ASHESI UNIVERSITY COLLEGE

ASSESSING THE EFFECTS OF AUTOMATION ON WOMEN'S EMPLOYMENT IN

GHANA

THESIS PROJECT

B.Sc. MANAGEMENT INFORMATION SYSTEMS

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Thesis Project submitted to the Department of Computer Science, Ashesi

University in partial fulfilment of the requirements for the award of

Bachelor of Science degree in Management Information Systems.

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2021

DECLARATION

I hereby declare that this Thesis Project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:

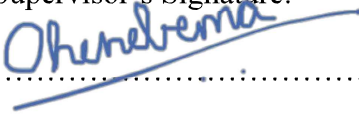…………………………………………………………………………………………

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I hereby declare that preparation and presentation of this Thesis Project were supervised in accordance with the guidelines on supervision of CSIS Thesis laid down by Ashesi University.

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Supervisor's Name:

Professor Angela Owusu Ansah

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Date:

May 16, 2021

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Acknowledgements

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Abstract

As the age of robots and self-learning software is upon us, fears of the apocalyptic vision of a world where jobs will be destroyed with human labour to be replaced by robots causing severe unemployment keeps increasing. This paper sought to assess the effects of automation on the average Ghanaian woman by studying the labour force participation trends among women in Ghana and then using the Oxford study by Frey and Osbourne (2013) to estimate the probability of women's jobs in Ghana being computerized. To do this, I employed the deductive research approach and comparative survey design. I used archival data of the 2015 Labour Force Report from the Ghana Statistical Service to get a better understanding of the types of jobs Ghanaian women are typically employed in. In conjunction, I put this information against the Frey and Osbourne (2013) probability index on automation risk to estimate the potential automation risk for each sector and what this means for the female labour force of Ghana. The participants of this study are women who are economically active (15-59 years old) and who are in the agriculture, fishing and forestry sector; wholesale and retail sector; manufacturing, mining and quarrying sector; hotels and restaurants sector or public administration sector. The research revealed that only about 15% of Ghanaian working women are at a high risk of automation or have above a 70% automation risk which is lesser than the 20% of women globally. Moreover, it was found that although the majority of both the male and female workforce in Ghana have a predominantly medium risk of automation, 42% of the total male workforce has a medium automation risk whilst 38% of the female workforce has a medium automation risk. Also, the male workforce has an 18% high automation risk whilst the female workforce has a 15% automation risk. This suggests that men in Ghana are affected slightly more than the women in Ghana by automation.

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Chapter 1: Introduction

1.1 Background

An estimated 60 per cent of jobs have at least 30 per cent of activities which could be automated with already-proven technologies by 2030 (McKinsey 2017). As the age of robots and self-learning software is upon us, fears of the apocalyptic vision of a world where jobs will be destroyed with human labour to be replaced by robots causing severe unemployment keeps increasing. Automation is not a new concept. Humans have always been developing technology and tools that can help to increase economic output with less human effort. Recently, Machine Learning and Artificial Intelligence (A.I.) have accelerated the rate at which every sector is being automized ushering the world into what the World Economic Forum (WEF) has termed the "fourth industrial revolution". Automation has triggered major economic growth, an increase in productivity from 0.8 to 1.4 percent annually and an increase in the wealth of citizens among countries in Western Europe and as more and more sectors are being automized, there poses a great threat on the labour force.

"Almost no occupation will be unaffected by the adoption of currently available technologies with approximately 25 percent of U.S. employment (36 million jobs in 2016) facing high exposure to automation in the coming decades (with greater than 70 percent of current task content at risk of substitution)." (Muro, Maxim & Whiton, 2019, pp. 5).

On the other hand, according to Millington (2017), although automation indeed affects a larger scope of occupations, not all jobs will be lost. In fact, she points to the fact that whilst some jobs are declining, some will grow, and the majority will change. The uncertainty of the exact implications of automation on jobs has created the need to study labour trends in different

demographics and the skills required for different type of occupations to make predictions based on these characteristics. Some studies have found that automation will affect women and men differently. For one, the female labour participation rate has stubbornly been around 49 per cent for the last 30 years, which is nearly 27 percentage points lower than the rate for men and on the other hand, women usually occupy occupations in healthcare, personal services and education (Faith, 2017). The Office for National Statistics (ONS) estimates that women hold about 70.2 per cent of jobs that are at 'high risk' of automation (Muro, Maxim, and Whiton, 2019). To further understand this, we need to understand that jobs constitute "a bundle of tasks" that workers employ their expertise and skills to in order to complete said tasks in exchange for wages. Among these tasks are repetitive ones that are well understood and so can be codified, making these task highly automable.

Moreover, there have been numerous studies that have reported varying outcomes on how automation will affect employment depending on the methodology they use. As such, according to these different studies, automation can affect between 9% (Arntz, Gregory and Zierahn, 2016) and 47% (Frey & Osbourne, 2013) of jobs which is a very wide range. These studies have, however, been conducted for U.S and U.K and other OECD countries leaving out Africa. Considering the differences in labour trends, geography and technological advancement between first and third world countries, there may be a difference in the effects of automation on women's employment in Ghana. This study aims to use the methodologies from the occupation-based approach in the Oxford study by Frey & Osbourne (2013), and the task-based approach by the OECD study by Arntz, Gregory and Zierahn (2016) in conjunction with secondary data from the Ghana Statistical Service (2015) to estimate how automation will affect women's employment in Ghana.

1.2 Research Problem.

Automation and its effect on access to jobs is a very current topic and the body of research around this topic keeps growing. Novel research on automation and employment was conducted in 2013 by Frey & Osbourne which found that 47% of U.S jobs are at risk of computerization. Soon after, several substantial research have been added to the growing body of literature in this area with a deeper focus on how automation affects female employment in the U.S.A (Madgavkar, Krishnan & Ellingrud, 2019) and the U.K. (Roberts, Statham & Rankin, 2019). Although there have band automation's effects on employment in Sub-Saharan Africa (Gaus & Hoxtell, 2019) and South Africa (le Roux, 2018). However, none have been done with a primary focus on the effects on women's access to jobs in Africa and much less, women in Ghana. This paper seeks to assess the effects of automation on the average Ghanaian woman by studying the labour force participation trends among women in Ghana with an emphasis on the type of jobs women in Ghana occupy and then study the tasks of these jobs and finally how prone these jobs are to automation. The research will also suggest ways women and the leadership of Ghana can prepare for this revolution with a look at promoting STEM among girls in basic schools and facilitating a smooth transition by joining forces with the private sector.

1.3 Research Questions

In order to fully understand the effects of automation on women's access to jobs in Ghana, we would have to look at the effects of automation on women in other parts of the world where studies have been conducted, and the how different is the effects of automation on men's access to jobs. Therefore, this study will look at the following research questions:

- **What is the effect of automation on women's access to jobs in Ghana?**

- **How is this effect different for women in other parts of the world?**

- **How is the effect of automation on jobs different for men than for women?**

1.4 Limitations of the Study.

Currently, any research paper about how automation is affecting women's access to jobs has been done with a focus on women in developing countries. As such, this study will refer a lot to these past studies and make comparisons to developed countries. However, any comparisons of different societies, or exploration for underlying relationships must be conducted with a perceived need to understand the differences in the economic, political, educational and sociological factors that affect the labour market trends and the effects of automation on the two societies. Thus, this thesis paper will take the differences in the different parts of the world into consideration when any comparisons are made.

Moreover, this paper will heavily rely on the computerization probability index put together by Frey and Osbourne (2013) and data about the labour trends among women in Ghana from the 2015 Ghana Statistical Service National Employment Report (2015) to estimate automation's effects on women's employment in Ghana. Firstly, the data from the National Employment Report (2015) is relatively old which will affect the accuracy of the findings. Also, the occupations mentioned in the National Employment Report (2015) may not necessarily be the same as that identified in the probability index. For this research, the equivalents of such occupations will be identified as much as possible.

Chapter 2: Literature Review

2.1 Introduction

In my literature review and owing to the fact that automation and its effect on employment is a very current topic, I have found numerous studies on what the future of work with automation will look like. These studies focus on different demographic groups and also touch on what leadership can do to ensure the smooth adjustment of jobs into the age of automation. They also touch on how leadership can mitigate the imminent hardships that these changes will cause on affected groups. However, there is a lack of focus on Africa which is most likely to be the part of the world that is more susceptible to the effects of automation. There are also no studies, that I could find, that discuss the effects of automation on women's employment in Ghana.

2.2 The Future of Work.

Over the past few years, reservations of unemployment caused by technological advances have emerged because of developments in 'smart automation'. The combination of A.I, Robotics and Machine Learning is helping to create novelties such as driverless cars like the Tesla and intelligent virtual assistants like Siri, Alexa and Cortana. As such, nearly a billion jobs in the world and 4.5 million jobs in South Africa are going to be affected by automation (le Roux, 2019) and since women occupy jobs that have a 70.2 percent high automation potential it is particularly alarming for them. Automation is technology that supports humans, with little supervision, to produce, maintain, or deliver products and services (Gaus & Hoxtell, 2019). The impacts of automation will be of "varied intensity – and drastic for only some," (Maxim, Muro & Whiton, 2019). In the U.S, 25 per cent of jobs (which is approximately 35

million jobs as at 2016) will face high exposure to automation, whilst 36% will face medium exposure and finally 39% will face low exposure. The idea behind exposure to automation is that jobs that are usually routine, predictable, physical and cognitive are most vulnerable since they can be easily codified and understood by a machine. Jobs that are highly affected by automation include office administration work, production, transportation and food preparation and these constitute a quarter of all jobs (Maxim, Muro & Whiton, 2019). The more secure jobs are the creative, complex, technical and professional ones but these range from jobs requiring high educational qualifications to lower-paying ones like personal care and domestic service jobs. The common characteristics between these types of jobs that make them less prone to automation are their non-routine activities and the need for emotional and social intelligence which cannot be coded. The figure below illustrates the industries that are potentially at a high risk of automation in the USA.
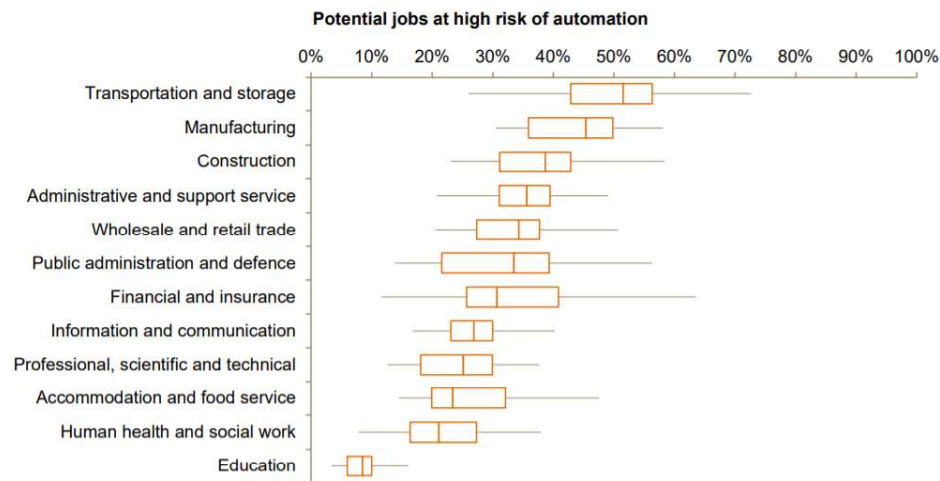
Source: PIACC data, PwC analysis

Figure 2.1 - Share of jobs with potential high automation rates by industry

In the figure, the transport and storage sector have the highest potential for computerization of about 57% and about 50% for the manufacturing sector. The construction sector, financial and insurance service activities and public administration and defense activities also show significant potential of being at risk with a range of about 40 – 50% risk.

