Automated Analysis of Job Market Demands using Large Language Model

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***Abstract*—This paper presents a comprehensive analysis of labor market demands for Myanmar workers in Japan, and Thailand, focusing on opportunities for individuals without higher education degrees. Leveraging ChatGPT's text classification and summarization capabilities, we extracted vital insights from extensive job advertisements and social media groups. The dataset comprises 152 job advertisements from Thailand and 30 from Japan, collected in 2023. Our research provides a valuable snapshot of skill demands and job opportunities, offering insights for informed decision-making by both job seekers and international non-governmental organizations. The innovative approach of using ChatGPT highlights its efficacy in understanding labor market dynamics. These findings serve as a foundation for tailored interventions to bridge employment challenges faced by marginalized Myanmar youths.**

***Keywords*—ChatGPT; labour market analysis; skills identification; online job adverts; skills demand**

I. Introduction

Understanding the skill demands of industries is crucial for educational providers, graduates, and job seekers. In today's rapidly changing job market, having the right skills is vital for securing desired positions and achieving career success. Educational institutions play a key role in preparing individuals for the workforce. However, without an accurate understanding of industry skill requirements, their programs may not align with market needs, leaving graduates unprepared for employers' expectations.

For educational providers, insights into industry skill demands enable them to design and customize curricula to meet job market needs. By staying updated on evolving skill requirements, institutions can update courses, introduce new programs, and adapt teaching methods to ensure graduates possess sought-after skills. This alignment enhances graduates' employability, improves job prospects, and boosts the institution's reputation.

Likewise, for graduates and job seekers, understanding industry skill demands is equally important. It allows them to make informed decisions about education and training choices. By knowing which skills are in high demand, job seekers can acquire or enhance those skills to improve their competitiveness. Aligning their skill sets with industry requirements increases job offers, provides more opportunities for career advancement, and contributes to long-term success.

The digitization of the job market has created opportunities to better understand job market needs through the accessibility of online job advertisements. These advertisements serve as valuable sources for understanding the most popular job openings and skill requirements in the market. However, job postings often contain unstructured text and require further processing to identify the required skills. This is where Natural Language Processing (NLP) techniques come into play. NLP has gained significant attention for its ability to identify and extract skills mentioned in job advertisements. Various methodologies and approaches, such as named entity recognition, rule-based systems, machine learning algorithms, and information retrieval models, have been proposed for skill extraction from job advertisements using NLP. Extensive research has been conducted on the extraction of demanded skills from job advertisements, uncovering valuable insights into job market requirements and skill trends.

Recently, large language models have emerged as powerful tools for processing and generating human-like langauge. Its capabilities stimulates the interests of researchers to leverage this tool in the context of identifying high-demand skills in the dynamic job market. The primary objective of this research is to utilize ChatGPT's capabilities in text classification and summarization to pinpoint the currently sought-after skills. It is crucial to emphasize that this research specifically concentrates on the skills needed by skilled workers without higher formal education, with a particular emphasis on Myanmar youths as a case study. The aim is to assess the employment prospects available in Thailand and Japan for Myanmar youths lacking higher education degrees.

Myanmar youths have been grappling with significant challenges, including limited job opportunities and access to education. The employment rate in Myanmar has experienced a decline of 4.8 percentage points between 2020 and 2022, indicating a decrease in job opportunities [WorldBank, 2023] [1]. Many individuals from rural areas have resorted to seeking work overseas, both legally and illegally, as a means of survival [2]. Unfortunately, their dire circumstances often leave them with limited options and force them to accept any available job to sustain themselves. Consequently, a large portion of these individuals find employment as general workers across various factory sectors, without opportunities to enhance their skills or advance their careers. Prior to the Covid-19 pandemic, it was estimated that around three million Myanmar migrant workers were employed in Thailand. These workers typically found employment in sectors such as fishing, seafood processing, factories, and agriculture. Similarly, the number of Myanmar nationals working in Japan has also been increasing, with more than 33,000 workers reported in 2020. These figures are likely to have grown since then, indicating a growing trend of Myanmar citizens seeking employment opportunities in Japan and Thailand [3].

Traditionally, recruitment for these industries was facilitated through recruitment agencies or community networks, with a focus on individuals who had basic proficiency in the Thai language rather than specific vocational skills. Unfortunately, these workers often face difficulties such as lower pay, workplace abuse, long working hours, and a loss of dignity. In recent years, alongside the continued prevalence of agent-based recruitment, there has been an increasing trend among Myanmar workers to explore alternative channels for finding employment opportunities. This includes searching government and company websites, joining relevant Facebook groups, and utilizing job advertisement platforms. These online avenues provide additional options for job seekers to connect with potential employers and access a broader range of opportunities.

This study aims to provide a snapshot of employment opportunities for Myanmar youths seeking overseas jobs through online channels. It focuses on identifying specific labor market opportunities in Japan and Thailand for Myanmar workers. By gaining insights into job demands and the relevant skills required in these countries, the analysis aims to assist Myanmar job seekers, especially those lacking higher education degrees. To conduct this research, data was collected through job recruitment agencies and by directly collecting data from job advertisements, providing insights into current job opportunities and requirements.

This research makes the following significant contributions:

- This research serves as a proof of concept for the effectiveness of using ChatGPT for skill extraction from job advertisements. By demonstrating the tool's capabilities in extracting relevant skills from unstructured data, it showcases its potential for analyzing job market demands.
- This research uniquely focuses on job prospects for Myanmar youths in Thailand and Japan without higher education. While many studies center on professionals with formal degrees, this research highlights skilled laborers without such qualifications.
- This research highlights challenges faced by Myanmar youths in job and education. It aims to contribute to social development by addressing these issues and promoting inclusive opportunities for marginalized individuals without higher education.
- By understanding the job prospects and skills demanded in Thailand and Japan, individual job seekers can equip themselves with the necessary skills and prepare for better employment opportunities. This information also enable policymakers to design targeted interventions to address employment challenges.

