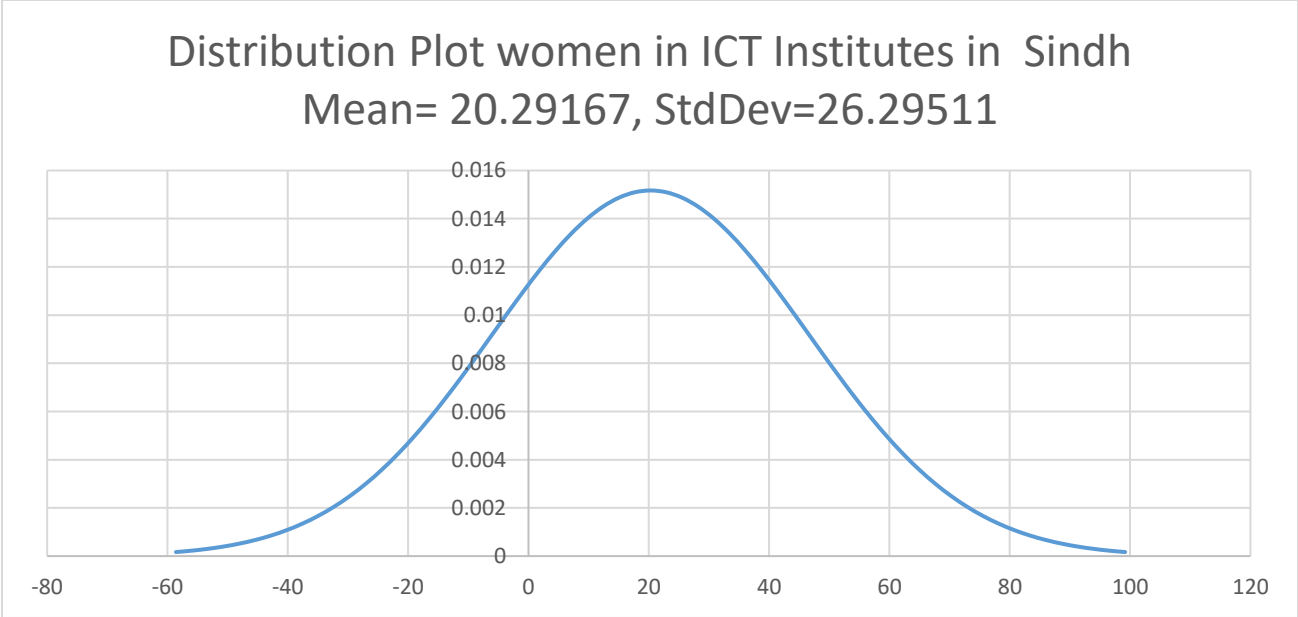

Figure 5 Normal Distribution Plot of women working in different ICT institutes in Sindh