The novel Oxford research conducted by Osbourne and Frey (2013) found that 47% of jobs in the U.S are at a high risk of being computerized. The study comes to this conclusion by identifying 702 jobs and calculating the probability of each job being automated (on a scale of 0-1). The study stated that, the criteria of "social perceptiveness, negotiation, persuasion, assisting and caring for others, originality, fine arts, finger dexterity, manual dexterity, and the need for a cramped workspace" is important to tell a particular job's potential to be automated (Frey &Osbourne, 2013).

Jobs at a lower risk	Jobs at a higher risk
social perceptiveness,	finger dexterity,
negotiation,	manual dexterity
persuasion,	need for a cramped workspace
assisting and caring for others,	
originality	
Fine arts	

Conversations about automation's effect on work often result in either the fears of an apocalyptic world of mass unemployment or the creation of the utopian world of no work and more leisure. However, as more studies are conducted, it is realized that there are many more

facets to the effects of automation on work in the future. This has created contrasting predictions on There are varying predictions on what the effects of automation will be on work. There is an argument that automation will cause employment to gradually diminish given the economic trends in countries like the U.S. (le Roux, 2018). Another side also argues that automation will rather help create more job opportunities that will reduce gender and economic inequality (Knowles, 2017). Yet another study agrees with both arguments but adds that jobs will evolve in nature even more than they decrease or increase (Millington, 2017). The "tecno-optimists" strongly believe that automation will relieve people of dangerous and unpopular work and the "tecno-pessimists" argue that automation will create mass unemployment and unequal wealth distribution. It is not a one size fits all when it comes to automation mainly because of the differences in economic structure, level of automation technology being employed and labour market trends from country to country.

In contrast to the Frey and Osbourne (2013) study, Arntz, Gregory and Zierahn (OECD, 2016) re-examined the novel Oxford research and, using a new and very detailed OECD data set, came up with a much lower estimate. Their study concluded that only about 9% of jobs were at a 'high risk of computerization' (Arntz, Gregory & Zierahn , 2016). This different conclusion stems from the theory that any estimations of a job's susceptibility to automation must factor in the component or specific tasks within said occupation instead of estimating based on the occupation as a whole. This different take puts the risk of computerization between the range of 9% - 47% of occupations which is a very wide range.

2.4 Labour Trends Among Women in Ghana

Sackey (2005) asserts within the formal sector of Ghana, women generally hold the lower and middle positions at their workplaces. "Occupational groups in the 1980s were such that in the administrative and managerial positions only 9% were women, while among clerical, sales and service workers, there were 75% women. Thus women form over two-thirds of employees in the lower stratum of the public sector and less than one-tenth of employees in the upper stratum" (Sackey, 2005, pp. 1). The formal sector is male-dominated because employment in the sector is dependent upon educational level and the acquisition of skills. This conditions seems to be satisfied by males more than by females for several reasons such as financial resources, social and cultural issues (Abraham, Ohemeng & Ohemeng, 2017). Although there is a substantial percentage of the female labour force in Ghana in the informal sector, there seems to be an inclusive increasing trend, in recent times, in the formal sector (Sackey, 2005). The figure below shows the distribution of the female labour force across the sectors of economic activity in Ghana.
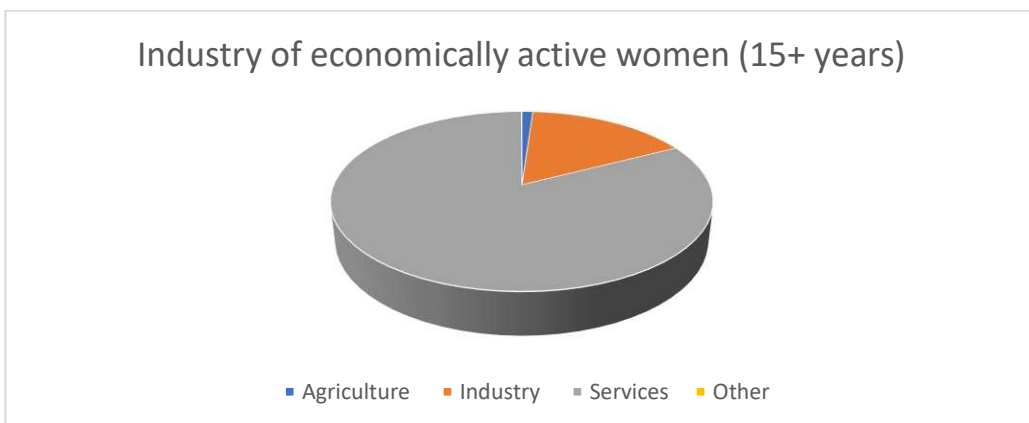
Source: Ghana Statistical Service

Figure 2.2 - Industry of economically active women (15+ years)

From the figure above, majority of the economically active women in Ghana (82.5%) are employed in the service sector, making it the sector most women are employed in.

2.5 Automation in Africa

Determining an occupation's susceptibility to automation is now based on whether the said job is routine and thus, codifiable. Usually, jobs in production fit this characteristic and Sub-Saharan African economies heavily rely on agriculture and production which essentially suggests that they are more susceptible to automation (Millington, 2017).

> Sub-Saharan Africa does have areas of economic activity where digital infrastructure is highly developed, where capital is available, and where the economic calculus favors automation. In Sub-Saharan Africa's high-wage and internationalized manufacturing sector and in its high-wage service economy, for example, increasing usage of automation technology is likely. (Gaus & Hoxtell, 2019, pp. 6)

This suggests that there is cause for concern for the occupations within sub-Saharan Africa being affected by advances in technology. Gaus and Hoxtell (2019), predict that advances in technology and the acceleration of sectors being automated will seriously affect the middle class population who work in the formal sectors. They believe that "for them, hard times are likely coming sooner rather than later."

2.6Automation & Women Employment

According to Roberts, Parkes, Statham & Rankin (2019), research shows that advances in automation technology will affect men and women differently. This is because men and women usually occupy different kinds of jobs. They state that twice as many women as men occupy jobs that are most likely to be automated. However, if the automation of component tasks in jobs is accelerated, an opportunity to narrow gender inequality will be realized as automation can enable higher pay for lower wage jobs, mostly occupied by women, through increased productivity. Overall, men stand to gain one job for every three jobs lost to technological advances, while women are expected to gain one job for every five or more jobs lost. While this is concerning, there is a shift in women's employment in jobs that require a lot of social skills which are particularly important in high-paying jobs and are difficult to automate. This may mean that women will actually benefit from automation (Hartmann & Hegewisch, 2019).

2.6.1 Automation For Men & Women

Women often find themselves with the "disproportionate share of home and family care work". Women also have participated in only about 49 per cent of the labour force for the last 30 years, which is nearly 27 percentage points lower than the rate for men (Faith, 2017).. Out of this, 70.2 per cent of jobs that are at 'high risk' of automation. In other words, women hold jobs with the highest proportions of 'component tasks that could be automated' (Roberts, Parkes, Statham & Rankin. 2019). With this, it is obvious that automation will affect men differently than it affects women. However, studies have found that automation will affect 21

per cent of women's jobs which is not so different from the 20 per cent of male jobs. Other studies also strongly believe that women may benefit more as automation may create more opportunities for them. However, women will have to make more adjustments than men in the automation age. In Ghana, a higher proportion of women are hired in unskilled jobs suggesting that they might be greatly affected by automation. As such, much of the literature on women's jobs and automation advocate for public policies to protect women and their employment from automation.

Chapter 3 – Methodology

3.1 Introduction

The growing body of research on automation and its effect on the labour force forces us to take look at the different lenses. In other words, automation does not affect everyone in the same way and people of different demographic, geographic, economic and social groups have a different outlook on the concept, and all have to have literature representative of their interest. The lens that I choose to view the effects of automation on employment is through the lens of the Ghanaian woman working in the formal sector.

3.2 Research Questions

The literature review has revealed that the future of work looks very uncertain and yet, automation is definitely going to play a big role in its evolution. However, the masses are afraid that they will be replaced by robots. Although this is a lot likely to happen for some, automation may increase and decrease job opportunities but change even more current jobs. It also reveals that the effects on men will vary than the effect on women with differing opinions on which group will be the most affected. The literature review also discusses the fact of the differing labour trends between women in Ghana and women in the world suggesting that the effects of automation will be different for women in different parts of the world. As such, my research is going to be guided by the following research questions:

- **What is the effect of automation on women's access to jobs in Ghana?**
- **How is this effect different for women in other parts of the world?**
- **How is the effect of automation on jobs different for men than for women?**

3.3 Method

3.3.1 Research Approach

Research approach used will be the Deductive Research Approach. This approach takes a theory and then uses data gathered to prove the theory. Here I will determine possible answers to the above research questions which will form my theories and then gather data to prove or disprove the theories. For this essay, my theories based on the research question are:

- o **A higher percentage of the jobs that women usually occupy in Ghana will be highly automable by 2030.**
- o **Women in Ghana will be affected more by automation than women in the U.S and U.K**
- o **Women have a higher percentage of their jobs automable than men in Ghana.**

With these hypotheses or theories, I will collect data that will be able to affirm or disprove the claims that I have made.

3.3.2 Research Design

For this research, I have chosen the comparative survey design. I will use archival data of the 2015 Labour Force Report from the Ghana Statistical Service to get a better understanding of the types of jobs Ghanaian women are typically employed in. I will also use the Frey and Osbourne (2013) probability index on automation risk and the PwC study on employment to estimate the potential automation risk for each sector and what this means for the female labour force of Ghana. I will also use online surveys to compare women think about how much of a risk they what the results from using the probability index of Frey and Osbourne

and the statistics of Ghanaian Female Labour Force reveal to what women think about their tasks and how automable their occupation is. In other words, I will present the participant with a survey of the following criteria: social perceptiveness, negotiation, persuasion, assisting and caring for others, originality, fine arts, finger dexterity, manual dexterity and the need for a cramped workspace. I will ask the participants to rate on a scale of 1-5 how much of each criteria they need for their work. I will also use the survey to gather the opinions of women in the working population on what they think of automation risk as a way to confirm the significance of this study to women in the labour force. My data collection tool, as such, will be online survey.