In the next section, a detailed review of the literature in the field of skill identification from online job adverts will be provided. This will be followed by the methodology section, which will explain the data collection methods, data preprocessing, and the results of the exploratory data analysis, presented in Section IV. The key findings and recommendations will be provided in Section V. Finally, the paper will be concluded with a summary and suggestions for future research in the final section.

II. Literature Review

Over the past few years, numerous research papers and surveys have been published, delving into various aspects of job market analysis. One promising research direction focuses on developing skill databases such as ESCO (European Skills/-Competences, qualifications and occupations framework) [4], O*NET (Occupational Information Network) [5] to highlight in-demand skills. ESCO is a project that classifies skills, occupations, and related competencies in various European languages. On the other hand, O*NET, developed and maintained by the US Department of Labor, provides comprehensive information about different occupations, including required skills, knowledge, and work activities. These databases, which are regularly updated to reflect changes in the labor market, serve as valuable resources for understanding industry trends and skill requirements.

The trend of customizing research for specific industries or regional analyses is evident in recent studies. Grüger et al. [6] developed a system that automatically identifies skills in German-language job advertisements, showcasing the effectiveness of this approach. Similarly, Papoutsoglou et al. [7] presented a framework for collecting online job advertisements from StackOverflow and extracting the necessary skills and competencies for specific IT jobs. They employed multivariate statistical data analysis to explore correlations within the dataset. Another relevant study conducted by Kennan et al. [8] analyzed online job advertisements to gain insights into the knowledge, skills, and competencies sought after for early career information systems (IS) graduates in Australia. In addition, Adan et al. [9] introduced C3-IoC, an AI-based solution aimed at assisting students from the UK in exploring IT career paths based on their education level, skills, and prior experience.

A recent publication, [10], presented a systematic review of advancements in skill identification based on job market demands from online job advertisements. The authors thoroughly examined 108 research articles published between 2010 and 2020, providing a comprehensive survey on skill identification. Their study established a framework that addresses three key challenges: skill base generation, skill identification methods, and skill identification granularity. To enhance skill identification and capture the dynamic needs of the job market, the authors recommended leveraging recent deep learning methods.

The field of natural language processing has experienced remarkable progress since the introduction of ChatGPT and its subsequent version, GPT-4 [11]. These advancements have had a significant impact on various conventional tasks, including machine translation, sentiment analysis, text summarization, named entity recognition, and topic segmentation, among others. Researchers have been leveraging the capabilities of ChatGPT to enhance the efficiency and effectiveness of text analysis processes. For example, Hoes et al. [12] investigated the potential of ChatGPT for automated online content moderation. Their study demonstrated that ChatGPT achieved an impressive accuracy of 69% in categorizing statements as true or false.

In a similar vein, [13] proposed AugGPT, a text data augmentation approach that utilizes the capabilities of Chat-

GPT. AugGPT generates multiple conceptually similar yet semantically distinct samples by rephrasing each sentence in the training set. These augmented samples can be effectively utilized for downstream model training. Experimental results on few-shot learning text classification tasks demonstrate the superiority of AugGPT over state-of-the-art text data augmentation methods in terms of testing accuracy and the distribution of augmented samples.

The process of skill identification and normalization from job advertisements encounters numerous challenges, as highlighted in [10]. The language used in job adverts can be diverse and informal, leading to ambiguity and noise during skill extraction. Moreover, the ever-changing nature of job markets and evolving skill requirements pose difficulties in maintaining up-to-date skill taxonomies. Recent research papers [12], [13] showcasing the capabilities of ChatGPT in extracting key information and analyzing text data have motivated us to explore the potential of this large language model in automating skills identification from job advertisements.

III. Dataset

A. Data Collection

The dataset for this research was compiled through manual extraction from two job advertisement platforms, as well as various Facebook groups frequently promoting job listings. The dataset for the Thailand job market originated from job advertisements featured on two prominent Thai job recruitment platforms [14] [15] and multiple Facebook groups [16]–[20] known for posting job vacancies. To narrow the focus on skill requirements for individuals without higher education degrees, job advertisements mandating such qualifications were excluded. The majority of these job listings do not specify gender preferences, implying that the positions are open to applicants of any gender. A total of 152 job advertisements were collected between April 2023 and June 27, 2023, offering a snapshot of the Thailand job market during that specific timeframe.

Regarding the Japanese job market, the job advertisement platforms were exclusively aimed at candidates with higher education degrees. Consequently, the dataset for the Japanese job market was procured from job advertisements published on the official Facebook pages of Myanmar recruitment agencies targeting opportunities in Japan [21]–[23]. Data collection spanned from January 2023 to June 22, 2023, and encompassed a total of 30 job advertisements, advertising a total of 842 job openings.

To ensure alignment with the research focus on comprehending skill demands for individuals without higher education degrees, job advertisements requiring higher education degrees or above were excluded during the data collection process. In sum, a total of 152 job advertisements were amassed from April 2023 to June 27, 2023, providing a snapshot of the job market within that specific time frame.