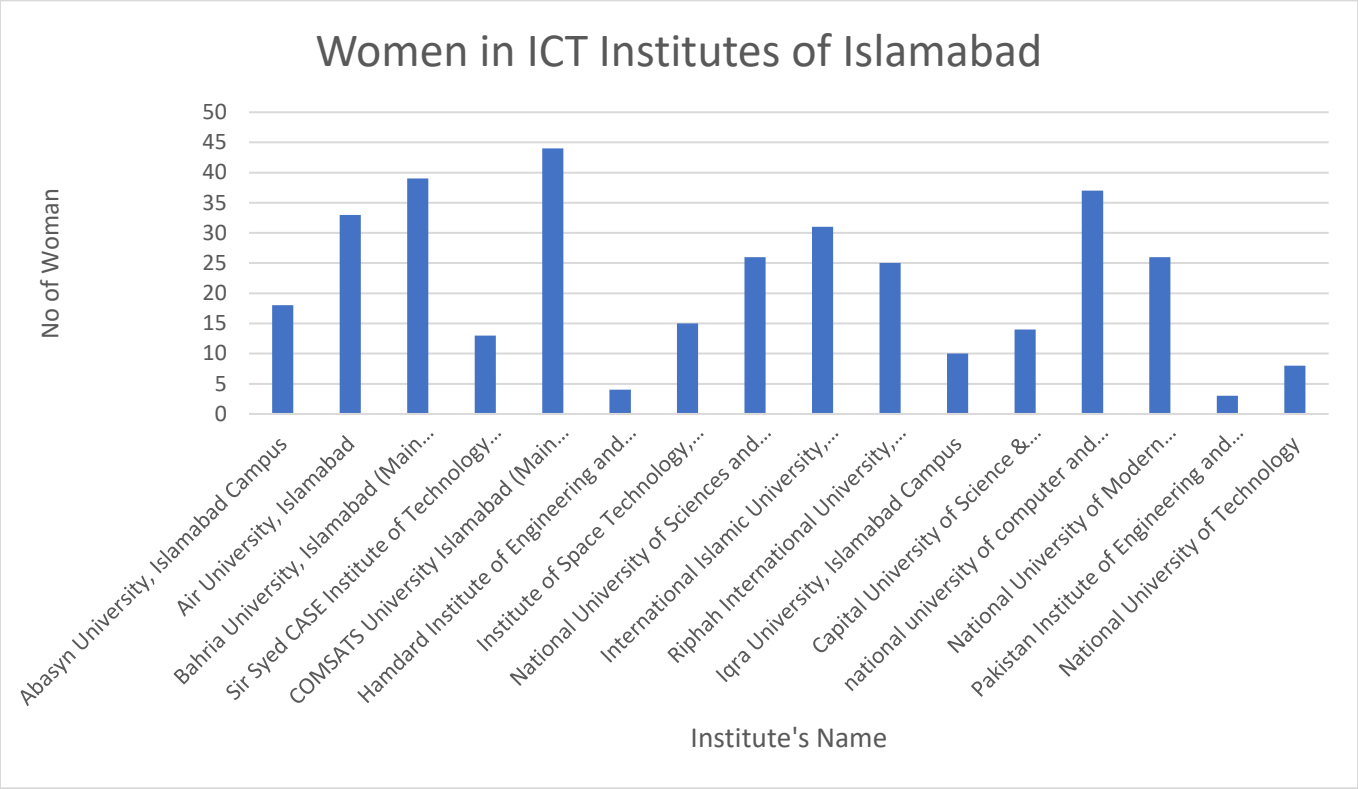

Figure 6 Number of women working in different ICT institutes in Islamabad

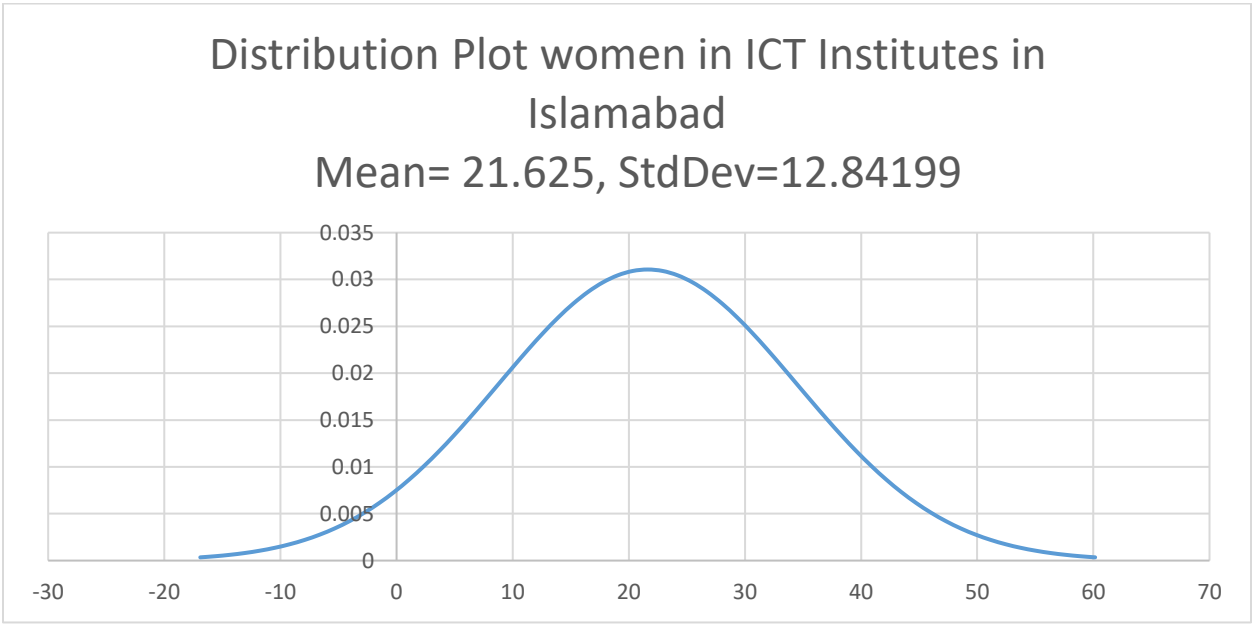

Figure 7 Normal distribution Plot of women working in different ICT institutes in Islamabad