3.3.3 Participants

The participants of this research will be between 2-5 women each in the agriculture, fishing and forestry sector; wholesale and retail sector; manufacturing, mining and quarrying sector; hotels and restaurants sector and public administration sector. As such, participants will be anywhere between 10 and 25 Ghanaian women in the working population (15-59 years). I chose these sectors because they are the sectors women work in the most. Considering the specific type of participants I am seeking; I will combine the purposive sampling technique with the snowball sampling technique for sectors that are more difficult to find participants.

3.3.4 Measure one.

To measure the impact of automation on women's employment in Ghana, I will employ the use of the Frey & Osbourne (2013) probability index and the PwC study which is a build-up of the Oxford study. The PwC study combines the Oxford study and OECD study whose main argument is that an entire job cannot be automated but rather some tasks within the job.

This new perspective leads the study to conclude that only 9% of jobs can be automated which is a great contrast from the Oxford study's 47%. I will then use an online survey to gather the opinions of women on whether they considered the risk of automation in choosing their occupations and what they think the effects of automation is on women's employment in Ghana.

3.3.6 Data Analysis

For data collection, I first analyzed reports and past studies from the National Employment Report (2015) and the Oxford study by Frey & Osbourne (2013). From the Employment Report (2015), we found the occupations that the Ghanaian working class are usually employed in and put these against the probability index from Frey & Osbourne (2013) to derive the automation risk of that sector. There were some multiple occupations found in the probability index that could fit under one labelled occupation in the National Employment Report (2015). As such, averages of these probabilities were found. After finding the probabilities of the occupations, they were matched to the corresponding populations, as seen in Appendix A, and so that we can tell what percentage of the population is at a high, medium and low risk of automation .

For analyzing the data from the online survey there were questions that provided quantitative results and ones that required qualitative ones. For the qualitative results, I thoroughly read the responses and highlighted the responses that mainly cut across for the respondents.

3.3.7 Ethical Considerations

To secure appropriate permissions to conduct this study, I submitted an application for a careful human subject review by Ashesi University's IRB board and received approval from the IRB office to carry out this research.

3.4 High Level Design

To make the probability index more accessible to the public, I am designing a software that allows its users to be able to search for their careers and check the rate of automation risk of their job. As seen in Appendix B, The user can either scroll through the entire list of 702 jobs as specified by Frey and Osbourne (2013) or type in the search to filter the list. After clicking the risk level will be displayed.

Also, some users may not find their job title in the list as it is either under a different name or does not exist in the list. As such, I have introduced the automation risk calculator functionality whereby the user rates the requirements of social perceptiveness, finger dexterity, negotiation, manual dexterity persuasion, need for a cramped workspace, assisting and caring for others, originality and fine arts on a scale of one to ten and the system calculates the automation risk using JavaScript as shown in Appendix C.

Chapter 4 – Findings

4.1 Overview of the Study

The objective of the study was to examine how susceptible women's jobs in Ghana are to the risk of automation. To do this, a list of sectors and jobs with their corresponding percentage of the total population for both women and men were derived from the Ghana Statistical Service (GSS). This was then used in addition to the Frey and Osbourne (2013) Oxford study probability index, included in Appendix B, to derive the percentage likelihood of each job or sector being computerized. The data derived was also used to examine the difference of automation risk between men and women in Ghana and between women in Ghana and women in the U.K. and USA. The table below shows the different sectors in the Ghanaian labour force and how many men and women are employed in each sector as provided by the 2015 Labour Report of the GSS.

	Sex					
	Both Sexes		Male		Female	
Sub-sector	Number	Percent	Number	Percent	Number	Percent
Total	**3,383,206**	**100.0**	**2,039,032**	**100.0**	**1,344,174**	**100.0**
Industry	**614,517**	**18.2**	**395,205**	**19.4**	**219,312**	**16.3**
Manufacturing	437,316	12.9	262,489	12.9	174,827	13.0
Mining and quarrying	42,576	1.3	32,310	1.6	10,266	0.8
Electricity and gas	10,810	0.3	8,415	0.4	2,395	0.2
Water supply, sewerage, waste management	35,943	1.1	22,561	1.1	13,382	1.0
Construction	87,872	2.6	69,430	3.4	18,442	1.4
Services	**2,708,796**	**80.1**	**1,599,249**	**78.4**	**1,108,641**	**82.5**
Wholesale and retail trade	817,848	24.2	479,816	23.5	338,032	25.1
Transportation and storage	75,270	2.2	57,493	2.8	17,777	1.3
Accommodation and food	190,565	5.6	76,139	3.7	114,426	8.5
Information and communication	39,506	1.2	28,842	1.4	10,664	0.8
Financial and Insurance	121,459	3.6	74,993	3.7	46,466	3.5
Real estate	10,410	0.3	7,836	0.4	2,574	0.2
Professional, scientific and technical	79,693	2.4	56,461	2.8	23,232	1.7
Administrative and support service Activities	102,673	3.6	73,923	3.6	28,750	2.1
Public administration and defence	170,626	5.8	117,357	5.8	53,269	4.0
Education	477,068	14.1	287,483	14.1	189,585	14.1
Human health and social work	143,008	4.2	72,029	3.5	70,979	5.3
Arts, entertainment and recreation	18,755	0.6	14,676	0.7	4,079	0.3
Other services	461,915	13.7	252,201	12.4	208,808	15.5
Agriculture	**59,893**	**1.8**	**44,578**	**2.2**	**15,315**	**1.1**
Crops	42,672	1.3	30,747	1.5	11,925	0.9
Livestock and poultry	9,355	0.3	7,576	0.4	1,779	0.1
Forestry and logging	5,016	0.1	4,106	0.2	910	0.1
Fishing and aquaculture	2,850	0.1	2,149	0.1	701	0.1

Source: Labour Force Report, Ghana Statistical Service

Figure 4.1 - Persons engaged by sub-sector by sex

From the figure above, out of 3.383,206 people in Ghana who are economically active, the total number of women who are economically active is 1,344,174 women which represents 39.7% of the total labour force whilst there are 2,039,032 men which constitutes 60.2% of the total labour force. It is also evident that a majority of the labour force is employed in the services sector for both women (82.5% of the total female labour force) and men (78.4% of the total male labour force). Although more men than women are employed in the services sector, there is a greater percentage of women than men employed in the sector. The most dominant area in the service sector for both men and women is from wholesale and retail activities. Also, men are more employed in every sector than women except for accommodation and food related jobs.

4.2 Analysis of the probability index data.

The sectors and groups of jobs derived from the Ghana Statistical Service were put against Frey & Osbourne's probability index and the corresponding probabilities were assigned to the data from GSS. There were some instances where there were multiple occupations from the Oxford data that fit into one sector in the GSS data. Here, an average of these multiple probabilities was found. The full table of probabilities, the number of women employed in each sector and their risk level is included in Appendix A. With the risk level, an occupation or sector is either high risk (above 70%), medium risk (between 30% and 70%) and low risk (below 30%). After the deriving the probabilities, the risk level for each occupation was determined. As seen in Figure 4.2 below, 38% of the occupations are at low risk of automation, 33% of the occupations are at medium risk of automation and 29% of the occupations are at high risk of automation. Although the biggest proportion of occupations are at a low risk, the difference between low, medium and high risk are close.
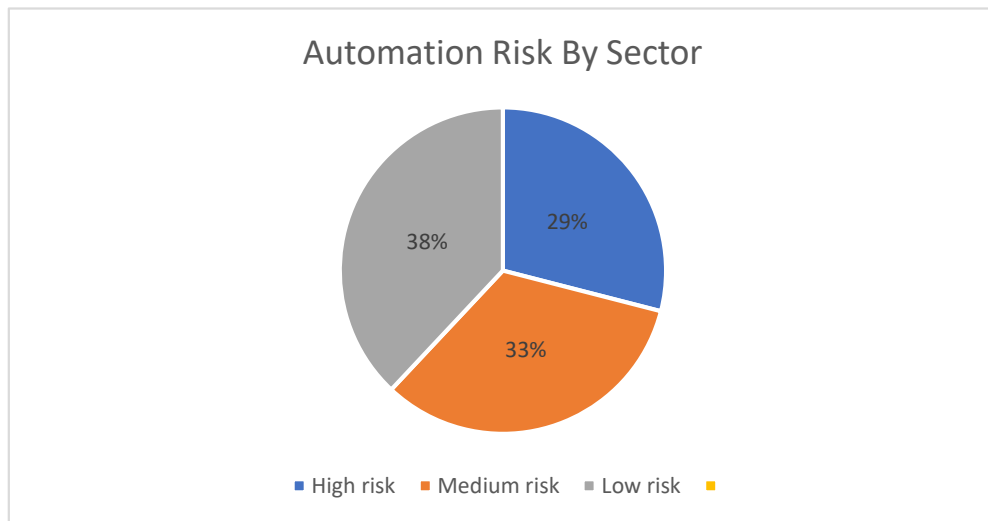
Figure 4.2 - Automation Risk By Sector

In addition, Figure 4.3 also summarizes how the risk level looks like with the actual population numbers. From the figure, it is evident that 202,718 women (which represents 15% of the total female work force) are at high risk of automation, 414,601 women (which represents 31% of the total female work force) are at low risk of automation and 509,601 (which represents 38% of the total female work force) are at medium risk of automation.
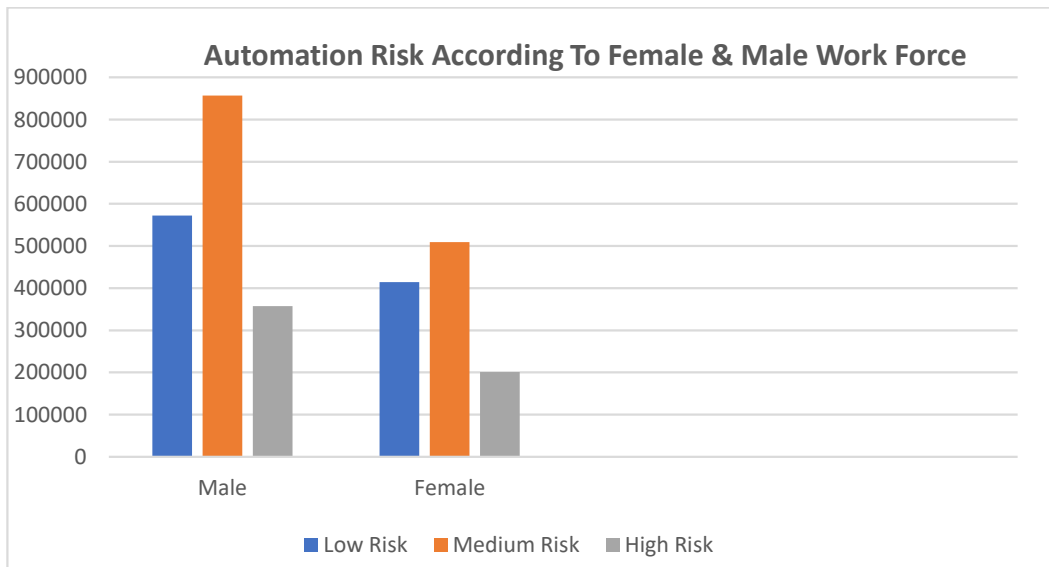
Figure 4.1 - Automation Risk According To Female Work Force

Note how more of the occupations are at low risk of automation whereas more women are at medium risk of automation.

