Can Computers Take Our Jobs?

Prepared for
Ethical issues in computing and research methods

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Abstract

The technology is now undergoing a remarkable development, resulting in robots and machines capable of performing specific tasks rather than humans. In this research, we study people's perception whether computers are able to take our jobs or not. a survey was used on 675 to know whether they think computer can take our jobs or not, and we found out that they do not think computers can replace humans in the meantime.

Introduction

Computers have brought a revolution in human life. To begin with, computers took over different human activities. Now even problem-solving are being done by computers. The situation makes many of us wonder can computers take our jobs?

As computer science students we are interested in people's perception. For that we established a survey to gather the information about their opinion on whether computers can take our jobs.

Literature Review

Background

Back in 1959, artificial intelligence was used through a combination of algorithms. These algorithms played an important role in fixing it by knowing when the next signal would be identical to the outgoing signal, and then scanning it electronically. The solution was very elegant and still in use today. These machines used a system of algorithms known as Madaline. It was the first time that AI was used in the workplace. Today, it is widely recognized that computers with AI are coming to do our jobs.

Everyone seems to know what a robot is, yet it is hard to give a precise definition. The Oxford English Dictionary gives the following definition: "A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer".

Robots offer us many advantages such as: increase in productivity, reduction in production, minimization of human fatigue, improvement in quality of products, reduction in accidents and hence safety for workers, and job creation. (Arora & Gupta, 2007) (Borland & Coelli, 2017)

but there are also disadvantages that limit the employment of robots today, such as: robots and computer with AI consume high cost, level of their work is consistent and do not develop, limitations of ability and others.

1- The high cost:

Robotic equipment comes with a hefty and expensive price. Companies need to shell out sum of money to finance robots. this is only the robotic machines. Companies still need to employ professional people to code and program them. (Borland & Coelli, 2017)

2- level of their work is consistent and do not develop:

Robots are not smart, they can do only the work they are programmed on. As a result, work will be fixed and undeveloped.

3- Limitations of ability:

"It is more difficult to automate tasks that require flexibility, judgment, intuition, creativity, and common sense". (Wolla, 2018)

Robots and machines work based on the programmed assignments and predetermined process. Unexpected situations will not be accommodated appropriately. Simple missing chips or parts may also cause the whole system to cease working properly.

Robots can perform a number of different jobs in numerous fields and the amount of tasks delegated to robots is rising progressively.

1. **In medicine**, a wide range of robots is being developed to serve in a variety of roles within the medical environment. Here is some of the uses for robots in the field of medicine today:

   - "Telepresence: Physicians use robots to help them examine and treat patients in rural or remote locations, giving them a "telepresence" in the room.
   - Surgical Assistants: These remote-controlled robots assist surgeons with performing operations.
   - Rehabilitation Robots: These play a crucial role in the recovery of people with disabilities, including improved mobility, strength, coordination, and quality of life.
   - Medical Transportation Robots Supplies, medications, and meals are delivered to patients and staff by these robots, thereby optimizing communication between doctors, hospital staff members, and patients". (Crawford, 2016)

2. **In Security and Military,** "In laboratories today, robots are being developed to carry equipment for dismounted soldiers traveling on foot in extreme terrain. Robots are being designed to rescue the wounded, stand sentry duty, detect and neutralize mines, clear ranges of unexploded ordnance, search for dirty bombs, and more. What is so important is not that robots will replace personnel, but that they will allow the same number of personnel to do

more, over larger areas of responsibility—exactly what is needed for increased national security". (Purdy, 2008)

3. **In Entertainment,** "Children do especially like the ball playing robot. Even children of about 3 years of age enjoy playing with the robot which is with 1.2 meters substantially higher than the children themselves. This proves, that an intuitive interaction with the robots was achieved". (Barth & Graf, 2002)

4. **In Education,** "It has been shown that young children performed better on post-learning examinations and generated more interest when language learning took place with the help of a robot as compared to audiotapes and books". (Mubin, Stevens, Shahid, Al Mahmud, & Dong, 2013)

5. **In Manufacturing,** "Industrial robotics has become an integral part of the manufacturing environment. Robotics is the most prevalent technology used in manufacturing of most consumer and commercial products worldwide. Manufacturing firms interested in saving money recognize that the investment made in robotics, whether initially or as a process rework, has a direct positive impact on their bottom line. The last 10 years have seen a marked growth in the application of industrial robots in what are considered the traditional areas for robots, specifically:
   - Welding (spot and arc welding).
   - Machine and equipment loading and unloading.
   - Palletizing and packing of consumer products.
   - Paint finishing and sealing.
   - Mechanical assembly". (Nee, 2015)