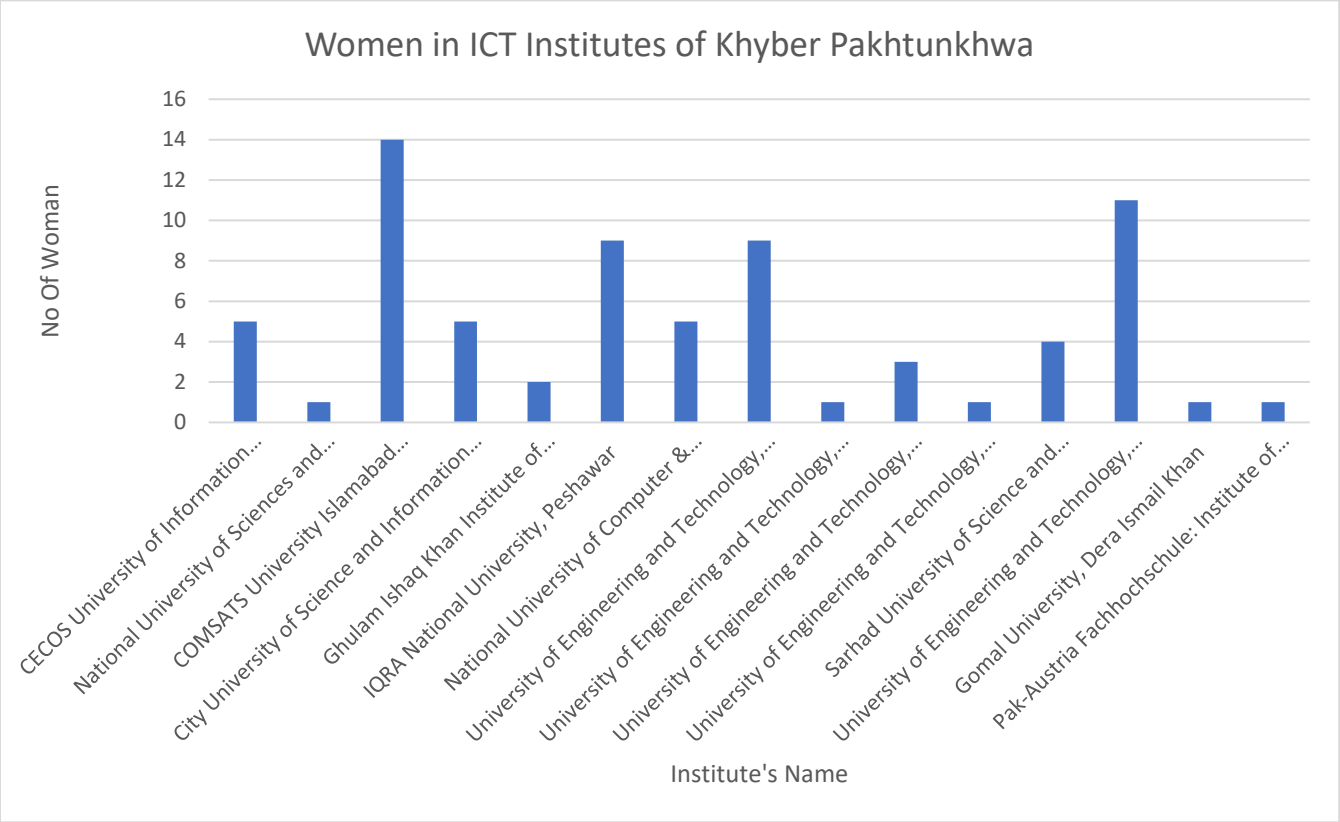

Figure 8 Number of women working in different ICT institutes in Khyber Pakhtunkhwa