Finally, I also analyzed the automation risk of the male work force. From Figure 4.3 again, it is apparent that 357895 men (which represents 18% of the total male work force) are at high risk of automation, 572,046 women (which represents 28% of the total female work force) are at low risk of automation and 856,890 (which represents 42% of the total male work force) are at medium risk of automation.

4.3 Answering Research Questions and Hypothesis.

4.3.1 Research Question One

The first question this study seeks to answer is what is the effect of automation on women's access to jobs in Ghana? From the analysis of the probability index data, it is evident that only about 15% of the female work force is at a high risk of automation or have above a 70% automation risk. This could be attributed to the fact that a majority of the female workforce of Ghana is employed in the service sector which on average has a medium risk of automation. My hypothesis for this research question was that a higher percentage of the jobs that women usually occupy in Ghana will be highly automable by 2030. Considering the fact that only 15% of women in the working force are at a high risk of automation, I will reject this claim'. However, despite the good sign of only 15% of women being at a high risk of automation, there is still 38% of women at medium risk or between 30% and 70% risk of automation which, although it is not high it is also quite a problem.

4.3.2 Research Question Two

The next question this research seeks to answer is how the effect of automation on women's employment is different for women in other parts of the world, specifically the U.S. According to Krishnan, Ellingrud and Madgavkar (2019), 20% of women globally are at risk of their jobs being automated. This is far higher than the 15% of women in Ghana at high risk of automation. My projection for this research was that women in Ghana will be affected more by automation than women in the U.S. Again, I reject this statement since women in the U.S have a higher automation risk than women in Ghana.

4.3.3 Research Question Three

The final research question this study seeks to answer is how is the effect of automation on jobs different for men than for women? From the analysis of the probability index, it was found that although the majority of both the male and female workforce have a predominantly medium risk of automation, 42% of the total male workforce has a medium automation risk whilst 38% of the female workforce has a medium automation. Also, the male workforce has an 18% high automation risk whilst the female workforce has a 15% automation risk. This suggests that men in Ghana are affected slightly more than the women in Ghana by automation.

4.3.4 Analysis Of Online Survey.

For the online survey data analysis, there were both quantitative and qualitative responses recorded. Out of the 48 responses received, 87% of the women had heard about the emerging technology of automation whilst 13% had not heard of it. In addition, when asked how worried they were about the prospects of robots replacing their jobs, most of the women were neutral.

82.6% of the women also did not consider the risk of automation when picking their current occupations.

Next, I asked the respondents their opinions on the research questions of this study;

- o **What is the effect of automation on women's access to jobs in Ghana?**
- o **How is this effect different for women in other parts of the world?**
- o **How is the effect of automation on jobs different for men than for women?**

For the first question, 44.6% of the respondents answered that more women in Ghana will be negatively affected by the effects of automation, 19.2% answered that automation will not affect women's employment in Ghana negatively whilst the rest of the respondents were either not sure or did not respond. This suggests that most of the respondents believed that women were at a higher risk of their jobs being replaced by computerization just like my hypothesis. However, as discovered from the analysis of the first research question, only 15% of the female working force are at a high risk of automation.

Moreover, for the second research question, most of the respondents thought that women in Ghana would be more at risk of automation than women in other parts of the country. Despite this, a significant number of the respondents also thought that there would be no difference in how automation affected women's employment in Ghana than how it affected the employment of women in western countries. One respondent stated that, "The effect may not be entirely different from those in other developing and mature economies, because gendered employment and stereotypes still exist and play monumental role. Rather, the access of women to higher skills which will make them active participants in a future automated industry differ significantly and as such will have different outcomes."

Again, from the analysis of research question two, both opinions were different from the facts as 20% of women in western countries are more prone to being replaced by robots than women in Ghana.

Furthermore, for the last research question, a significant number of the women believe that women are at a higher risk of being replaced by robots than men are. However, some respondents have interesting additions to their opinions. Participants 6 and 32 believe that "the probability of automation affecting women is less than the effects on men. As I think the jobs most of the common jobs men typically find themselves in can be automatized." Participant 10 also believes that "Most women are not educated but now women are being enrolled into various fields of enlightened." Finally, Participant 44 is of the opinion that "Men as well women lose jobs with the adoption of technology. However, with the current situation where more men than women are involved in highly-skilled jobs, men are more likely to benefit from automation." From the analysis of the research question, both men and women in Ghana experience a lower risk of automation however, men are more affected than women are contrary to what many of the respondents believe.

Chapter 5 – Conclusions And Recommendations.

5.1 Introduction

The goal of my research was to assess the effects of automation on women's employment in Ghana. I specifically wanted to know to know the number of women who are at high risk of being replaced by automation as well as the numbers who are at low risk. In addition, I wanted to compare these proportions to the proportions of men's automation risk in Ghana and then to that of women in western countries. As such, I explored the past studies on the topic, and my work was heavily reliant on that if Frey and Osbourne (2013). These research helped me understand the effects of automation on employment for American labour force and U.K labour force. This served as a foundation for calculating the rates for the Ghanaian labour force. In addition, I collected data through an online survey and asked my respondents to answer my research questions. In this chapter, I will provide an overview of the results of my study and analyze the results in concurrence with literature I referenced I my literature review. I will also emphasize the limitations of this study and suggest recommendations for future research in this area.

5.2 Summary of the results

The results revealed that women are predominantly at a medium risk (between 30% and 70%) of automation and only 15% of women are at a high risk of automation. This effect is less than the 20% risk of women in the U.S. and is also lower than for men in Ghana. This can be attributed to the fact that a majority of women in Ghana are employed in the service sector. This suggests that their jobs require higher social skills and as Frey and Osbourne (2013) stated in their research, jobs that require more social skills are less susceptible to automation. Muro,

Maxim and Whiton (2019) also asserted in their study that women are generally employed in jobs that require more social skills which reduce their risk of automation. Also, although a very small percentage of women in the workforce are at a high risk of automation, a greater percentage are at medium risk which does not mean that the jobs of Ghanaian are safe from the age of computerization.

The findings of this study are very significant as they add to the growing body of literature on the subject of automation and employment. The conclusions made in this study can help policymakers understand exactly how much of the labour force of Ghana will be affected by automation and how this will affect our productivity and economic performance. This will also help to guide policymakers on how to intervene.

5.3 Recommendations and Future Research

This research is constrained by the age of the data from the Ghana Statistical Service. As the data was gathered 6 years ago, there is reduced accuracy Also, the data will be more accurate if the occupations are split further into individual jobs rather than sectors. As such, I recommend that for future research, a more recent National Employment Report should be used to ensure that the findings are more current and thus, more accurate. I also suggest that extensive research to define into detail the various occupations that Ghanaians are employed in and the various component task within each task. This will help to increase the accuracy of the probability index developed for the labour force in Ghana.

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Appendix A

Occupation	Probability	Percentage	Risk Level
1. Agriculture (crops)	0.482	48%	Medium
2. Forestry	0.0081	0.8%	Low
3. Livestock	0.95	95%	High
4. Fishing	0.83	83%	High
5. Mining and Quarrying	0.14	14%	Low
6. Manufacturing	0.83	83%	High
7. Electricity & gas supply	0.88	88%	High
8. Water supply; sewerage, waste management.	0.61	61%	Medium
9. Construction	0.88	88%	High
10. Wholesale and retail trade	0.31	31%	Medium
11. Transportation and storage	0.425	42%	Medium
12. Accommodation & food service	0.063	6%	Low
13. Information and communication	0.033	3%	Low
14. Financial and insurance activities	0.54	54%	Medium
15. Real estate activities	0.86	86%	High

16. Professional, scientific & technical	0.007	0.7%	Low
17. Administrative & support service	0.33	33%	Medium
18. Public administration and defense	0.34	34%	Medium
19. Education	0.007	0.7%	Low
20. Human health and social work activities	0.016	1%	Low
21. Arts, entertainment and recreation	0.12	12%	Low

Appendix B

Appendix C

```javascript
2   // This is an array of objects that stores the requirements of occupations that is prompted to the user and the weight for each prompt.
3   // Skills requiring more social intelligence will have negative weights and skills that require manual skills will have a posiive weight
4
5   var prompts = [
6   {
7       prompt:'social perceptiveness (this involves being aware of others reactions and understanding why they react as they do, also known
8       weight: -1,
9       class: 'group0'
10  },
11  {
12      prompt: 'Negotiation & persuasion',
13      weight: -1,
14      class: 'group1'
15  },
16  {
17      prompt: 'assisting and caring for others',
18      weight: -1,
19      class: 'group2'
20  },
21  {
22      prompt: 'Originality & creativity',
23      weight: -1,
24      class: 'group3'
25  },
26  {
27      prompt: 'Fine arts',
28      weight: -1,
29      class: 'group4'
30  },
31  {
32      prompt: 'finger dexterity (the measure of a persons ability to handle small objects or to manipulate controls using their fingers)',
33      weight: 1,
34      class: 'group5'
35  },
36  {
37      prompt: 'manual dexterity (the ability to use your hands in a skillful, coordinated way to grasp and manipulate objects and demonstr
38      weight: 1,
39      class: 'group6'
40  },
```

```javascript
191  $('#submit-btn').click(function () {
192      // After clicking submit, add up the totals from answers
193      // For each group, find the value that is active
194      $('.results').removeClass('hide');
195      $('.results').addClass('show');
196
197      if(total < 0) {
198          // document.getElementById('intro-bar').style.width = ((total / 60) * 100) + '%';
199          // console.log(document.getElementById('intro-bar').style.width);
200          // document.getElementById('intro-bar').innerHTML= ((total / 60) * 100) + '%';
201          document.getElementById('results').innerHTML = '<b>Your job has a low risk of computerization!</b><br><br>\
202          ';
203      } else if(total > 0) {
204          document.getElementById('results').innerHTML = '<b>Your job has a high risk of computerization!</b><br><br>\
205          ';
206      } else {
207          document.getElementById('results').innerHTML = '<b>Your job has a medium risk of computerization!</b><br><br>\
208          '
209      }
210
211      // Hide the quiz after submit
212      $('#quiz').addClass('hide');
213      $('#submit-btn').addClass('hide');
214      $('#retake-btn').removeClass('hide');
215  })
216
217  // Refresh the screen when retake button is clicked
218  $('#retake-btn').click(function () {
219      $('#quiz').removeClass('hide');
220      $('#submit-btn').removeClass('hide');
221      $('#retake-btn').addClass('hide');
222
223      $('.results').addClass('hide');
224      $('.results').removeClass('show');
225  })
```

Appendix D (Frey and Osbourne, 2013)

The table below ranks occupations according to their probability of computerisation (from least- to most-computerisable). Those occupations used as training data are labelled as either '0' (not computerisable) or '1' (computerisable), respectively. There are 70 such occupations, 10 percent of the total number of occupations.