The job advertisements collected were initially in an unstructured format, as shown in Fig. 1. To transform the unstructured content into a structured dataset, the data collectors manually extracted the ‘Job Titles’, and ‘Skills and Responsibilities’. This involved organizing the content from the advertisements into a structured table format, exemplified

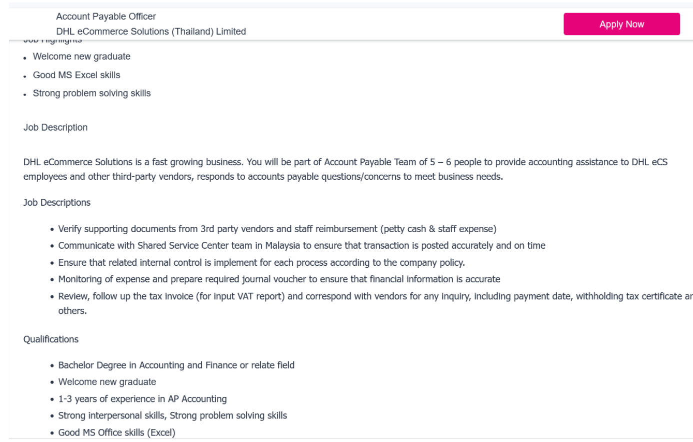

Fig. 1. Example job adverts from JobDB [14].

in Table I. Notably, job titles and skills are often not explicitly mentioned in the job adverts. Consequently, during the manual extraction process, the data collectors copied and pasted the content of the job descriptions or responsibilities into the skill and responsibility column, without explicitly assigning them to pre-defined skill databases like O*NET.

It is important to note that web scraping techniques were not employed in the data collection process due to strict prohibitions by the job advertisement platforms. To ensure compliance with legal regulations and respect the privacy policies of the companies, the researchers collected and categorized the data manually.

The dataset consists of two attributes: ‘Job Titles’, and ‘Skills and Responsibilities’. Table I presents a snapshot of the dataset, showcasing specific details and examples of the collected data.

B. Data Pre-processing

The initial step in data pre-processing for this project involves cleaning the unstructured text data, as presented in Table I. The data contains unwanted symbols, text, and duplicated records, requiring necessary cleansing. Consequently, the data cleaning process encompasses three essential actions: removing white spaces, eliminating duplicates, and converting the text to lowercase. These steps ensure text standardization and facilitate subsequent analysis.

However, it is important to note that the job titles and skills are preserved in their raw form without lemmatization. This deliberate decision was made to evaluate the performance of ChatGPT in grouping similar words with the same meaning. By retaining the original form of job titles and descriptions, we can assess the model’s ability to recognize and interpret variations in language while comprehending contextual information.

IV. Proposed Method

Our research introduces a novel method that leverages ChatGPT, a large language model, to enhance the efficiency of automated job market analysis and gain insights into job

TABLE I. Snap-Shot of the Collected Dataset

Job title	Skills and Responsibilities
Service Technician (Air Conditioning)	Respond to customer requests for repair of air conditioning systems in homes companies and factories. Perform routine maintenance tasks to ensure air conditioning systems are operating efficiently. Manage a team of technicians providing guidance and support as needed.
store staff	Responsible to Store Performance and staff development to meet business objective. Maintain and develop retail Store daily Operation to meet business efficiency in the best possibility way. Manage and retain people to run daily operation to achieve customer target and customer satisfaction. Develop SOP and Daily Operation Routine (WI)
Graphic Designer	"Create and conceptualize where needed marketing communications in different formats including advertising social media content website banners video editing (and occasional filming) event collateral and more. Implement visual marketing collateral according to BayWa brand guidelines. Coordinate with the regional marketing and sales teams to create communications that meet their needs. Manage and oversee third party suppliers
Accouting officer	Must be proficient in the use of the English language (both verbal and written) Must be proficient in Thai (both verbal and written) knowledge of other languages is an advantage Excellent organizational and time-management skills Must be very detail-orientated Positive attitude and sincere desire to learn on the job

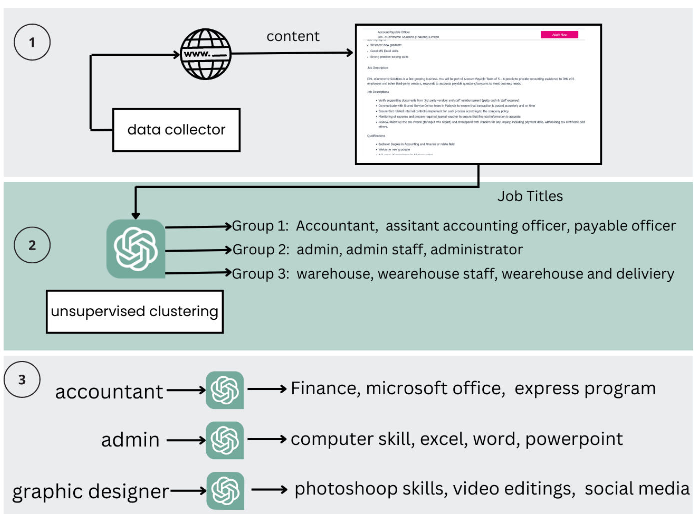

Fig. 2. Architecture of our proposed method.

market demands. The architecture of our proposed method is illustrated in Fig. 2.

The proposed method consists of two key steps aimed at analyzing job titles and skill demand using ChatGPT's zero-shot prompt capability.

In the initial step, we leverage ChatGPT's zero-shot prompt capability to perform job title clustering in a given dataset, obviating the necessity for predefined labels or manual annotation. Through the formulation of specific prompts, we guide the model to acquire knowledge from the provided information and infer appropriate clusters based on the semantic relationships among job titles. By applying this clustering process and subsequently analyzing the size of each resultant cluster, we can discern the most sought-after job titles within the market. The maximum number of clusters can be predetermined within the prompt by specifying either the desired number of clusters or the minimum size of each cluster.