The pace of artificial intelligence continues inexorably forward. "The "intelligence" of the robot will grow in the coming 10 years, with the robot becoming more integrated into the process and aware of its own operation. Advanced monitoring of the physical operation of the robot will be integrated into its software, allowing the robot to see proactively any mechanical changes in its own operation indicating possible future failure needing repair, or changes in the manufacturing process for which it is responsible. Learning and adaptive control will be standard with the best robots learning how to optimize their paths and cycle times to achieve maximum throughput, far better than the best robot programmer." (Nee, 2015).

Related works

Experts' opinions on the topic were divided, the canvassing (Smith & Anderson, 2014) collect a large response from experts who have been identified by researching those who are widely quoted as technology builders and analysts. A common response was that computers and robots will create more jobs than it takes. "Historically, technology has created more jobs than it destroys and there is no reason to think otherwise in this case. Someone has to make and service all these advanced devices." said Vint Cerf, vice president and chief Internet evangelist for Google. Jonathan Grudin, principal researcher for Microsoft, concurred saying: "Technology will continue to disrupt jobs, but more jobs seem likely to be created. When the world population was a few hundred million people there were hundreds of millions of jobs. Although there have always been unemployed people, when we reached a few billion people there were billions of jobs. There is no shortage of things that need to be done and that will not change". Michael Kende, the economist for a major Internet-oriented nonprofit organization, wrote concurred: "In general, every wave of automation and computerization has increased productivity without depressing employment, and there is no reason to think the same will not be true this time. In particular, the new wave is likely to increase our personal or professional productivity (e.g. self-driving car) but not necessarily directly displace a job (e.g. chauffeur). While robots may displace some manual jobs, the impact should not be different than previous waves of automation in factories and elsewhere. On the other hand, someone will have to code and build the new tools, which will also likely lead to a new wave of innovations and jobs". Joe Touch, director of the Information Sciences Institute's Postel Center at the University of Southern California, agrees on computers will displace jobs but also create new jobs, and said that will free us to explore other jobs. Marjory Blumenthal, a science and technology policy analyst, has a different opinion as she wrote for (Smith & Anderson, 2014): "In a given context, automated devices like robots may displace more than they create. But they also generate new categories of work, giving rise to second- and third-order effects. Also, there is likely to be more human-robot collaboration—a change in the kind of work opportunities available. The wider impacts are the hardest to predict; they may not be strictly attributable to the uses of automation, but they are related". An interesting point of view from Seth Finkelstein, a programmer, consultant and EFF Pioneer of the Electronic Frontier Award winner, said, "The techno determinism-negative view, that automation means jobs loss, end of story, versus the techno determinism-positive view, that more and better jobs will result, both seem to me to make the error of confusing potential outcomes with inevitability. Thus, a technological advance by itself can either be positive or negative for jobs, depending on the social structure as a whole….this is not a technological consequence; rather it's a political choice."

Others argued in (Smith & Anderson, 2014) that many jobs require uniquely human characteristics such as empathy, creativity, judgment, or critical thinking— that are uniquely human, and that technology may never be able to duplicate, no matter how advanced they become. As such, jobs

requiring these skills will remain relatively immune from encroachment by automation. David Hughes, a retired U.S. Army Colonel who, from 1972, was a pioneer in individual to/from digital telecommunications, wrote: "For all the automation and AI, I think the 'human hand' will have to be involved on a large scale. Just as aircraft have to have pilots and copilots, I don't think all 'self-driving' cars will be totally unmanned. The human's ability to detect unexpected circumstances, and take action overriding automatic driving will be needed as long and individually owned 'cars' are on the road". Also, Michael Glassman, associate professor at the Ohio State University, said: "I think AI will do a few more things, but people are going to be surprised how limited it is. There will be greater differentiation between what AI does and what humans do, but also much more realization that AI will not be able to engage the critical tasks that humans do". Deborah Lupton, a research professor on the faculty at the University of Canberra, Australia, wrote, "These technologies will displace some jobs, but they will also create others. Humans will always have the need for affective and embodied interactions with other humans, which can never be replaced by robots. This will particularly be the case in the context of healthcare, education, childcare and the care of the elderly. The attempted introduction of too many robotic devices may well lead to a backlash, in which humans who can provide care and education will become valued". On the other hand, Jonathan Grudin, principal researcher for Microsoft, predicted that caring for the sick, elderly, and physically challenged will be revolutionized by advances in robotics, and said: "I expect more robotic assistance for the elderly and infirm, because the demands are manageable, and the need is increasing". While Celia Pearce, an associate professor of digital media at the Georgia Institute of Technology, argued: "I actually see us moving away from AI and towards more crowdsourcing approaches. These tend to work better because it's been proven when you throw a large number of human minds at a problem you can often get a better result than trying to get a computer to resolve it. Truth be told, computers are not very smart. All they are is giant calculators. They can do things that require logic, but logic is only one part of the human mind. Inspiration, creativity and intuition, meaning-making, storytelling and communication are all things that humans can do that computers will never be able to achieve fully."