	Computerisable			
Rank	Probability	Label	SOC code	Occupation
1.	0.0028		29-1125	Recreational Therapists
2.	0.003		49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers
3.	0.003		11-9161	Emergency Management Directors
4.	0.0031		21-1023	Mental Health and Substance Abuse Social Workers
5.	0.0033		29-1181	Audiologists
6.	0.0035		29-1122	Occupational Therapists
7.	0.0035		29-2091	Orthotists and Prosthetists
8.	0.0035		21-1022	Healthcare Social Workers
9.	0.0036		29-1022	Oral and Maxillofacial Surgeons
10.	0.0036		33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers
11.	0.0039		29-1031	Dietitians and Nutritionists
12.	0.0039		11-9081	Lodging Managers
13.	0.004		27-2032	Choreographers
14.	0.0041		41-9031	Sales Engineers
15.	0.0042	0	29-1060	Physicians and Surgeons
16.	0.0042		25-9031	Instructional Coordinators
17.	0.0043		19-3039	Psychologists, All Other
18.	0.0044		33-1012	First-Line Supervisors of Police and Detectives
19.	0.0044	0	29-1021	Dentists, General
20.	0.0044		25-2021	Elementary School Teachers, Except Special Education
21.	0.0045		19-1042	Medical Scientists, Except Epidemiologists
22.	0.0046		11-9032	Education Administrators, Elementary and Secondary School
23.	0.0046		29-1081	Podiatrists
24.	0.0047		19-3031	Clinical, Counseling, and School Psychologists
25.	0.0048		21-1014	Mental Health Counselors
26.	0.0049		51-6092	Fabric and Apparel Patternmakers
27.	0.0055		27-1027	Set and Exhibit Designers
28.	0.0055		11-3121	Human Resources Managers
29.	0.0061		39-9032	Recreation Workers
30.	0.0063		11-3131	Training and Development Managers
31.	0.0064		29-1127	Speech-Language Pathologists
32.	0.0065		15-1121	Computer Systems Analysts
33.	0.0067	0	11-9151	Social and Community Service Managers
34.	0.0068		25-4012	Curators
35.	0.0071		29-9091	Athletic Trainers
36.	0.0073		11-9111	Medical and Health Services Managers
37.	0.0074	0	25-2011	Preschool Teachers, Except Special Education
38.	0.0075		25-9021	Farm and Home Management Advisors
39.	0.0077		19-3091	Anthropologists and Archeologists

Rank	Probability	Label	SOC code	Occupation
40.	0.0077		25-2054	Special Education Teachers, Secondary School
41.	0.0078		25-2031	Secondary School Teachers, Except Special and Career/Technical Education
42.	0.0081	0	21-2011	Clergy
43.	0.0081		19-1032	Foresters
44.	0.0085		21-1012	Educational, Guidance, School, and Vocational Counselors
45.	0.0088		25-2032	Career/Technical Education Teachers, Secondary School
46.	0.009	0	29-1111	Registered Nurses
47.	0.0094		21-1015	Rehabilitation Counselors
48.	0.0095		25-3999	Teachers and Instructors, All Other
49.	0.0095		19-4092	Forensic Science Technicians
50.	0.01		39-5091	Makeup Artists, Theatrical and Performance
51.	0.01		17-2121	Marine Engineers and Naval Architects
52.	0.01		11-9033	Education Administrators, Postsecondary
53.	0.011		17-2141	Mechanical Engineers
54.	0.012		29-1051	Pharmacists
55.	0.012		13-1081	Logisticians
56.	0.012		19-1022	Microbiologists
57.	0.012		19-3032	Industrial-Organizational Psychologists
58.	0.013		27-2022	Coaches and Scouts
59.	0.013		11-2022	Sales Managers
60.	0.014		19-2043	Hydrologists
61.	0.014		11-2021	Marketing Managers
62.	0.014	0	21-1013	Marriage and Family Therapists
63.	0.014		17-2199	Engineers, All Other
64.	0.014		13-1151	Training and Development Specialists
65.	0.014		43-1011	First-Line Supervisors of Office and Administrative Support Workers
66.	0.015		19-1029	Biological Scientists, All Other
67.	0.015		11-2031	Public Relations and Fundraising Managers
68.	0.015		27-1014	Multimedia Artists and Animators
69.	0.015		15-1111	Computer and Information Research Scientists
70.	0.015	0	11-1011	Chief Executives
71.	0.015	0	11-9031	Education Administrators, Preschool and Childcare Center/Program
72.	0.015		27-2041	Music Directors and Composers
73.	0.016		51-1011	First-Line Supervisors of Production and Operating Workers
74.	0.016		41-3031	Securities, Commodities, and Financial Services Sales Agents
75.	0.016		19-1031	Conservation Scientists
76.	0.016		25-2053	Special Education Teachers, Middle School
77.	0.017		17-2041	Chemical Engineers
78.	0.017		11-9041	Architectural and Engineering Managers
79.	0.017		17-2011	Aerospace Engineers
80.	0.018		11-9121	Natural Sciences Managers
81.	0.018		17-2081	Environmental Engineers
82.	0.018		17-1011	Architects, Except Landscape and Naval
83.	0.018		31-2021	Physical Therapist Assistants
84.	0.019	0	17-2051	Civil Engineers
85.	0.02		29-1199	Health Diagnosing and Treating Practitioners, All Other
86.	0.021		19-1013	Soil and Plant Scientists
87.	0.021		19-2032	Materials Scientists

Rank	Probability	Label	SOC code	Occupation
88.	0.021		17-2131	Materials Engineers
89.	0.021	0	27-1022	Fashion Designers
90.	0.021		29-1123	Physical Therapists
91.	0.021		27-4021	Photographers
92.	0.022		27-2012	Producers and Directors
93.	0.022		27-1025	Interior Designers
94.	0.023		29-1023	Orthodontists
95.	0.023		27-1011	Art Directors
96.	0.025		33-1011	First-Line Supervisors of Correctional Officers
97.	0.025		21-2021	Directors, Religious Activities and Education
98.	0.025		17-2072	Electronics Engineers, Except Computer
99.	0.027		19-1021	Biochemists and Biophysicists
100.	0.027		29-1011	Chiropractors
101.	0.028		31-2011	Occupational Therapy Assistants
102.	0.028		21-1021	Child, Family, and School Social Workers
103.	0.028		17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
104.	0.029		17-2112	Industrial Engineers
105.	0.029		53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators
106.	0.029		29-2056	Veterinary Technologists and Technicians
107.	0.03		11-3051	Industrial Production Managers
108.	0.03		17-3026	Industrial Engineering Technicians
109.	0.03		15-1142	Network and Computer Systems Administrators
110.	0.03		15-1141	Database Administrators
111.	0.03		11-3061	Purchasing Managers
112.	0.032		25-1000	Postsecondary Teachers
113.	0.033		19-2041	Environmental Scientists and Specialists, Including Health
114.	0.033	0	21-1011	Substance Abuse and Behavioral Disorder Counselors
115.	0.035	0	23-1011	Lawyers
116.	0.035		27-1012	Craft Artists
117.	0.035		15-2031	Operations Research Analysts
118.	0.035		11-3021	Computer and Information Systems Managers
119.	0.037		27-1021	Commercial and Industrial Designers
120.	0.037		17-2031	Biomedical Engineers
121.	0.037	0	13-1121	Meeting, Convention, and Event Planners
122.	0.038		29-1131	Veterinarians
123.	0.038		27-3043	Writers and Authors
124.	0.039		11-2011	Advertising and Promotions Managers
125.	0.039		19-3094	Political Scientists
126.	0.04		13-2071	Credit Counselors
127.	0.04		19-3099	Social Scientists and Related Workers, All Other
128.	0.041		19-2011	Astronomers
129.	0.041		53-5031	Ship Engineers
130.	0.042		15-1132	Software Developers, Applications
131.	0.042		27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators
132.	0.043		29-2053	Psychiatric Technicians
133.	0.045	0	17-1012	Landscape Architects
134.	0.045		21-1091	Health Educators

Rank	Probability	Label	SOC code	Occupation
135.	0.047		15-2021	Mathematicians
136.	0.047		27-1023	Floral Designers
137.	0.047		11-9013	Farmers, Ranchers, and Other Agricultural Managers
138.	0.048		33-2022	Forest Fire Inspectors and Prevention Specialists
139.	0.049		29-2041	Emergency Medical Technicians and Paramedics
140.	0.055		27-3041	Editors
141.	0.055		29-1024	Prosthodontists
142.	0.055	0	29-9799	Healthcare Practitioners and Technical Workers, All Other
143.	0.057		39-7012	Travel Guides
144.	0.058		29-2061	Licensed Practical and Licensed Vocational Nurses
145.	0.059		19-3041	Sociologists
146.	0.06		23-1022	Arbitrators, Mediators, and Conciliators
147.	0.061		19-1011	Animal Scientists
148.	0.064		39-9041	Residential Advisors
149.	0.066		53-1011	Aircraft Cargo Handling Supervisors
150.	0.066		29-1126	Respiratory Therapists
151.	0.067		27-3021	Broadcast News Analysts
152.	0.069		11-3031	Financial Managers
153.	0.07		17-2161	Nuclear Engineers
154.	0.071		11-9021	Construction Managers
155.	0.074		27-2042	Musicians and Singers
156.	0.075		41-1012	First-Line Supervisors of Non-Retail Sales Workers
157.	0.076		39-1021	First-Line Supervisors of Personal Service Workers
158.	0.077		19-1012	Food Scientists and Technologists
159.	0.08	0	13-1041	Compliance Officers
160.	0.08		33-3031	Fish and Game Wardens
161.	0.082		27-1024	Graphic Designers
162.	0.083		11-9051	Food Service Managers
163.	0.084	0	39-9011	Childcare Workers
164.	0.085		39-9031	Fitness Trainers and Aerobics Instructors
165.	0.091		11-9071	Gaming Managers
166.	0.097		49-9051	Electrical Power-Line Installers and Repairers
167.	0.098		33-3051	Police and Sheriff's Patrol Officers
168.	0.099		41-3041	Travel Agents
169.	0.1	0	35-1011	Chefs and Head Cooks
170.	0.1		39-2011	Animal Trainers
171.	0.1		27-3011	Radio and Television Announcers
172.	0.1	0	17-2071	Electrical Engineers
173.	0.1		19-2031	Chemists
174.	0.1		29-2054	Respiratory Therapy Technicians
175.	0.1	0	19-2012	Physicists
176.	0.11	0	39-5012	Hairdressers, Hairstylists, and Cosmetologists
177.	0.11		27-3022	Reporters and Correspondents
178.	0.11		53-2021	Air Traffic Controllers
179.	0.13		27-2031	Dancers
180.	0.13		29-2033	Nuclear Medicine Technologists
181.	0.13		15-1133	Software Developers, Systems Software
182.	0.13		13-1111	Management Analysts
183.	0.13		29-2051	Dietetic Technicians