Building upon the outcomes obtained from the Job Title Clustering step, we progress to the subsequent step, wherein we undertake an analysis of skill demand within each cluster. To accomplish this, we rely upon ChatGPT's zero-shot prompt functionality. For each job title cluster derived from Step 1, we construct a prompt that facilitates the extraction of skills from job descriptions specifically associated with that particular cluster. By employing this approach, we gain valuable insights into the skill demand prevalent within each distinct job title group.

A. Step 1: Job Title Clustering

In the initial step, we leverage the zero-shot prompt capability of ChatGPT to cluster the job titles in the given dataset. This prompt serves as a guide, enabling ChatGPT to generate meaningful clusters based on the similarities; it recognizes among the job titles. The resulting clusters offer valuable insights into different job categories within the job market, facilitating a comprehensive analysis of job market demands. Some job roles appeared multiple times in the job adverts database, indicating a higher demand for those specific roles during the analyzed time frame. Conversely, certain roles occurred rarely, suggesting a relatively lower demand for those positions. Analyzing the sizes of these clusters, in terms of the number of job advertisements assigned to each role, provides valuable insights into the demand for specific job roles during the specified time frame. Larger clusters indicate highly sought-after job roles, implying a higher demand in the job market for roles with the associated skills and qualifications.

Using the following prompt, we guide ChatGPT to recognize underlying patterns and similarities among the job titles. In this method, the number of clusters is not limited, but we predefined the minimum cluster size as 3, considering the content of the dataset.

```
def job_title_clustering(Job_title):
    prompt = f''''''
    Your task is to group Job titles from \
    a long job title corpus where each job
        title is separated by comma.

    From the given job title corpus, delimited
         by triple quotes \
    group the job titles that are similar.

    The minimum size of the group should be 3.

    Use the following format:
    Group 1: [<list of job titles that are
        similar>, quote each job title with ' '
        ]
    Group 2: [<list of job titles that are
        similar>, quote each job title with ' '
        ]

    '''{Job_titles}'''
    ''''''
    response = get_completion(prompt)
    return response
```

Listing 1: Prompt for Job Title Clustering

Table II presented as a snapshot of the clustering results, showcases the various job roles obtained from the clustering process in Step 1.

TABLE II. SNAP-SHOT OF THE JOB ROLES FROM THE CLUSTERING PROCESS

Group 1	Group 2	Group 3	Group 4
account payable officer	customer relations officer	administrator	warehouse
accountant	customer service	admin staff	warehouse and delivery staff
accountant	customer service	admin	warehouse associate
accounting and finance officer	customer service assistant (english speaking)	admin account	warehouse operations
accounting officer (ap)	customer service officer	admin executive	warehouse staff
assistant accounting manager	customer service quality assurance	admin officer	

B. Step 2: Skills Extraction

In the second step, we utilize ChatGPT's zero-shot prompt capability to extract skills from each cluster. To accomplish this, we gather the job descriptions from all the job advertisements within the corresponding cluster and combine them into a comprehensive string. This concatenated job description corpus is then inputted into the model, prompting it to extract skills from the descriptions.

Below is a code snippet illustrating the prompt employed to extract skills from a job description:

```
def extract_skills(grp_skill):
    prompt = f''''''
    Your task is to extract skills from \
    a corpus of job descriptions.

    From the given corpus of job descriptions,
         delimited by triple quotes \
    extract the commonly found skills.

    Format your response as a list of skills
        separated by comma.

    '''{grp_skill}'''
    ''''''

    response = get_completion(prompt)
    return response
```

Listing 2: Prompt for Skills Extraction

This prompt aids in guiding the model to identify and extract relevant skills from the job descriptions, contributing to a more comprehensive understanding of the skill requirements within each cluster. The *extract_skills* function takes a parameter called *grp_skill*, which represents the concatenated job descriptions from each cluster. By utilizing this prompt, it assists in guiding the model to identify and extract pertinent skills from the job descriptions. This process significantly contributes to enhancing the overall understanding of the skill requirements associated with each job role within the clusters. Through this step, we can effectively identify the key skills needed for each job role and gain valuable insights into the skill demand across different clusters.

V. RESULTS

A. Top Demanded Job Titles

The task of clustering job advertisements into common job roles, such as 'accountant' or 'admin', poses a significant challenge. The absence of standardized definitions for these roles and the existence of multiple names for the same role make the task non-trivial. Furthermore, not all job advertisements can be easily categorized into predefined roles. In order to address these difficulties, we leveraged ChatGPT's zero-shot prompt to cluster job titles and identify common job roles. We extracted the ten job roles with the largest number of job advertisements.

1) Thailand: Fig. 3 presents the top ten job positions that were highly sought after by low-level skilled workers in the Thailand job market between April and June 2023. Sales-related roles accounted for approximately 15% of the job advertisements during this period, including job titles such as *Sales*, *Sales Admin/Support Executive*, and *Sales Coordinator*. The second most in-demand category was customer service-related positions, representing around 13% of the job advertisements. This category encompassed roles like *Customer Relations Officer*, *Customer Support Specialist*, and *Customer*