A different opinion was from Geoff Livingston, author and president of Tenacity5 Media, who wrote, "I see the movement towards AI and robotics as evolutionary, in large part because it is such a sociological leap. The technology may be ready, but we are not—at least, not yet". (Smith & Anderson, 2014).

Methods of the Study

Data for this study were collected using a survey divided into two parts. Part one consisted of a list of 5 questions about general information about sample. The second part of the survey has a list of 10 questions that indicate their opinions about computers and their confidence in its ability to take our jobs.

Sample Selection

675 respondents were involved in this survey who's randomly selected from different age and Academic degree.

The respondents were asked to indicate their gender group, that represented in the results, 9.5% of the sample were males, and 90.5% was females.

also, the respondents were asked to indicate their age group, the sample consisted of 81.9% between 18 and 23 years, 4.4% between 24-30 years and 13.6% were 31 and over.

The Academic degree of the respondents, whose graduate from high school 46.8%, bachelor's degree 48.6%, master's degree 1.8%, Ph.D. 0.3% and 2.5% of the sample has others academic degrees.

50.1% of them were computer workers and 49.9% do paper work. The respondents were also asked if they are computer specialist and we found that 66.8% of them were computer specialist, and 33.2% weren't.

Results

The Results will be presented in three sections according to the following characteristics: questions about people's trust in the robot and their expectations in time to rely on it, the need of employ robots, and the consequences of employing them, and two scenarios to measure the impact of employing robots instead of humans on people's feelings.

people's confidence in robots

The first question was "When you think robots will do your job well?" 63% answer's the far future more than 10 years, 28% answer's the near future (5-10) years and 9% answer's nowadays. As shown in figure 1.
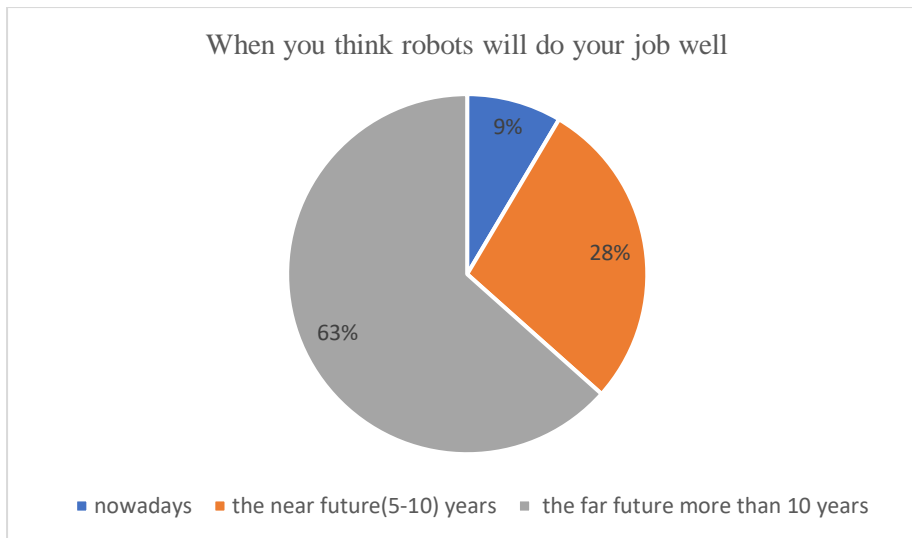
Figure 1: Time to rely on robots.