Rank	Probability	Label	SOC code	Occupation
184.	0.13		19-3051	Urban and Regional Planners
185.	0.13		21-1093	Social and Human Service Assistants
186.	0.13		25-3021	Self-Enrichment Education Teachers
187.	0.13		27-4014	Sound Engineering Technicians
188.	0.14		29-1041	Optometrists
189.	0.14		17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
190.	0.14		29-1071	Physician Assistants
191.	0.15		25-2012	Kindergarten Teachers, Except Special Education
192.	0.15		47-2111	Electricians
193.	0.16		17-2171	Petroleum Engineers
194.	0.16		43-9031	Desktop Publishers
195.	0.16		11-1021	General and Operations Managers
196.	0.17		29-9011	Occupational Health and Safety Specialists
197.	0.17		33-2011	Firefighters
198.	0.17		13-2061	Financial Examiners
199.	0.17		47-1011	First-Line Supervisors of Construction Trades and Extraction Workers
200.	0.17		25-2022	Middle School Teachers, Except Special and Career/Technical Education
201.	0.18		27-3031	Public Relations Specialists
202.	0.18		49-9092	Commercial Divers
203.	0.18		49-9095	Manufactured Building and Mobile Home Installers
204.	0.18		53-2011	Airline Pilots, Copilots, and Flight Engineers
205.	0.19		25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors
206.	0.2		19-1041	Epidemiologists
207.	0.2		39-4831	Funeral Service Managers, Directors, Morticians, and Undertakers
208.	0.21		15-1179	Information Security Analysts, Web Developers, and Computer Network Architects
209.	0.21		15-2011	Actuaries
210.	0.21		33-9011	Animal Control Workers
211.	0.21	0	39-6012	Concierges
212.	0.22		15-1799	Computer Occupations, All Other
213.	0.22		15-2041	Statisticians
214.	0.22		17-2061	Computer Hardware Engineers
215.	0.23		19-3022	Survey Researchers
216.	0.23		13-1199	Business Operations Specialists, All Other
217.	0.23		13-2051	Financial Analysts
218.	0.23		29-2037	Radiologic Technologists and Technicians
219.	0.23		29-2031	Cardiovascular Technologists and Technicians
220.	0.24		13-1011	Agents and Business Managers of Artists, Performers, and Athletes
221.	0.24		17-3029	Engineering Technicians, Except Drafters, All Other
222.	0.25		19-3092	Geographers
223.	0.25		29-9012	Occupational Health and Safety Technicians
224.	0.25		21-1092	Probation Officers and Correctional Treatment Specialists
225.	0.25		17-3025	Environmental Engineering Technicians
226.	0.25		11-9199	Managers, All Other
227.	0.25		53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians
228.	0.25		41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

Rank	Probability	Label	SOC code	Occupation
229.	0.26		25-2023	Career/Technical Education Teachers, Middle School
230.	0.27		53-5021	Captains, Mates, and Pilots of Water Vessels
231.	0.27		31-2012	Occupational Therapy Aides
232.	0.27		49-9062	Medical Equipment Repairers
233.	0.28		41-1011	First-Line Supervisors of Retail Sales Workers
234.	0.28	0	27-2021	Athletes and Sports Competitors
235.	0.28		39-1011	Gaming Supervisors
236.	0.29		39-5094	Skincare Specialists
237.	0.29		13-1022	Wholesale and Retail Buyers, Except Farm Products
238.	0.3		19-4021	Biological Technicians
239.	0.3		31-9092	Medical Assistants
240.	0.3	0	19-1023	Zoologists and Wildlife Biologists
241.	0.3		35-2013	Cooks, Private Household
242.	0.31		13-1078	Human Resources, Training, and Labor Relations Specialists, All Other
243.	0.31		33-9021	Private Detectives and Investigators
244.	0.31		27-4032	Film and Video Editors
245.	0.33		13-2099	Financial Specialists, All Other
246.	0.34		33-3021	Detectives and Criminal Investigators
247.	0.34		29-2055	Surgical Technologists
248.	0.34		29-1124	Radiation Therapists
249.	0.35	0	47-2152	Plumbers, Pipefitters, and Steamfitters
250.	0.35	0	53-2031	Flight Attendants
251.	0.35		29-2032	Diagnostic Medical Sonographers
252.	0.36		33-3011	Bailiffs
253.	0.36		51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic
254.	0.36		49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers
255.	0.37		51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders
256.	0.37		53-7061	Cleaners of Vehicles and Equipment
257.	0.37		39-4021	Funeral Attendants
258.	0.37		47-5081	Helpers–Extraction Workers
259.	0.37		27-2011	Actors
260.	0.37		53-7111	Mine Shuttle Car Operators
261.	0.38		49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
262.	0.38	1	17-1022	Surveyors
263.	0.38		17-3027	Mechanical Engineering Technicians
264.	0.38		53-7064	Packers and Packagers, Hand
265.	0.38		27-3091	Interpreters and Translators
266.	0.39		31-1011	Home Health Aides
267.	0.39		51-6093	Upholsterers
268.	0.39		47-4021	Elevator Installers and Repairers
269.	0.39		43-3041	Gaming Cage Workers
270.	0.39		25-9011	Audio-Visual and Multimedia Collections Specialists
271.	0.4	0	23-1023	Judges, Magistrate Judges, and Magistrates
272.	0.4		49-3042	Mobile Heavy Equipment Mechanics, Except Engines
273.	0.4		29-2799	Health Technologists and Technicians, All Other
274.	0.41		45-2041	Graders and Sorters, Agricultural Products

Rank	Probability	Label	SOC code	Occupation
275.	0.41		51-2041	Structural Metal Fabricators and Fitters
276.	0.41	1	23-1012	Judicial Law Clerks
277.	0.41		49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
278.	0.42		19-4093	Forest and Conservation Technicians
279.	0.42		53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand
280.	0.43		39-3093	Locker Room, Coatroom, and Dressing Room Attendants
281.	0.43		19-2099	Physical Scientists, All Other
282.	0.43	0	19-3011	Economists
283.	0.44		19-3093	Historians
284.	0.45		51-9082	Medical Appliance Technicians
285.	0.46		43-4031	Court, Municipal, and License Clerks
286.	0.47		13-1141	Compensation, Benefits, and Job Analysis Specialists
287.	0.47		31-1013	Psychiatric Aides
288.	0.47		29-2012	Medical and Clinical Laboratory Technicians
289.	0.48		33-2021	Fire Inspectors and Investigators
290.	0.48		17-3021	Aerospace Engineering and Operations Technicians
291.	0.48		27-1026	Merchandise Displayers and Window Trimmers
292.	0.48		47-5031	Explosives Workers, Ordnance Handling Experts, and Blasters
293.	0.48		15-1131	Computer Programmers
294.	0.49		33-9091	Crossing Guards
295.	0.49		17-2021	Agricultural Engineers
296.	0.49		47-5061	Roof Bolters, Mining
297.	0.49		49-9052	Telecommunications Line Installers and Repairers
298.	0.49		43-5031	Police, Fire, and Ambulance Dispatchers
299.	0.5		53-7033	Loading Machine Operators, Underground Mining
300.	0.5		49-9799	Installation, Maintenance, and Repair Workers, All Other
301.	0.5		23-2091	Court Reporters
302.	0.51		41-9011	Demonstrators and Product Promoters
303.	0.51		31-9091	Dental Assistants
304.	0.52		51-6041	Shoe and Leather Workers and Repairers
305.	0.52		17-3011	Architectural and Civil Drafters
306.	0.53		47-5012	Rotary Drill Operators, Oil and Gas
307.	0.53		47-4041	Hazardous Materials Removal Workers
308.	0.54		39-4011	Embalmers
309.	0.54		47-5041	Continuous Mining Machine Operators
310.	0.54		39-1012	Slot Supervisors
311.	0.54		31-9011	Massage Therapists
312.	0.54		41-3011	Advertising Sales Agents
313.	0.55		49-3022	Automotive Glass Installers and Repairers
314.	0.55		53-2012	Commercial Pilots
315.	0.55		43-4051	Customer Service Representatives
316.	0.55		27-4011	Audio and Video Equipment Technicians
317.	0.56		25-9041	Teacher Assistants
318.	0.57		45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers
319.	0.57		19-4031	Chemical Technicians
320.	0.57		47-3015	Helpers–Pipelayers, Plumbers, Pipefitters, and Steamfitters
321.	0.57	1	13-1051	Cost Estimators

Rank	Probability	Label	SOC code	Occupation
322.	0.57		33-3052	Transit and Railroad Police
323.	0.57		37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers
324.	0.58		13-2052	Personal Financial Advisors
325.	0.59		49-9044	Millwrights
326.	0.59		25-4013	Museum Technicians and Conservators
327.	0.59		47-5042	Mine Cutting and Channeling Machine Operators
328.	0.59	0	11-3071	Transportation, Storage, and Distribution Managers
329.	0.59		49-3092	Recreational Vehicle Service Technicians
330.	0.59		49-3023	Automotive Service Technicians and Mechanics
331.	0.6		33-3012	Correctional Officers and Jailers
332.	0.6		27-4031	Camera Operators, Television, Video, and Motion Picture
333.	0.6		51-3023	Slaughterers and Meat Packers
334.	0.61		49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles
335.	0.61		31-2022	Physical Therapist Aides
336.	0.61		39-3092	Costume Attendants
337.	0.61	1	13-1161	Market Research Analysts and Marketing Specialists
338.	0.61		43-4181	Reservation and Transportation Ticket Agents and Travel Clerks
339.	0.61		51-8031	Water and Wastewater Treatment Plant and System Operators
340.	0.61		19-4099	Life, Physical, and Social Science Technicians, All Other
341.	0.61		51-3093	Food Cooking Machine Operators and Tenders
342.	0.61		51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
343.	0.62	1	53-5022	Motorboat Operators
344.	0.62		47-2082	Tapers
345.	0.62		47-2151	Pipelayers
346.	0.63		19-2042	Geoscientists, Except Hydrologists and Geographers
347.	0.63		49-9012	Control and Valve Installers and Repairers, Except Mechanical Door
348.	0.63		31-9799	Healthcare Support Workers, All Other
349.	0.63		35-1012	First-Line Supervisors of Food Preparation and Serving Workers
350.	0.63		47-4011	Construction and Building Inspectors
351.	0.64		51-9031	Cutters and Trimmers, Hand
352.	0.64		49-9071	Maintenance and Repair Workers, General
353.	0.64		23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers
354.	0.64		43-5081	Stock Clerks and Order Fillers
355.	0.64		51-8012	Power Distributors and Dispatchers
356.	0.64		47-2132	Insulation Workers, Mechanical
357.	0.65		19-4061	Social Science Research Assistants
358.	0.65		51-4041	Machinists
359.	0.65		15-1150	Computer Support Specialists
360.	0.65		25-4021	Librarians
361.	0.65		49-2097	Electronic Home Entertainment Equipment Installers and Repairers
362.	0.65		49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
363.	0.65		53-7041	Hoist and Winch Operators
364.	0.66		37-2021	Pest Control Workers
365.	0.66		51-9198	Helpers–Production Workers
366.	0.66		43-9111	Statistical Assistants
367.	0.66		37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners
368.	0.66		49-3051	Motorboat Mechanics and Service Technicians