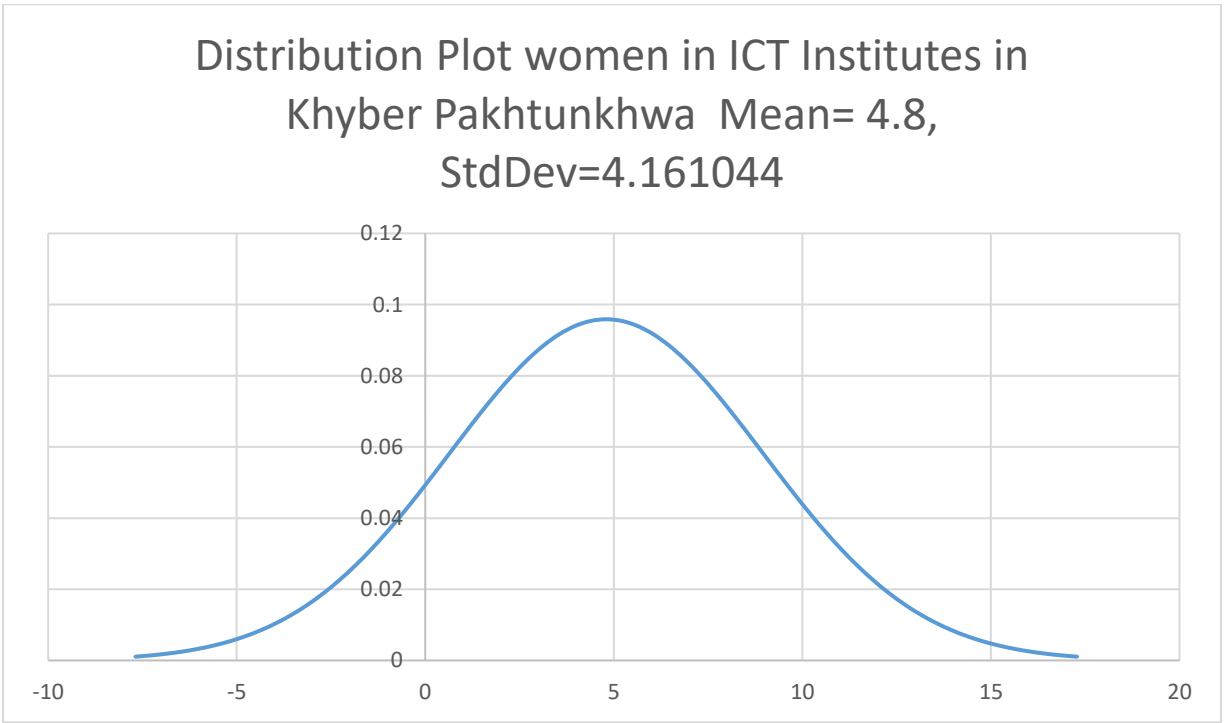

Figure 9 Normal distribution Plot of women working in different ICT institutes in Khyber Pakhtunkhwa

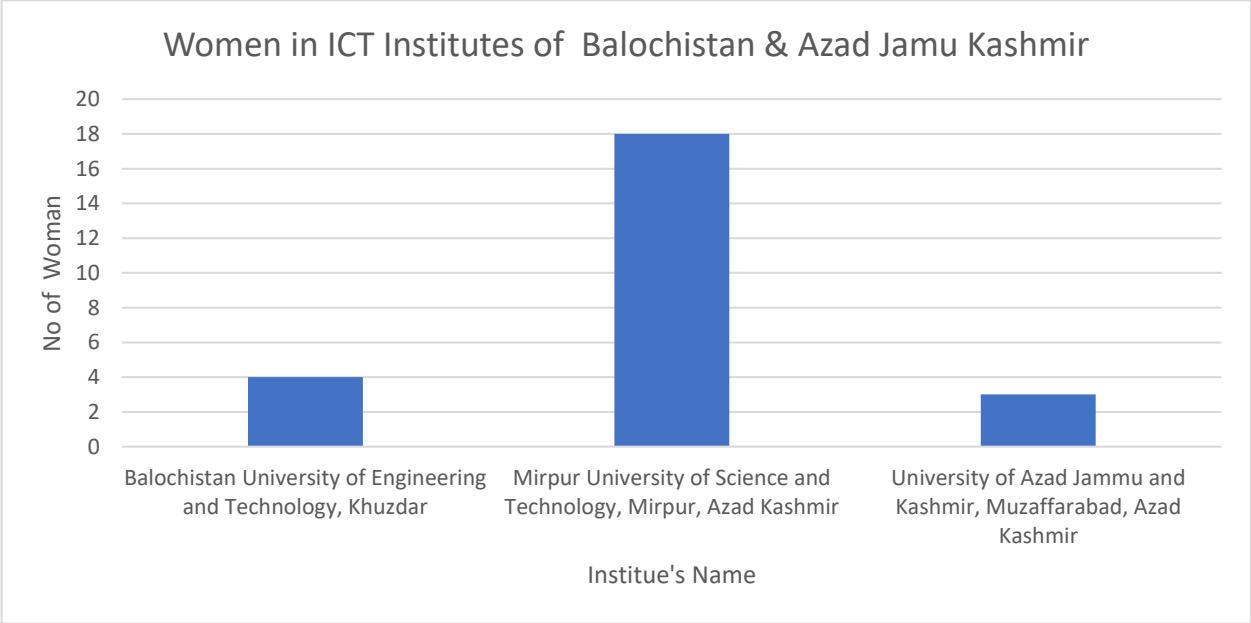

Figure 10 Number of women working in different ICT institutes in Baluchistan & Azad Jammu Kashmir