The second question was "In your opinion what fields are suitable for Robots?" 506 chose Manufacturing field, and Technological was also chosen by 506, 315 chose Entertainment, 275 chose Educational, 255 chose Security and Military, and 222 choose Medical. As shown in figure 2.
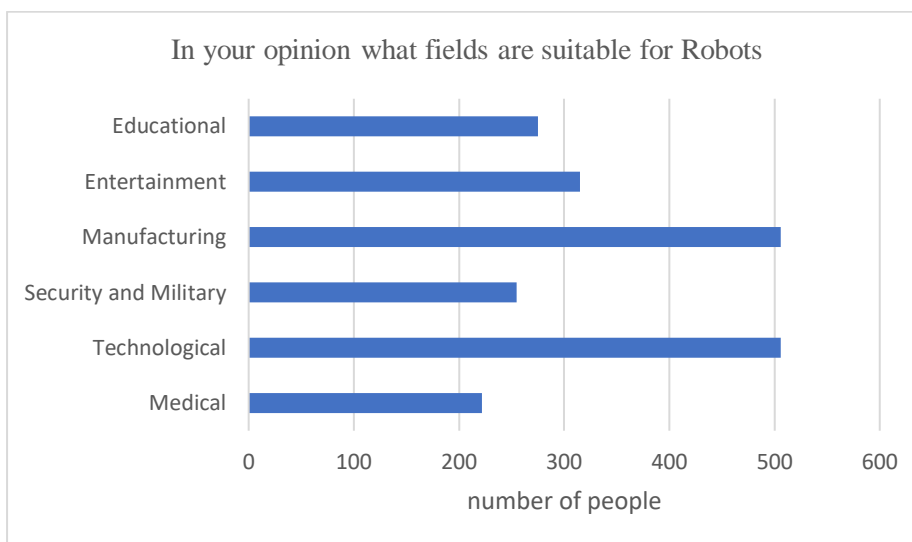

Figure 2: Fields people think are suitable for Robots.

The third question was "In the previous field you have chosen, do you trust the ability of robots to make the right decisions?" as it's shown in figure 56% chose often, 31% chose sometimes, and 13.5% choose yes always.
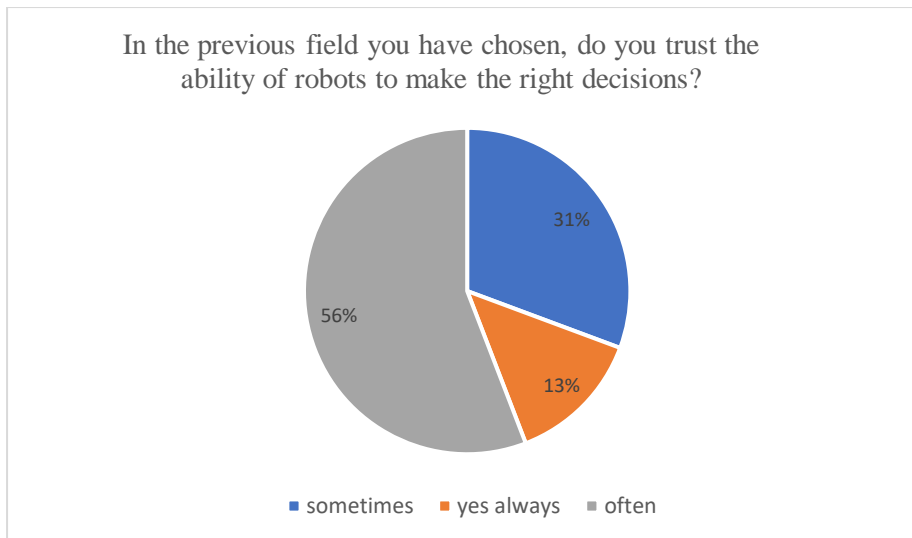
Figure 3: people's trust the robots in the fields they've chose.