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Rank	Probability	Label	SOC code	Occupation
369.	0.67		51-9196	Paper Goods Machine Setters, Operators, and Tenders
370.	0.67		51-4071	Foundry Mold and Coremakers
371.	0.67		19-2021	Atmospheric and Space Scientists
372.	0.67	1	53-3021	Bus Drivers, Transit and Intercity
373.	0.67		33-9092	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers
374.	0.67		49-9041	Industrial Machinery Mechanics
375.	0.68		43-5052	Postal Service Mail Carriers
376.	0.68		47-5071	Roustabouts, Oil and Gas
377.	0.68		47-2011	Boilermakers
378.	0.68		17-3013	Mechanical Drafters
379.	0.68		29-2021	Dental Hygienists
380.	0.69	1	53-3033	Light Truck or Delivery Services Drivers
381.	0.69	0	37-2012	Maids and Housekeeping Cleaners
382.	0.69		51-9122	Painters, Transportation Equipment
383.	0.7		43-4061	Eligibility Interviewers, Government Programs
384.	0.7		49-3093	Tire Repairers and Changers
385.	0.7		51-3092	Food Batchmakers
386.	0.7		49-2091	Avionics Technicians
387.	0.71		49-3011	Aircraft Mechanics and Service Technicians
388.	0.71		53-2022	Airfield Operations Specialists
389.	0.71		51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers
390.	0.71		47-4799	Construction and Related Workers, All Other
391.	0.71		29-2081	Opticians, Dispensing
392.	0.71		51-6011	Laundry and Dry-Cleaning Workers
393.	0.72		39-3091	Amusement and Recreation Attendants
394.	0.72		31-9095	Pharmacy Aides
395.	0.72		47-3016	Helpers–Roofers
396.	0.72		53-7121	Tank Car, Truck, and Ship Loaders
397.	0.72		49-9031	Home Appliance Repairers
398.	0.72		47-2031	Carpenters
399.	0.72		27-3012	Public Address System and Other Announcers
400.	0.73		51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders
401.	0.73		11-3011	Administrative Services Managers
402.	0.73		47-2121	Glaziers
403.	0.73		51-2021	Coil Winders, Tapers, and Finishers
404.	0.73		49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
405.	0.74		49-2011	Computer, Automated Teller, and Office Machine Repairers
406.	0.74		39-9021	Personal Care Aides
407.	0.74		27-4012	Broadcast Technicians
408.	0.74		47-3013	Helpers–Electricians
409.	0.75		11-9131	Postmasters and Mail Superintendents
410.	0.75		47-2044	Tile and Marble Setters
411.	0.75		47-2141	Painters, Construction and Maintenance
412.	0.75		53-6061	Transportation Attendants, Except Flight Attendants
413.	0.75	1	17-3022	Civil Engineering Technicians
414.	0.75		49-3041	Farm Equipment Mechanics and Service Technicians
415.	0.76		25-4011	Archivists
416.	0.76		51-9011	Chemical Equipment Operators and Tenders

Rank	Probability	Label	SOC code	Occupation
417.	0.76		49-2092	Electric Motor, Power Tool, and Related Repairers
418.	0.76		45-4021	Fallers
419.	0.77		19-4091	Environmental Science and Protection Technicians, Including Health
420.	0.77		49-9094	Locksmiths and Safe Repairers
421.	0.77		37-3013	Tree Trimmers and Pruners
422.	0.77		35-3011	Bartenders
423.	0.77		13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products
424.	0.77	1	35-9021	Dishwashers
425.	0.77	0	45-3021	Hunters and Trappers
426.	0.78		31-9093	Medical Equipment Preparers
427.	0.78		51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
428.	0.78		43-9011	Computer Operators
429.	0.78		51-8092	Gas Plant Operators
430.	0.79		43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators
431.	0.79		53-3032	Heavy and Tractor-Trailer Truck Drivers
432.	0.79		39-5093	Shampooers
433.	0.79		47-2081	Drywall and Ceiling Tile Installers
434.	0.79		49-9098	Helpers–Installation, Maintenance, and Repair Workers
435.	0.79		49-3052	Motorcycle Mechanics
436.	0.79		51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
437.	0.79		45-4022	Logging Equipment Operators
438.	0.79		47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles
439.	0.8		39-5011	Barbers
440.	0.8		47-5011	Derrick Operators, Oil and Gas
441.	0.81	1	35-2011	Cooks, Fast Food
442.	0.81		43-9022	Word Processors and Typists
443.	0.81	1	17-3012	Electrical and Electronics Drafters
444.	0.81		17-3024	Electro-Mechanical Technicians
445.	0.81		51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders
446.	0.81		11-9141	Property, Real Estate, and Community Association Managers
447.	0.81		43-6013	Medical Secretaries
448.	0.81		51-6021	Pressers, Textile, Garment, and Related Materials
449.	0.82		51-2031	Engine and Other Machine Assemblers
450.	0.82		49-2098	Security and Fire Alarm Systems Installers
451.	0.82		49-9045	Refractory Materials Repairers, Except Brickmasons
452.	0.82		39-2021	Nonfarm Animal Caretakers
453.	0.82	1	47-2211	Sheet Metal Workers
454.	0.82		47-2072	Pile-Driver Operators
455.	0.82		47-2021	Brickmasons and Blockmasons
456.	0.83		45-3011	Fishers and Related Fishing Workers
457.	0.83		47-2221	Structural Iron and Steel Workers
458.	0.83		53-4021	Railroad Brake, Signal, and Switch Operators
459.	0.83		53-4031	Railroad Conductors and Yardmasters
460.	0.83		35-2012	Cooks, Institution and Cafeteria
461.	0.83		53-5011	Sailors and Marine Oilers
462.	0.83		51-9023	Mixing and Blending Machine Setters, Operators, and Tenders

Rank	Probability	Label	SOC code	Occupation
463.	0.83		47-3011	Helpers–Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
464.	0.83		47-4091	Segmental Pavers
465.	0.83		47-2131	Insulation Workers, Floor, Ceiling, and Wall
466.	0.83		51-5112	Printing Press Operators
467.	0.83		53-6031	Automotive and Watercraft Service Attendants
468.	0.83		47-4071	Septic Tank Servicers and Sewer Pipe Cleaners
469.	0.83		39-6011	Baggage Porters and Bellhops
470.	0.83		41-2012	Gaming Change Persons and Booth Cashiers
471.	0.83		51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic
472.	0.83		47-2071	Paving, Surfacing, and Tamping Equipment Operators
473.	0.84		51-4111	Tool and Die Makers
474.	0.84		17-3023	Electrical and Electronics Engineering Technicians
475.	0.84		47-2161	Plasterers and Stucco Masons
476.	0.84		51-4192	Layout Workers, Metal and Plastic
477.	0.84		51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic
478.	0.84		33-9032	Security Guards
479.	0.84		51-6052	Tailors, Dressmakers, and Custom Sewers
480.	0.84		53-7073	Wellhead Pumpers
481.	0.84		43-9081	Proofreaders and Copy Markers
482.	0.84		33-3041	Parking Enforcement Workers
483.	0.85		53-7062	Laborers and Freight, Stock, and Material Movers, Hand
484.	0.85		41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
485.	0.85	1	43-5041	Meter Readers, Utilities
486.	0.85		51-8013	Power Plant Operators
487.	0.85		51-8091	Chemical Plant and System Operators
488.	0.85		47-5021	Earth Drillers, Except Oil and Gas
489.	0.85		19-4051	Nuclear Technicians
490.	0.86		43-6011	Executive Secretaries and Executive Administrative Assistants
491.	0.86		51-8099	Plant and System Operators, All Other
492.	0.86		35-3041	Food Servers, Nonrestaurant
493.	0.86		51-7041	Sawing Machine Setters, Operators, and Tenders, Wood
494.	0.86		53-4041	Subway and Streetcar Operators
495.	0.86		31-9096	Veterinary Assistants and Laboratory Animal Caretakers
496.	0.86		51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders
497.	0.86		41-9022	Real Estate Sales Agents
498.	0.86	1	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic
499.	0.86		49-9043	Maintenance Workers, Machinery
500.	0.86		43-4021	Correspondence Clerks
501.	0.87		45-2090	Miscellaneous Agricultural Workers
502.	0.87		45-4011	Forest and Conservation Workers
503.	0.87		51-4052	Pourers and Casters, Metal
504.	0.87		47-2041	Carpet Installers
505.	0.87		47-2142	Paperhangers
506.	0.87		13-1021	Buyers and Purchasing Agents, Farm Products
507.	0.87		51-7021	Furniture Finishers
508.	0.87		35-2021	Food Preparation Workers