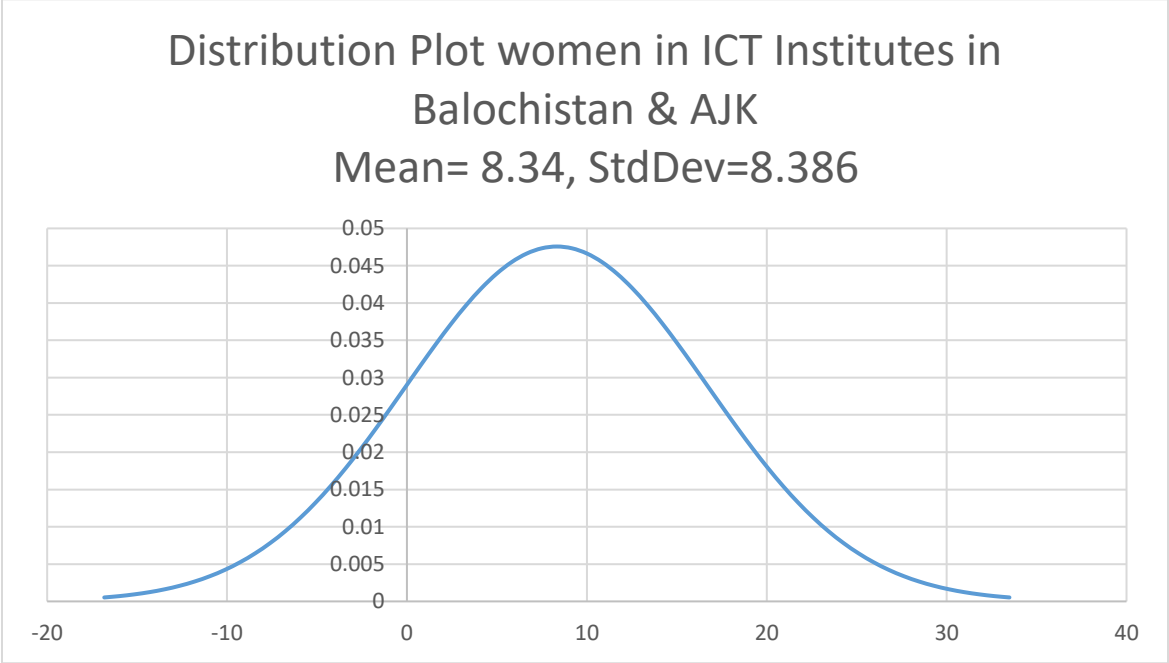

Figure 11 Normal distribution Plot of women in different ICT institutes in Baluchistan & Azad Jammu Kashmir

Figure 12 shows the overall summary of each province and Capital Islamabad. The total number of women faculty of ICT institutes in Punjab is 587, while in Sindh is 487, in Capital Islamabad is 346, in Khyber Pakhtunkhwa is 72 and in Balochistan and Azad Jammu, Kashmir is 25.