The fourth question was "In the fields you've chosen how you are relying on Robots" 80% chose partially, and 20% chose totally. As shown in figure 4.
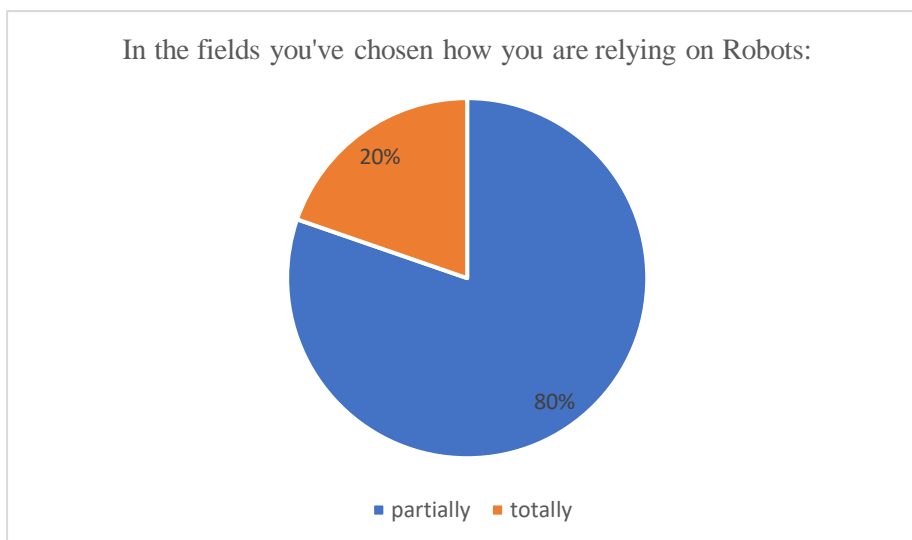

Figure 4: How people relying on robots in the fields they've chosen.

The fifth question was "What do you think the reason that makes people don't trust Robots?", "The works done by Robots are less accurate" was chosen by 88, "The works done by Robots are less efficient" was chosen by 67, " The robot could be biased" was chosen by 125, " Robots can't make valid decision on sensitive/difficult situations" was chosen by 466, "Robots can't explain the reasons behind any decisions are made" was chosen by 413, and "Robots have no emotion" was chosen by 375. As shown in figure 5.
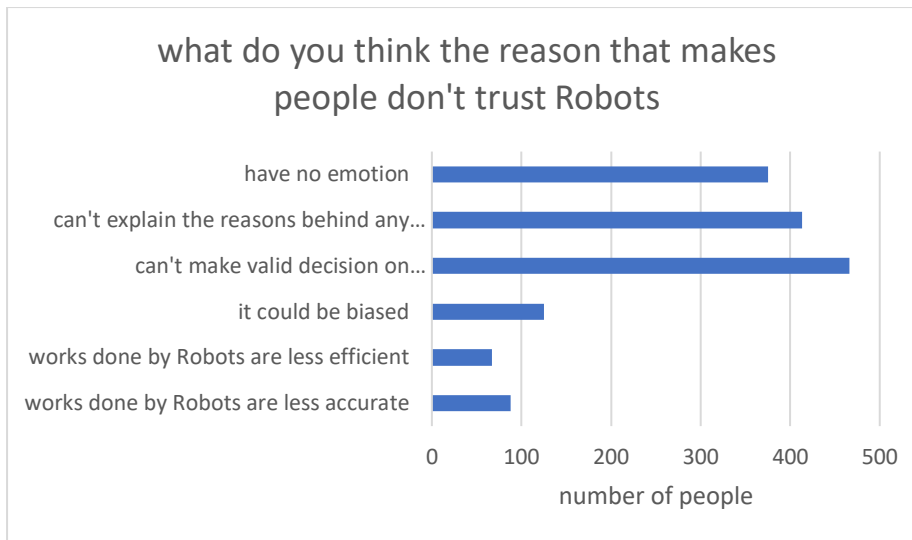
Figure 5: Reasons make people don't trust Robots.