Rank	Probability	Label	SOC code	Occupation
509.	0.87		47-2043	Floor Sanders and Finishers
510.	0.87	1	53-6021	Parking Lot Attendants
511.	0.87		47-4051	Highway Maintenance Workers
512.	0.88		47-2061	Construction Laborers
513.	0.88		43-5061	Production, Planning, and Expediting Clerks
514.	0.88		51-9141	Semiconductor Processors
515.	0.88		17-1021	Cartographers and Photogrammetrists
516.	0.88		51-4051	Metal-Refining Furnace Operators and Tenders
517.	0.88		51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders
518.	0.88		51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers
519.	0.88		47-2053	Terrazzo Workers and Finishers
520.	0.88		51-4194	Tool Grinders, Filers, and Sharpeners
521.	0.88		49-3043	Rail Car Repairers
522.	0.89		51-3011	Bakers
523.	0.89	1	31-9094	Medical Transcriptionists
524.	0.89		47-2022	Stonemasons
525.	0.89		53-3022	Bus Drivers, School or Special Client
526.	0.89	1	27-3042	Technical Writers
527.	0.89		49-9096	Riggers
528.	0.89		47-4061	Rail-Track Laying and Maintenance Equipment Operators
529.	0.89		51-8021	Stationary Engineers and Boiler Operators
530.	0.89	1	51-6031	Sewing Machine Operators
531.	0.89	1	53-3041	Taxi Drivers and Chauffeurs
532.	0.9	1	43-4161	Human Resources Assistants, Except Payroll and Timekeeping
533.	0.9		29-2011	Medical and Clinical Laboratory Technologists
534.	0.9		47-2171	Reinforcing Iron and Rebar Workers
535.	0.9		47-2181	Roofers
536.	0.9		53-7021	Crane and Tower Operators
537.	0.9		53-6041	Traffic Technicians
538.	0.9		53-6051	Transportation Inspectors
539.	0.9		51-4062	Patternmakers, Metal and Plastic
540.	0.9		51-9195	Molders, Shapers, and Casters, Except Metal and Plastic
541.	0.9		13-2021	Appraisers and Assessors of Real Estate
542.	0.9		53-7072	Pump Operators, Except Wellhead Pumpers
543.	0.9		49-9097	Signal and Track Switch Repairers
544.	0.91		39-3012	Gaming and Sports Book Writers and Runners
545.	0.91		49-9063	Musical Instrument Repairers and Tuners
546.	0.91		39-7011	Tour Guides and Escorts
547.	0.91		49-9011	Mechanical Door Repairers
548.	0.91		51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders
549.	0.91		53-7071	Gas Compressor and Gas Pumping Station Operators
550.	0.91		29-2071	Medical Records and Health Information Technicians
551.	0.91		51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
552.	0.91		51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic

Rank	Probability	Label	SOC code	Occupation
553.	0.91		53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers
554.	0.91		49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment
555.	0.91		35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers
556.	0.91		51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic
557.	0.91		19-4041	Geological and Petroleum Technicians
558.	0.91		49-3021	Automotive Body and Related Repairers
559.	0.91		51-7032	Patternmakers, Wood
560.	0.91		51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic
561.	0.92		43-9071	Office Machine Operators, Except Computer
562.	0.92		29-2052	Pharmacy Technicians
563.	0.92		43-4131	Loan Interviewers and Clerks
564.	0.92		53-7031	Dredge Operators
565.	0.92		41-3021	Insurance Sales Agents
566.	0.92		51-7011	Cabinetmakers and Bench Carpenters
567.	0.92		51-9123	Painting, Coating, and Decorating Workers
568.	0.92		47-4031	Fence Erectors
569.	0.92		51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic
570.	0.92		41-2031	Retail Salespersons
571.	0.92		35-3021	Combined Food Preparation and Serving Workers, Including Fast Food
572.	0.92		51-9399	Production Workers, All Other
573.	0.92		47-3012	Helpers–Carpenters
574.	0.93		51-9193	Cooling and Freezing Equipment Operators and Tenders
575.	0.93		51-2091	Fiberglass Laminators and Fabricators
576.	0.93		47-5013	Service Unit Operators, Oil, Gas, and Mining
577.	0.93		53-7011	Conveyor Operators and Tenders
578.	0.93		49-3053	Outdoor Power Equipment and Other Small Engine Mechanics
579.	0.93		53-4012	Locomotive Firers
580.	0.93		53-7063	Machine Feeders and Offbearers
581.	0.93		51-4061	Model Makers, Metal and Plastic
582.	0.93		49-2021	Radio, Cellular, and Tower Equipment Installers and Repairs
583.	0.93		51-3021	Butchers and Meat Cutters
584.	0.93		51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders
585.	0.93		53-7081	Refuse and Recyclable Material Collectors
586.	0.93	1	13-2081	Tax Examiners and Collectors, and Revenue Agents
587.	0.93		51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
588.	0.93	1	53-7051	Industrial Truck and Tractor Operators
589.	0.94	1	13-2011	Accountants and Auditors
590.	0.94		51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
591.	0.94		43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service
592.	0.94	0	35-3031	Waiters and Waitresses
593.	0.94		51-3022	Meat, Poultry, and Fish Cutters and Trimmers
594.	0.94		13-2031	Budget Analysts
595.	0.94		47-2051	Cement Masons and Concrete Finishers

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Rank	Probability	Label	SOC code	Occupation
596.	0.94		49-3091	Bicycle Repairers
597.	0.94		49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers
598.	0.94		51-4121	Welders, Cutters, Solderers, and Brazers
599.	0.94	1	43-5021	Couriers and Messengers
600.	0.94		43-4111	Interviewers, Except Eligibility and Loan
601.	0.94		35-2015	Cooks, Short Order
602.	0.94		53-7032	Excavating and Loading Machine and Dragline Operators
603.	0.94		47-3014	Helpers–Painters, Paperhangers, Plasterers, and Stucco Masons
604.	0.94		43-4081	Hotel, Motel, and Resort Desk Clerks
605.	0.94		51-9197	Tire Builders
606.	0.94		41-9091	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers
607.	0.94		37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers
608.	0.94		45-2011	Agricultural Inspectors
609.	0.94	1	23-2011	Paralegals and Legal Assistants
610.	0.95		39-5092	Manicurists and Pedicurists
611.	0.95		43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping
612.	0.95		51-6062	Textile Cutting Machine Setters, Operators, and Tenders
613.	0.95		43-3011	Bill and Account Collectors
614.	0.95		51-8011	Nuclear Power Reactor Operators
615.	0.95		33-9031	Gaming Surveillance Officers and Gaming Investigators
616.	0.95		43-4121	Library Assistants, Clerical
617.	0.95		47-2073	Operating Engineers and Other Construction Equipment Operators
618.	0.95		51-5113	Print Binding and Finishing Workers
619.	0.95		45-2021	Animal Breeders
620.	0.95		51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
621.	0.95	1	51-2022	Electrical and Electronic Equipment Assemblers
622.	0.95		51-9191	Adhesive Bonding Machine Operators and Tenders
623.	0.95		37-3011	Landscaping and Groundskeeping Workers
624.	0.95		51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic
625.	0.95		43-5051	Postal Service Clerks
626.	0.95		51-9071	Jewelers and Precious Stone and Metal Workers
627.	0.96		43-5032	Dispatchers, Except Police, Fire, and Ambulance
628.	0.96		43-4171	Receptionists and Information Clerks
629.	0.96		43-9061	Office Clerks, General
630.	0.96		11-3111	Compensation and Benefits Managers
631.	0.96	1	43-2011	Switchboard Operators, Including Answering Service
632.	0.96		35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop
633.	0.96		47-5051	Rock Splitters, Quarry
634.	0.96		43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive
635.	0.96		17-3031	Surveying and Mapping Technicians
636.	0.96		51-7031	Model Makers, Wood
637.	0.96		51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders
638.	0.96		53-4011	Locomotive Engineers
639.	0.96	1	39-3011	Gaming Dealers

Rank	Probability	Label	SOC code	Occupation
640.	0.96		49-9093	Fabric Menders, Except Garment
641.	0.96		35-2014	Cooks, Restaurant
642.	0.96		39-3031	Ushers, Lobby Attendants, and Ticket Takers
643.	0.96		43-3021	Billing and Posting Clerks
644.	0.97		53-6011	Bridge and Lock Tenders
645.	0.97		51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing
646.	0.97		51-2092	Team Assemblers
647.	0.97		51-6042	Shoe Machine Operators and Tenders
648.	0.97		51-2023	Electromechanical Equipment Assemblers
649.	0.97	1	13-1074	Farm Labor Contractors
650.	0.97		51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders
651.	0.97		51-9081	Dental Laboratory Technicians
652.	0.97		51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders
653.	0.97		51-9022	Grinding and Polishing Workers, Hand
654.	0.97		37-3012	Pesticide Handlers, Sprayers, and Applicators, Vegetation
655.	0.97		45-4023	Log Graders and Scalers
656.	0.97		51-9083	Ophthalmic Laboratory Technicians
657.	0.97	1	41-2011	Cashiers
658.	0.97		49-9061	Camera and Photographic Equipment Repairers
659.	0.97		39-3021	Motion Picture Projectionists
660.	0.97		51-5111	Prepress Technicians and Workers
661.	0.97		41-2021	Counter and Rental Clerks
662.	0.97	1	43-4071	File Clerks
663.	0.97		41-9021	Real Estate Brokers
664.	0.97		43-2021	Telephone Operators
665.	0.97		19-4011	Agricultural and Food Science Technicians
666.	0.97		43-3051	Payroll and Timekeeping Clerks
667.	0.97	1	43-4041	Credit Authorizers, Checkers, and Clerks
668.	0.97		35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop
669.	0.98		41-9012	Models
670.	0.98		51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
671.	0.98		43-3031	Bookkeeping, Accounting, and Auditing Clerks
672.	0.98		43-6012	Legal Secretaries
673.	0.98		27-4013	Radio Operators
674.	0.98		53-3031	Driver/Sales Workers
675.	0.98	1	13-1031	Claims Adjusters, Examiners, and Investigators
676.	0.98		41-2022	Parts Salespersons
677.	0.98	1	13-2041	Credit Analysts
678.	0.98		51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic
679.	0.98		43-5071	Shipping, Receiving, and Traffic Clerks
680.	0.98		43-3061	Procurement Clerks
681.	0.98		51-9111	Packaging and Filling Machine Operators and Tenders
682.	0.98		51-9194	Etchers and Engravers
683.	0.98		43-3071	Tellers
684.	0.98		27-2023	Umpires, Referees, and Other Sports Officials
685.	0.98		13-1032	Insurance Appraisers, Auto Damage
686.	0.98	1	13-2072	Loan Officers

Rank	Probability	Label	SOC code	Occupation
687.	0.98		43-4151	Order Clerks
688.	0.98		43-4011	Brokerage Clerks
689.	0.98		43-9041	Insurance Claims and Policy Processing Clerks
690.	0.98		51-2093	Timing Device Assemblers and Adjusters
691.	0.99	1	43-9021	Data Entry Keyers
692.	0.99		25-4031	Library Technicians
693.	0.99		43-4141	New Accounts Clerks
694.	0.99		51-9151	Photographic Process Workers and Processing Machine Operators
695.	0.99		13-2082	Tax Preparers
696.	0.99		43-5011	Cargo and Freight Agents
697.	0.99		49-9064	Watch Repairers
698.	0.99	1	13-2053	Insurance Underwriters
699.	0.99		15-2091	Mathematical Technicians
700.	0.99		51-6051	Sewers, Hand
701.	0.99		23-2093	Title Examiners, Abstractors, and Searchers
702.	0.99		41-9041	Telemarketers