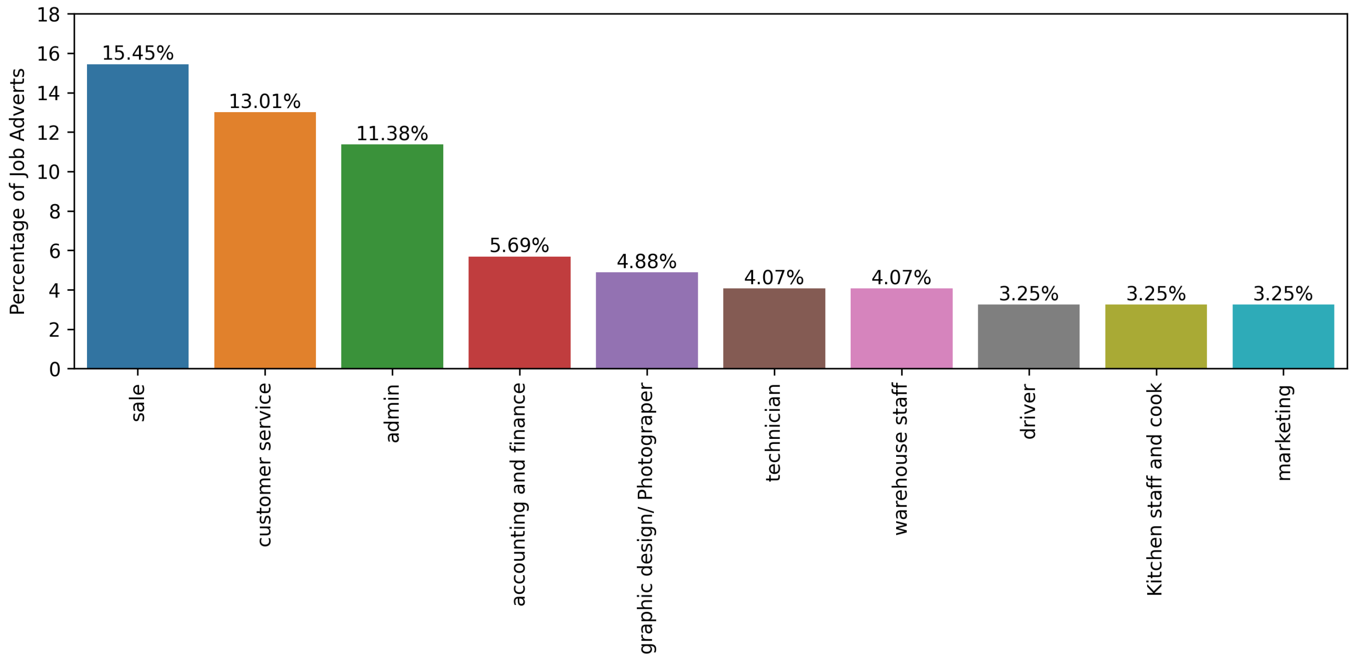

Fig. 3. Top ten most in-demand job positions in Thailand job market.

Service (Call Center). Admin-related positions ranked third in terms of demand and included roles such as *Admin Executive*, *Admin Officer*, *Admin Support Staff*, and *Administrative Officer*. It is observed that all the job postings are open to both male and female candidates.

TABLE III. Comparison of Job Roles from Human Annotation and ChatGPT

ChatGPT	%(GPT)	Manual	% (Manual)
sale	15.45	sales	12.67
customer service	13.01	customer service	12.67
admin	11.38	admin	12.0
accounting and finance	5.69	marketing	7.33
graphic design/ Photograper	4.88	staff	5.33
technician	4.07	accountant	5.33
warehouse staff	4.07	warehouse	4.67
driver	3.25	receptionist	4.67
Kitchen staff and cook	3.25	officer	4.67
marketing	3.25	technician	4.0

Comparison against human annotations: To assess the clustering results, we compared the top ten job titles obtained through our proposed method with the annotations provided by job-seeking individuals in the Thailand market. The comparison results are shown in Table III, which illustrates the overlapping job roles between the individuals' specifications and the results generated by ChatGPT. The frequency column represents the proportion of job advertisements related to specific job roles within the analyzed time-frame. Our observations revealed that seven out of the top 10 job roles, excluding graphic designer, driver, and kitchen staff, overlapped between the human annotations and the model's results. The top three job roles remained consistent, with only minor variations in the frequency of job advertisements.

2) Japan: Fig. 4 illustrates the top ten job positions that were in high demand among low-level skilled workers from Myanmar in the Japanese job market between January and June 2023. The analysis considered 30 job advertisements, totaling 842 job openings. Please note that for the Japanese Job market, worker recruitment in Myanmar is commonly facilitated through agencies, and in many cases, mass recruitment is conducted where more than 10 workers are hired simultaneously.

The top ten industries with high demand encompassed agriculture, food service, interior building cleaning, and nursing care. Among these industries, agriculture recorded the highest level of recruitment, employing over 250 workers (30% of total job openings). The food service industry closely followed, hiring approximately 120 workers. The cleaning industry had the highest recruitment of female workers, with 100 positions filled during the study period. The nursing care sector and fishery/aquaculture industries each recruited around 65 workers. Additionally, the manufacturing of food and beverages industry hired approximately 50 workers.

Out of all the job advertisements, 14% specifically targeted female workers, including the cleaning industry, manufacturing of food and beverages, and airport ground staff. Conversely, only 10% of the job adverts were specifically aimed at male workers. Notably, the construction industry exclusively recruited male workers, with a total of 30 workers being hired.