The need of employ robots and the consequences of employing them

The first question in this section was "What do you think is the need to employ Robots", The result shown in figure 6. "The need of pace to accomplish works" was chosen by 468, "To do dangerous work" was chosen by 445, "Difficulty and complexity of some works" chosen by 290 , "The lack of human crew in some jobs" chosen by 156.
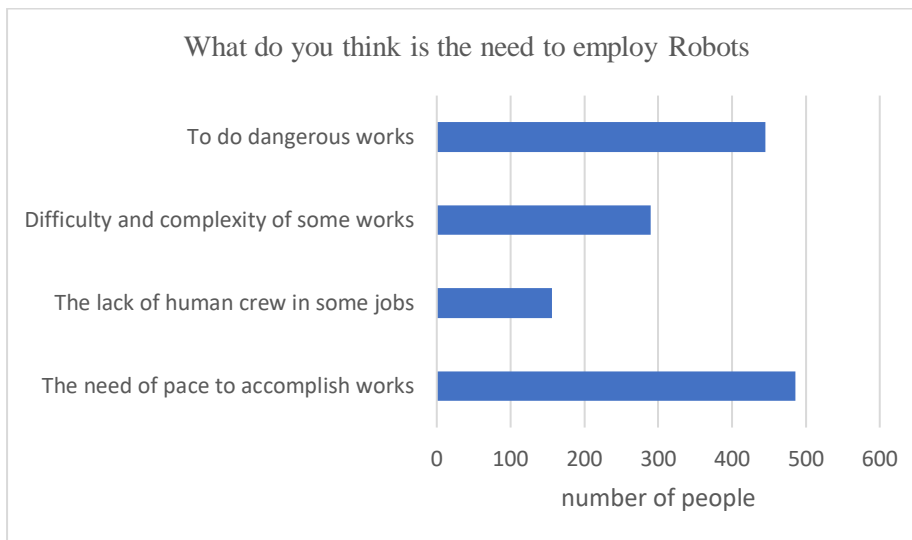

Figure 6: The need of employing Robots.

The second question was "The consequences of employing robots tend to be: good or bad" 36% of the respondents chose good and 64% chose bad. As shown in figure 7.
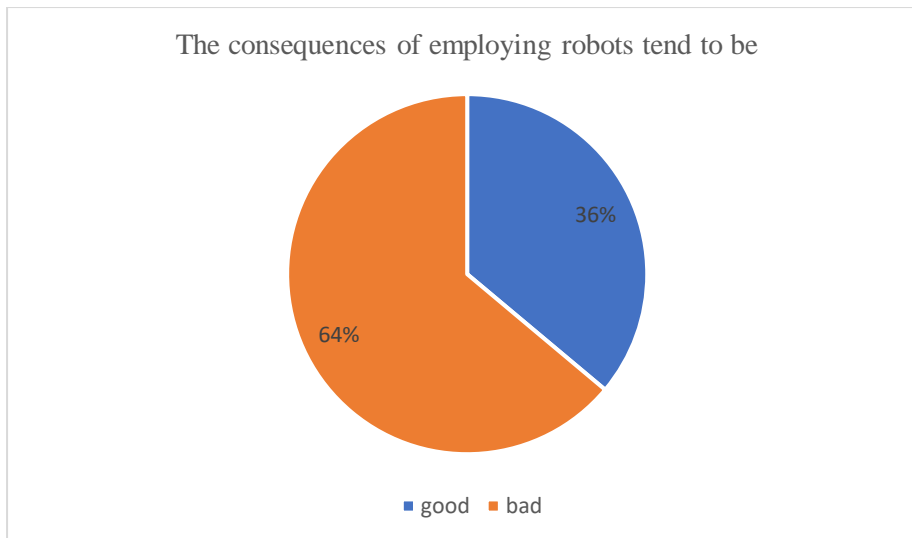
Figure 7: people's opinions on how the consequences of employing robots tend to be.

The third question in this section was "In your opinion, what are the consequences of employing Robots?" 477 of respondents chose Increasing the unemployment rate, 457 chose humans may become overly dependent on Robots, 306 chose having an emotionless workplace, 229 chose level of their work is consistent and do not develop, 217 chose obesity, 179 chose financial loss, and 138 of respondents chose others. as shown in figure 8.
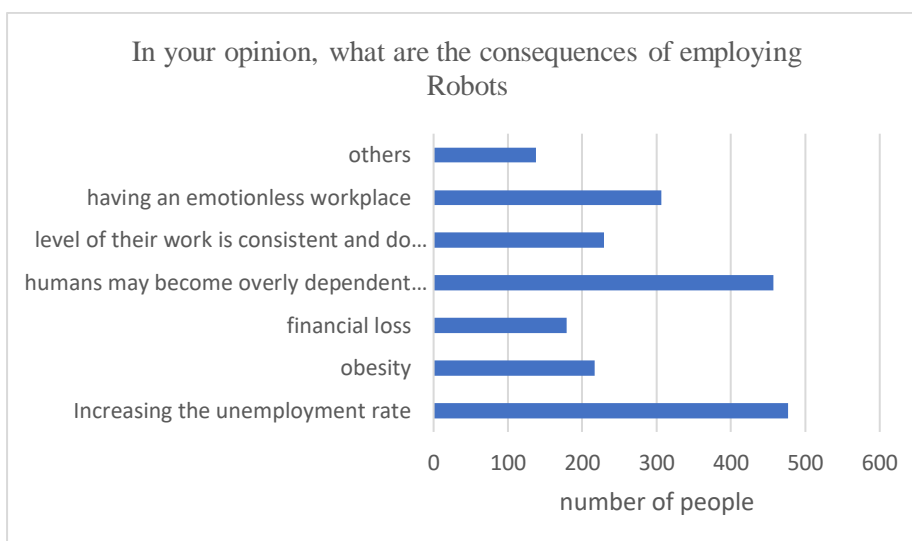