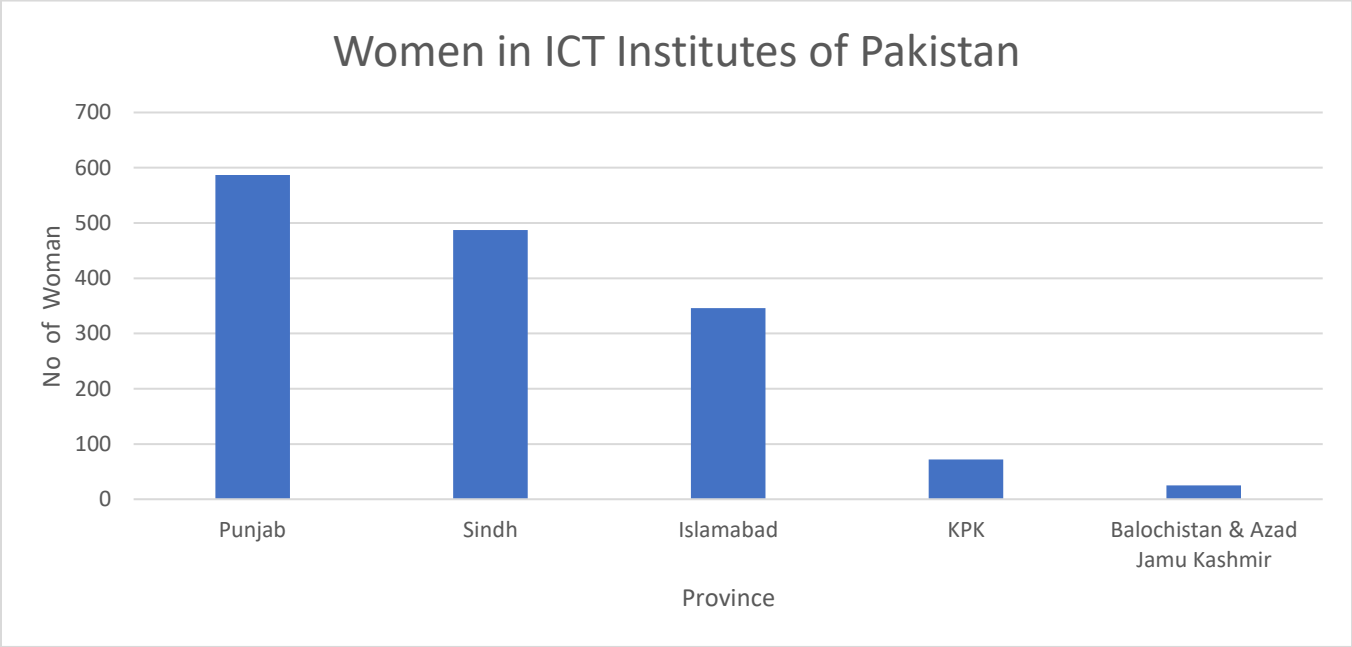

Figure 12 Number of women working in different ICT institutes in Pakistan

- **Number of Women in Sub-Fields of ICT**

Figure 13 describes the total number of women in sub-fields of ICT. The graph shows that 335 women are contributing to Electrical Engineering Faculty, 540 women to Computer Science Faculty, 158 women to Software Engineering Faculty, 164 to Computer Engineering Faculty, 98 women to Computing Faculty, 145 women to Information Technology Faculty, 48 to Biomedical Engineering, 51 to Telecommunication Engineering, 75 to Electronic Engineering, 8 to Avionics Engineering, 6 to Cyber Security, 5 to Data Science and Artificial Intelligence. Hence, it can be observed that a large number of women are interested in the Computer Science field.

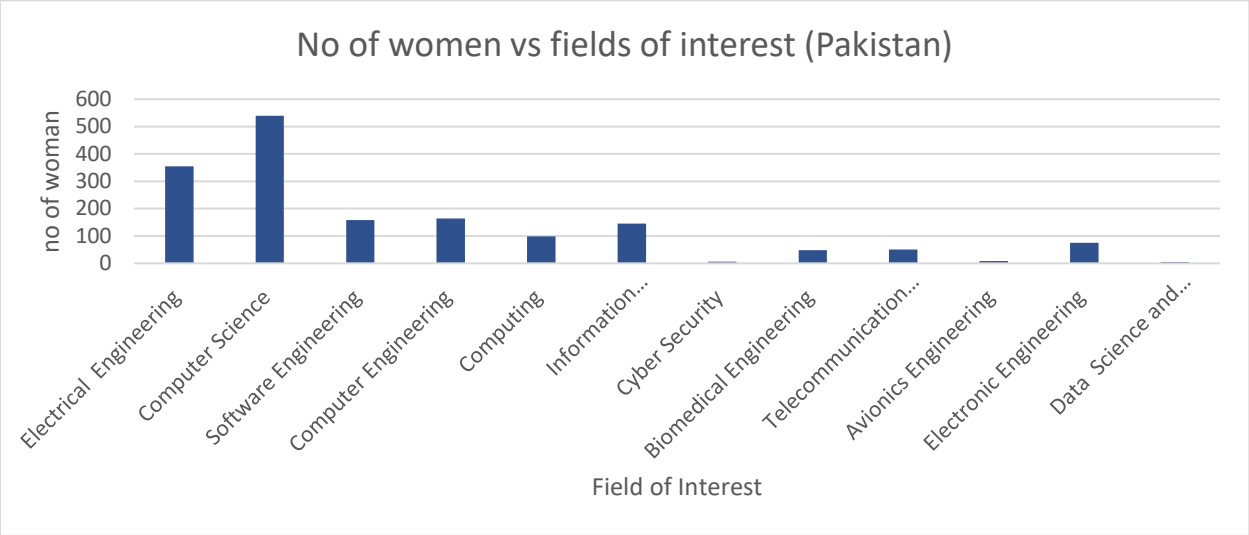

Figure 13 Number of women in sub-fields of ICT in Pakistan

- **Women's Designations in ICT Institutes of Pakistan**

Figure 14 illustrates the women's designations in ICT institutes of Pakistan's Provinces and Islamabad. In total, there are 42 Associate Professors, 392 Assistant Professors, 797 Lecturers, 157 Lab Engineers, 42 Instructors, 9 Research Associates, 8 Research assistants, 26 Teaching Fellows, 38 designations are unknown.