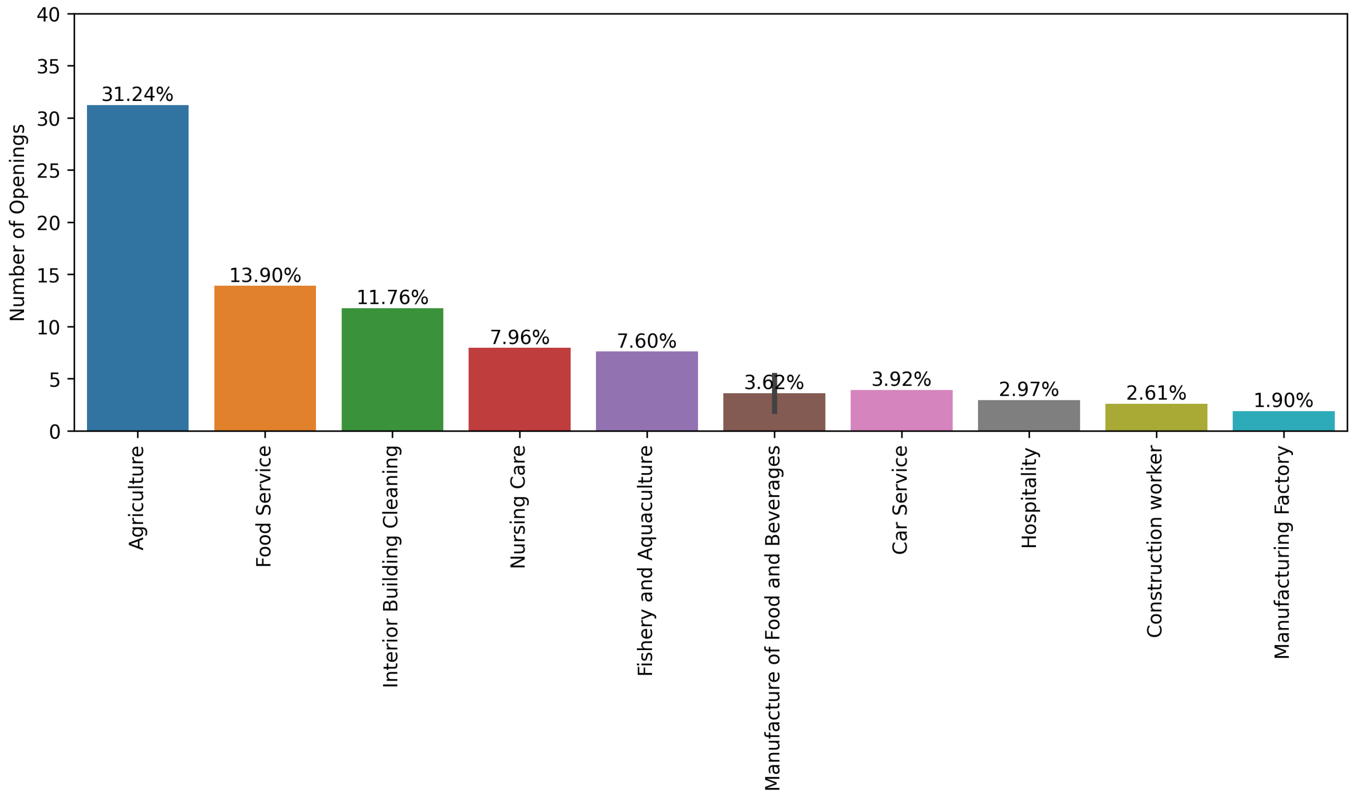

Fig. 4. Most in-demand job sectors in Japanese job market targeting to Myanmar skilled workers.

The carpentry and interior home decoration industries followed as the second and third most recruited industries for male workers. The majority of job recruitment, accounting for 76%, was open to both male and female workers. Additionally, it is worth mentioning that while some openings in the manufacturing of food and beverages industry were exclusively for female workers, others were open to both male and female applicants.

Comparison against Human annotations: Table IV presents a comparison of the results obtained from Human annotations and those generated by ChatGPT. The table reveals a significant level of overlap in clustering between the human annotations and the model's output, with only minor variations in the frequency of job advertisements.

3) Comparison between Thailand and Japan: Please note that the above data represents two different dimensions, providing insights into the job markets in Thailand and Japan for Myanmar workers. The data from Thailand encompasses job advertisements that are open to not only Myanmar nationals but also individuals of other nationalities, including Myanmar workers. On the other hand, the Japanese data specifically focuses on opportunities for Myanmar workers in Japan.

Both Japan and Thailand utilize their national languages as the official working languages. However, in the Thai job market, there is a noticeable trend of posting job advertisements in English. This practice aims to attract individuals of diverse nationalities, including Myanmar workers who possess English language skills. On the other hand, the Japanese job market follows a different approach. Job advertisements in English primarily target professionals with higher degrees or specialized skills. These advertisements cater to individuals who possess a certain level of proficiency in English, reflecting the demand for language fluency in certain industries or job

TABLE IV. COMPARISON OF JOB ROLES FROM HUMAN ANNOTATION AND CHATGPT

ChatGPT	%(GPT)	Manual	% (Manual)
Agriculture	31.24	Agriculture workers	31.97
Food Service	13.9	Food service	14.63
Interior Building Cleaning	11.76	Cleaner	12.49
Nursing Care	7.96	Nurse and care giver	8.69
Fishery and Aquaculture	7.6	Fishery Firm workers	8.34
Manufacture of Food and Beverages	5.34	Construction worker	6.91
Car Service	3.92	Manufacture of Food and Beverages	6.08
Hospitality	2.97	Car Service	4.66
Construction worker	2.61	Manufacturing Factory worker	4.06
Manufacturing Factory	1.9	Front Desk	3.71

roles. However, lower-skilled workers from Myanmar seeking employment in Japan often heavily rely on recruitment agencies to secure job opportunities. These agencies act as intermediaries, connecting job seekers with employers who specifically seek foreign workers. In Myanmar, these agencies frequently use social media platforms like Facebook to announce job advertisements, enabling job seekers in Myanmar to search for opportunities through these platforms.