Figure 8: people's opinions of consequences of employing Robots.

measure the impact of employing robots instead of humans on people's feelings

The First question in this section was "Imagine your boss comes to you and tells you that you will be replaced by another, more efficient employee, how disappointed are you going to feel?" it was scale

from 1-5 and 5 means very disappointed, 1 not disappointed, figure 9 shows that 372 chose 5, 139 chose 4, 128 chose 3, 27 chose 2 and 9 chose 1.
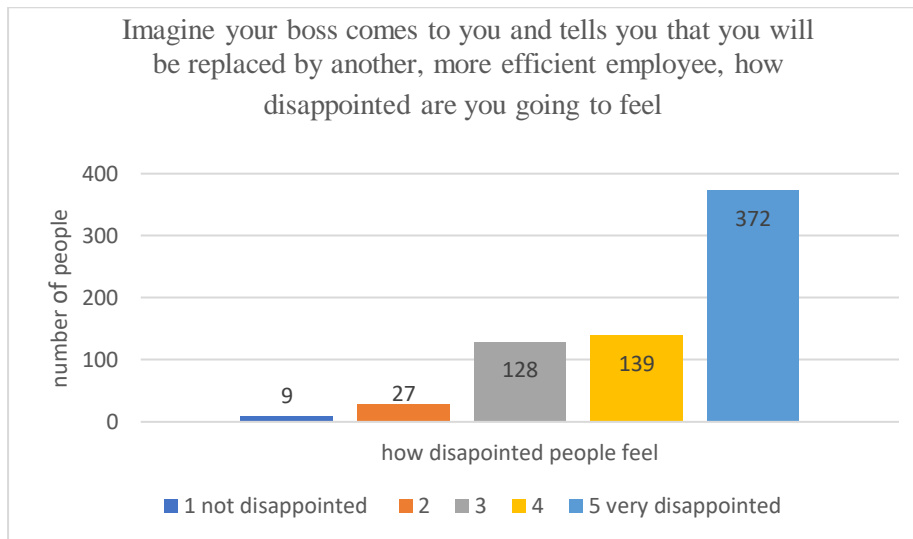

Figure 9: how disappointed people would be if they were replaced with human.

The second question in this section was "Imagine your boss comes to you and tells you that you will be replaced by another, more efficient robot, how disappointed are you going to feel?" it was scale from 1-5 and 5 means very disappointed, 1 not disappointed, figure 10 show that 471 chose 5, 86 chose 4, 83 chose 3, 18 chose 2, and 17 chose 1.
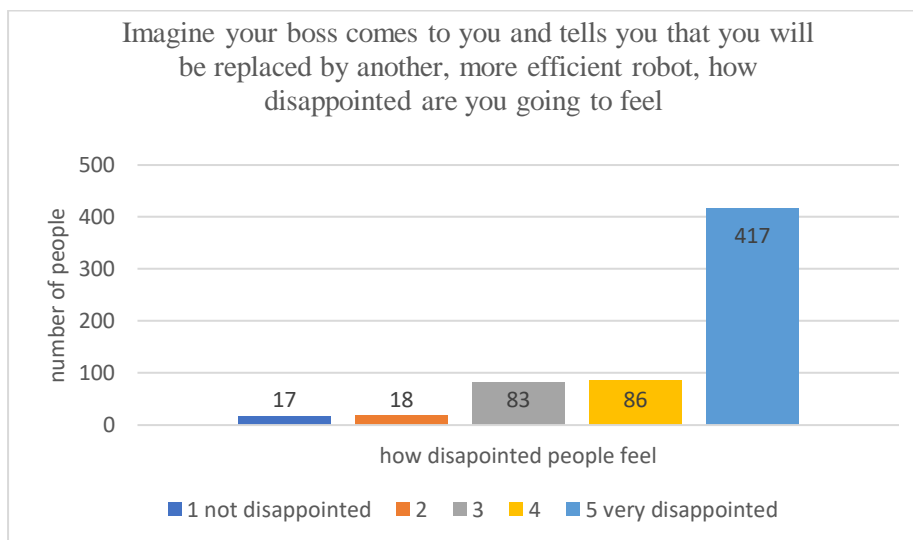

Figure 10: how disappointed people would be if they were replaced with robots.