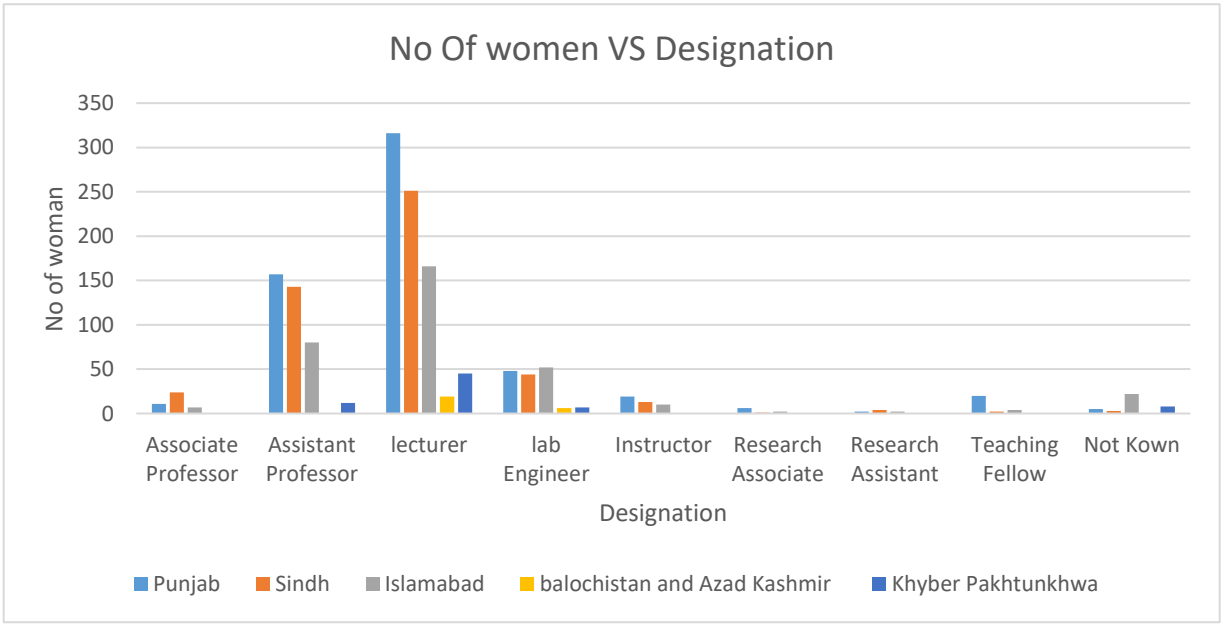

Figure 14 Women's designations in Provinces and Islamabad

- **Qualification Of Women Faculty In ICT Institutes Of Pakistan**

Figure 15 illustrates the qualification of women faculty in ICT institutes of Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Azad Jammu Kashmir, and Capital Islamabad. 244 women are holding the degree of PhD, 89 women are perusing a PhD Degree (PhD Scholar), 37 hold the M.Phil. degree, 562 women hold MS degree, 18 Continue the MS Degree (MS Scholar), 132 hold ME degree, 27 hold BE degree, 69 hold BS degree, 98 women hold M.Sc. degree, 21 hold B.Sc. Degree and 216 women's Qualification is not known.