It is important to note that both Thailand and Japan recognize the importance of language proficiency, and fluency in the respective national languages is highly valued. While the Thai job market embraces the use of English in job advertisements to attract a diverse talent pool, the Japanese job market focuses more on higher-skilled positions and relies on recruitment agencies for lower-skilled job placements. Understanding these dynamics is crucial for Myanmar workers seeking employment opportunities in these two countries.

By comparing the study between the Japanese and Thai job markets, it can be observed that the top five industries with high demand for both genders in the Japanese job market were agriculture (31%), food service (14%), building cleaning (12%), nursing care (8%), and fishery/aquaculture. In the Japanese job market, a significant majority of job recruitment (76%) was open to both male and female workers. The construction industry exclusively recruited male workers, while the cleaning industry had the highest recruitment of female workers. In contrast, data from official job agencies indicates that the Thai job market had a high demand for sales-related roles (15%), customer service-related positions (13%), and administrative-related positions (11%) between April and June 2023. This suggests that the service sector in Thailand is becoming more open to Myanmar nationals who can speak both English and Thai.

Fig. 5. Snap-shot of the top demanded skills for top three sought-after job roles in Thailand.

B. Top Demanded Skills

Proficiency in Japanese, and Thai is essential for workers seeking promising job opportunities in various sectors.

1) Thailand: Fig. 5 displays the required skills for the top three sought-after job roles: sales, customer service, and administration. Among the technical skills, employers highly prioritize computer literacy proficiency and competence in Microsoft Office tools. English language proficiency is also frequently requested. It is worth noting that the Thai job market places great importance on soft skills as well. Employers in Thailand consistently seek abilities such as customer service, communication, and problem-solving.

2) Japan: Fig. 6 provides valuable insights into the required skills for the agriculture and fishery/aquaculture sectors in Japan. In addition to the essential manual labor skills, such as breeding, collecting, sorting of animals, farming, and planting, there is also a significant demand for knowledge in management and health and safety practices. It is worth noting that the agriculture and fishery/aquaculture sectors in Japan require workers with a diverse skill set. While manual labor skills are foundational, the demand for additional knowledge in management and health and safety reflects the need for workers who can contribute to the overall success and sustainability of these industries.

Fig. 6. Snap-shot of the top demanded skills for agriculture and fishery / aquaculture sectors in Japan.

Fig. 7. Snap-shot of the top demanded skills for construction sector in Japan.

Fig. 7 highlights the highly demanded skills for male workers in the Japanese construction sector. It can be seen that the Japanese construction sector demands a range of skills related to various construction activities such as plumbing, pumping, formwork, finishing, scaffolding, plastering, roofing and carpentry. In addition, it also requires skilled workers who can operate and maintain a wide range of machinery and equipment. By focusing on acquiring these skills, Myanmar workers can enhance their chances of finding employment opportunities in the Japanese construction sector.

C. Evaluation of Unsupervised Clustering

To assess the clustering results between the proposed method and manual grouping, we employ precision and recall as evaluation metrics. Precision quantifies the proportion of job roles accurately classified by the model, while recall measures the model's capability to correctly capture all job titles.

1) Evaluation metrics: Precision, as a metric, gauges the correctness of the clustering results by calculating the percentage of job roles that were correctly assigned to their respective clusters. A higher precision value indicates a higher accuracy in classifying job roles.

$$\text{precision} = \frac{TruePositive}{TruePositive + FalsePositive} \tag{1}$$

On the other hand, recall assesses the model's completeness in capturing all relevant job titles. It measures the proportion of actual job titles that were correctly identified and included in the dataset. A higher recall value implies that the model successfully captures a larger portion of the job titles.

$$\text{recall} = \frac{TruePositive}{TruePositive + FalseNegative} \tag{2}$$

In Eq. (1) and (2), True Positives indicate the number of job titles that are accurately classified within their respective clusters. This means that a job title is correctly assigned to the appropriate cluster, such as "admin officer" being assigned to the admin cluster. False Positives, on the other hand, refer to job titles that are incorrectly assigned to a cluster where they don't belong. For instance, if a job title like "sale" is incorrectly assigned to the admin cluster. False Negatives represent the job titles that should be belong to the given cluster but are mistakenly assigned to the wrong cluster. For example, the title "admin officer" is erroneously assigned to the sale cluster instead of the admin cluster.

By considering both precision and recall, we can gain a comprehensive understanding of the performance of the proposed clustering method compared to the manual grouping. These evaluation metrics provide insights into the model's accuracy, correctness, and ability to capture a broad range of job titles within the clustering process.

2) Accuracy: In this section, we present the performance of unsupervised clustering for the top ten job roles in Thailand Job Market. The resulting confusion matrix (Fig. 8) provides insights into the clustering accuracy. The confusion matrix visually represents the performance of the clustering model, showcasing its ability to assign job adverts to the corresponding job roles. The high accuracy scores indicate the model's proficiency in recognizing and grouping similar job descriptions together.

For the Thailand Job market, the proposed model demonstrated impressive performance by accurately capturing all the job adverts annotated by humans in the driver, graphic designer, and kitchen helper roles. Furthermore, it achieved a high accuracy rate of 95% for sales roles and 88% for accountant roles. For sales, administration, and customer service roles, ChatGPT achieved approximately 70% accuracy. However, ChatGPT did not perform well for the marketing and technician roles due to the wide and diverse range of words used to describe these roles. The inherent variability and ambiguity in job descriptions related to marketing and technician positions pose challenges for accurate clustering.