Discussion

The result of the first question shows that the majority of people see that we need at least ten years for robots to take their jobs.

Many respondents believe Manufacturing and technical most suitable fields for Robots, then the Entertainment and educational field, and very few of them who see the medical, security and military field suitable. But they do not fully trust it whether it is able to make the right decision in difficult situations and not always entirely reliable, since the human element is indispensable. This is consistent with a previous study "that automation can be employed to undertake certain tasks within jobs, but not all tasks within those jobs.". (Borland & Coelli, 2017)

Majority of respondents chose robot can't make valid decision on sensitive/difficult situations, it can't explain the reasons behind any decisions and have no emotions as the reasons that makes them don't trust robots, few of them chose robot could be biased, less efficient and less accurate.

The respondents were asked what they think is the need to employ Robots, we found out that majority of them chose the need of pace to accomplish works and to do dangerous works, few of them chose difficulty and complexity of some works, and the lack of human crew in some jobs.

Our respondents think that the consequences of employing robots tend to be more bad than good, they believe that employing robots in the first place contributes to increased unemployment, in second place humans may become overly dependent on Robots, in third place employing robot cause an emotionless workplace, in fourth place the level of the work would be consistent and do not develop, in fifth place employing robot would increase obesity, in sixth place it caused financial loss.

Most of our respondents believe that advanced technology and robotics employee increase the number of unemployment, but with reference to a previous study conducted in Europe and Australia the increasing use of technology and computers coincides with the phenomenon of attracting jobs." the increased use of IT and computers in the United States, Europe and Australia has been found to coincide with the phenomenon of job polarisation". (Borland & Coelli, 2017). Many of them also thought employing robots become responsible of making humans rely dependent on Robots so they are not incredibly excited about machines taking over their responsibilities. Also, our respondents thought that Robots have no sense of emotions or conscience. It lacks empathy and this is one major disadvantage of having an emotionless workplace which conflict with previous studies stated that computer and machines can recognize emotions. (Bartlett, et al., 2006). and acting like it had emotions (Barth & Graf, 2002). Furthermore, the respondents believe that Robots may have AI but they are certainly not as intelligent as humans, and they can't improve their jobs outside the pre-

defined programming. As the previous study (Friedrich, Kaiser, & Dillmann, 1997) stated. Yet many respondents thought employing robots would be responsible of cause some health problems like obesity. and few of them consider financial loss as consequences of employing robots since robots cost much money in maintenance & repair, the programs need to be updated to suit the changing requirements, the machines need to be made smarter, in case of breakdown, the cost of repair may be very high, the procedures to restore lost code or data may be time-consuming & costly.

The article (Flam, 2019) shows the results of 2000 respondents were much more upset imagining themselves being replaced by another human, and the robotic takeover was easier to accept. Based on that we were expecting similar result, but as our result shows in figure 10, more than half of respondents were more disappointed if they were replaced with robots. The research topic might be a factor in the result, but as we stated above, and people respond to the first question shows that respondents doesn't see robots or computers as a counterpart.

Upon all responses, even though robot increase in productivity, reduction in production, minimization of human fatigue, improvement in quality of products, reduction in accidents and hence safety for workers, and job creation. (Arora & Gupta, 2007) (Borland & Coelli, 2017). we can say that society is not ready and doesn't accept that computers taking their jobs, therefore, society will seek to prevent that by any means.

Conclusions

Based on the result we got, and from related works, we can say that computers have already taken some jobs, but not all of it, due to several reasons, such as that technology is not ready yet, human unique characteristics can't be replaced, and people cannot fully trust machines, computers cannot take all jobs in the meantime.

From our study we think that we should not see technology and computers as opponent, people need to understand that only routine work will be replaced by robots, we believe that if computers and human work in combine the productivity will increase, and the outcome of the work would be much more accurate, and efficient.

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