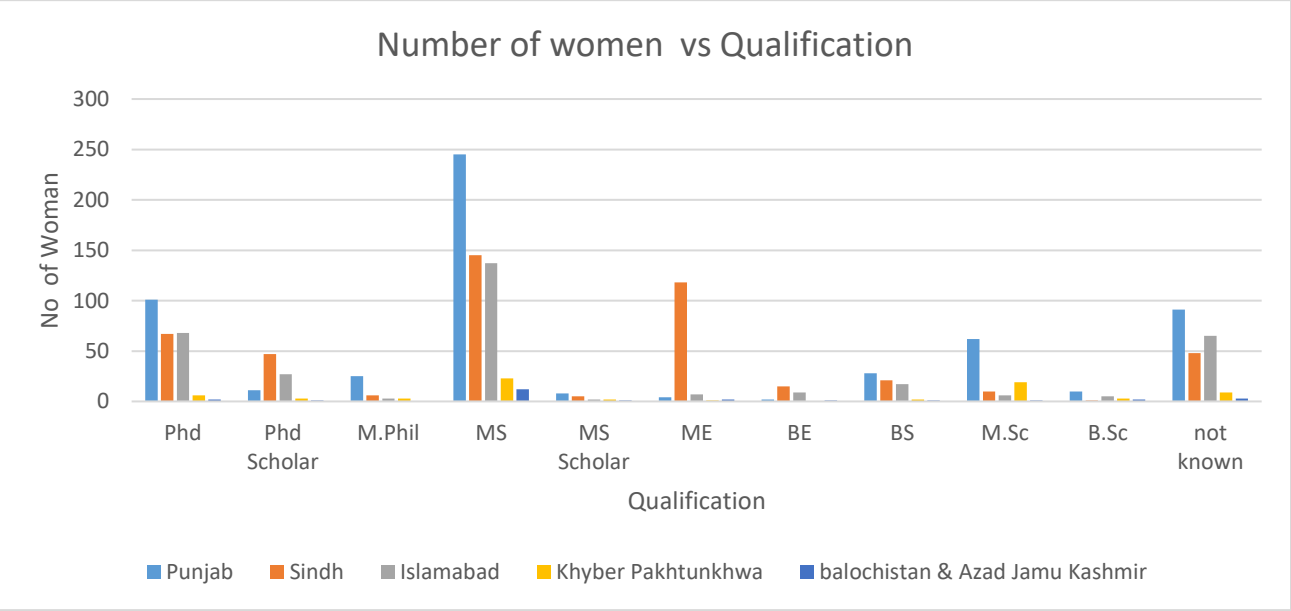

Figure 15 Qualification of Women Faculty of ICT institutes of Pakistan

- **Area of Interest of Women Faculty In ICT Institutes Of Pakistan**

Figure 16 describes the Area of Interest of women faculty in ICT institutes of Pakistan. Figure 16

shows that Machine learning, Artificial Intelligence, Data Mining, and Image Processing are the most popular research areas in which women are working in Pakistan.

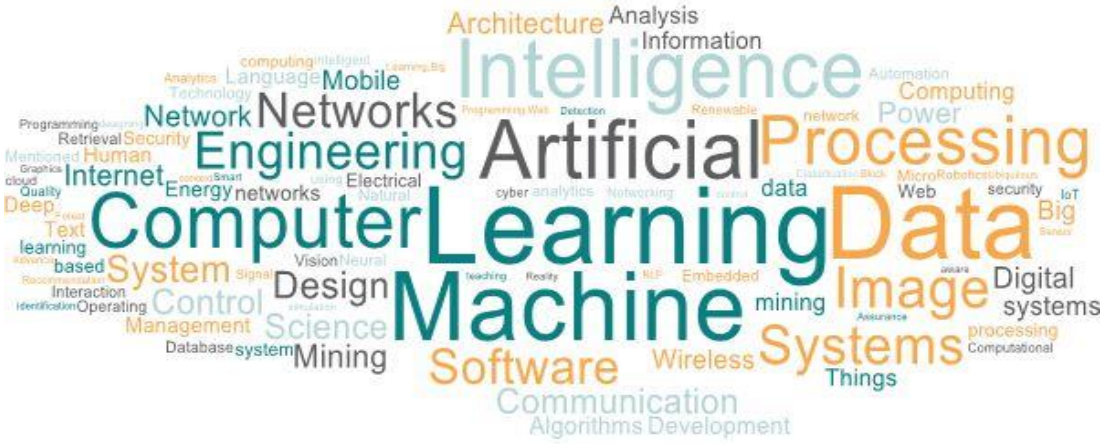

Figure 16 Word Cloud of Area of Interest of women Faculty in ICT institutes of Pakistan

Conclusion

The study contributes to the literature by highlighting women's empowerment in ICT institutes of Pakistan. The role of women in all the provinces including Aza Jamu Kashmir is analyzed. This study is beneficial for HEC to take extensive efforts to improve ICT education in Pakistan and empower women to be part of the ICT fields. This research shows that in total 1515 women are working in ICT institutes in Pakistan. Of those total women, 587 women are working in ICT institutes of Punjab, 487 in Sindh, 346 in Islamabad, 76 in KPK, and 25 in Azad Jammu Kashmir and Balochistan. The most trending field in ICT sub-fields is computer science in which most women are working.

Furthermore, it is also observed that from 1515 women faculty, 797 women are lectures, 392 Assistant Professors, 42 Associate Professors, 157 lab Engineers, 42 Instructors, 9 research Associate, 8 Research assistants, 26 Teaching Fellow and 38 are of unknown designation. This study also shows that 562 women hold MS degree, 244 holds PhD degree, 132 holds ME degree, 89 are PhD Scholars, 37 holds M.Phil degree, 18 are MS scholars, 27 hold BE degree, 69 holds a BS degree, 98 holds M.Sc degree, 21 holds B.Sc Degree and 216 are of unknown qualification. Though women's contribution is in almost every sub-field of ICT the most trending research fields in which women faculty of ICT institutes of Pakistan are interested are Machine learning, Artificial Intelligence, Data Mining, and Image Processing.

In future work, the data used for this analysis can be utilized to perform the bibliometric analysis, to identify top female authors considering the number of citations and h-index.

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