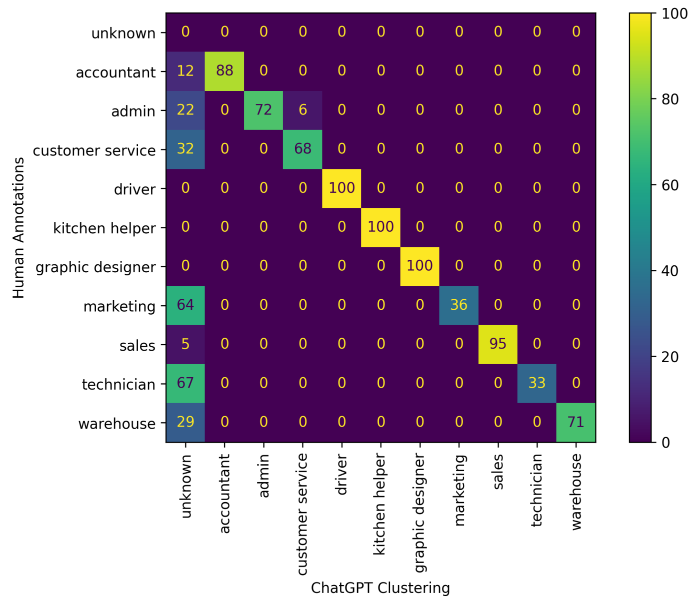

Fig. 8. Confusion Matrix for the top-ten job roles in Thailand.

This evaluation demonstrates the effectiveness of ChatGPT in automatically clustering job adverts into relevant job roles. The results highlight its potential for assisting in job matching and recruitment processes, aiding in the efficient categorization of job postings based on their role requirements.

3) Precision and recall: Fig. 9 depicts the precision and recall scores for the top ten demanded job roles in Thailand. The precision scores reflect a high success rate in accurately identifying the job roles, with most of them achieving a score of 100%. This indicates that the model performs well in correctly assigning job postings to their respective roles.

However, the variation in the recall scores indicates the model's ability to capture all the job roles within the relevant clusters. While precision measures the accuracy of the identified job roles, recall measures the model's capability to capture all the job roles present in the data. The variation in recall scores suggests that the model may have challenges in fully capturing all job roles, potentially missing some relevant postings.

VI. Limitation and Future Direction

It is important to acknowledge that this research offers a snapshot of the skills in demand by employers at a specific moment, and it may not encompass the complete range of skills required for a given occupation or industry due to the limited dataset size. However, the demonstrated success of the proposed method serves as a promising direction for exploring and harnessing the capabilities of large language models in understanding the industrial skill demands. It provides an avenue to develop a comprehensive understanding of skill

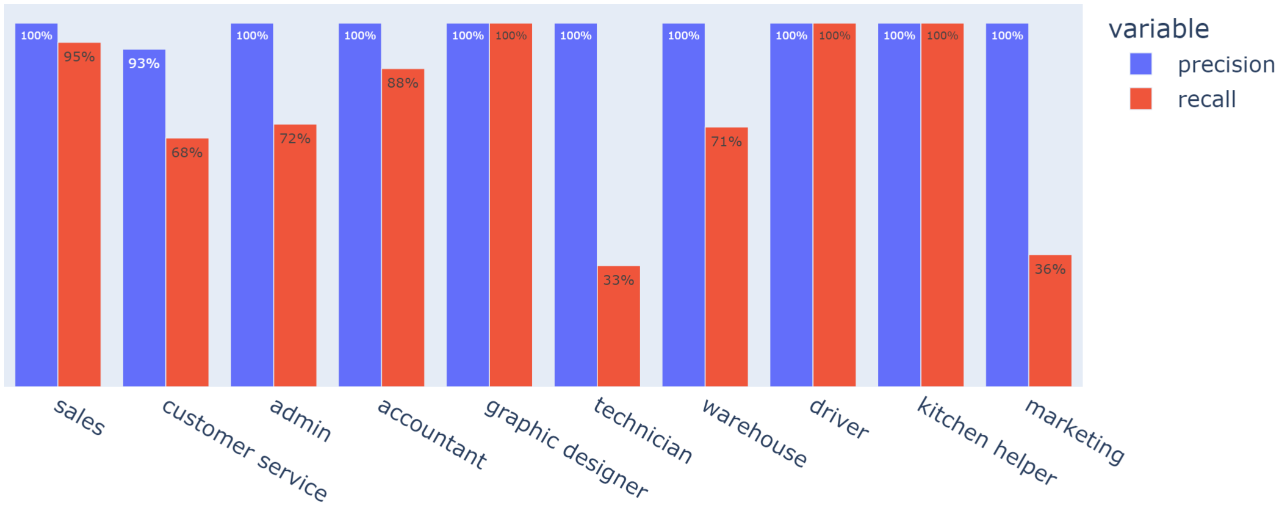

Fig. 9. Precision and Recall for the top-ten job roles in Thailand.

demand and contributes to the advancement of reducing the skill gap between the industries and training providers.

Another limitation is the validation of our results. We engaged youths seeking employment in Thailand and Japan, who lack expertise in labor market studies. This could introduce biased judgments when identifying job titles and clustering data. To improve accuracy, future research could involve experts or existing skill databases, refining job title identification and minimizing biases. This enhances result reliability.

VII. Conclusion

This study leverages the capabilities of ChatGPT, a powerful instrument for text classification and summarization, to identify in-demand skills among Myanmar workers. The main objective is to assess employment opportunities in Thailand and Japan for Myanmar youths lacking higher education degrees. Key highlights of this research include showcasing ChatGPT's proficiency in extracting skills from unstructured job ads, offering a rapid and thorough perspective on labor market demand, with a specific emphasis on highlighting opportunities for low-level skilled workers. Moreover, this study empowers international non-governmental organizations to make well-informed decisions while crafting targeted interventions to address the employment challenges confronted by marginalized Myanmar youths.

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