Individual Report

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This report contains seven parts.

- The **"Introduction"** part explains why we would like to choose robots of entertainment and literature for our topic and some basic information about our research.
- The **"Background"** part contains some information about the development of entertainment robots in the recent future. Besides, it also include some results and conclusions from other completed researches about this topic.
- The **"Methods"** part introduce the approaches we used for this research. The methods are about how we collect data, how we visualize the data, and how we analyze the results.
- The **"Results"** shows the data we collected and figures plotted by python.
- The **"Discussions"** part contains our thinking and analysis about the results. Some of the results that not worth discussing would be skipped.
- The **"Conclusions"** part conclude all the discoveries of this research.
- The **"Appendix"** part contains the citations of this report, and the question list for the survey.

Introduction

Our group topic is The Robots of entertainment and literature in 20 years, and my tasks are to design questions and analyze data for the Entertainment part. Besides, I am the recorder of minutes for each meeting, and I am often the person to push the progress of our research.

There are three reasons why we choose Entertainment and Literature as our group topic.

First, we think this topic has a much closer relationship to daily life, so it would be more convenient for us to convey to people unfamiliar with robots. Second, the technologies in this field are not very mature, so there is much space for us to imagine and discuss. Third, all of the group members are interested in this topic. Therefore, The Robots of entertainment and literature in 20 years becomes our group topic after voting.

We have had 6 group meetings overall. Their contents and timeline are as following:

Group Meeting Content	Date
Suggest and vote for the research topic	3.8
Preliminary decide the content of our survey	3.24
Complete the first version of survey questions	4.16
Adjust our questions after shown in class	4.19
Change the questions after collecting suggestions from others	5.14
Discuss how to analyze the data collected	5.21

Background

While the development of robots designed to replace humans in physical work(like industrial robots) gradually become mature, the development of robots for entertainment and literature is just at the beginning. However, it is predictable that in the coming 20 years, the research and invention of these kinds of robots would be a trend. Like suggested by Brooks[1]:

> Actually, in the course of the present century, intelligent autonomous machines will gradually substitute many automatic machines.

Therefore, many of the present machines would be replaced by AI in this century. Entertainment robots is just one of them. Some of the toys for children now would become intelligence in the few decades.

Entertainment robots required multiple interactive technologies, including voice synthesis, machine vision, delicate structure designation, fast AI algorithms, and so on. Most of these technologies are advanced researching fields now, and many of them have not been widely used in our life yet. So entertainment robots would be an appropriate application of these technologies would transfer from laboratory to industry.

According to the data collected by Data Bridge Market Research Market Analysis Study 2020, the global entertainment robots market is expected to increase in the following six years. Its value would increase four to five times as much as now. This is shown in Figure 1.
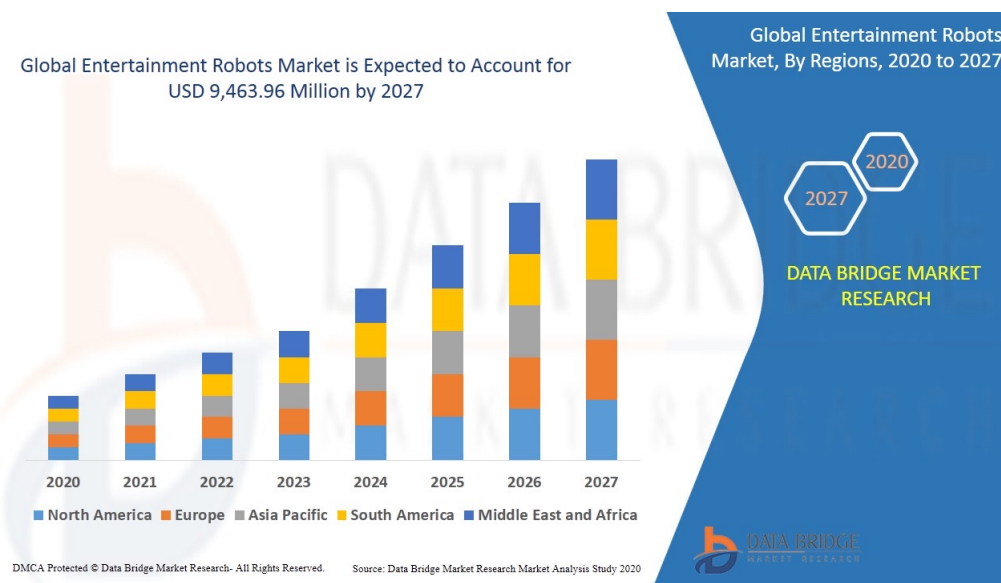

Figure 1: *The global entertainment robots market would increase in recent futrue*

However, developing some kinds of entertainment robots would challenge the traditional ethic thinking of human beings. The new applied ethics about robotics is called robotics. It was put forward in 2002 and publicly discussed in 2004 during the First International Symposium on Roboethics. We need to face this problem directly instead of avoiding it like stated by Gianmarco Veruggio in the book Roboethics: Social and Ethical Implications of Robotics[2]:

> In the next decades in the industrialized world – in Japan, South Korea, Europe, United States – humanoid robots will be among us, companions to the elderly and children, assistants to nurses, physicians, firemen, and workers. They will have eyes, human voices, hands and legs, skin to cover their gears, and brains with multiple functions. Often, they will be smarter and quicker than people they ought to assist. Placing robots in human environments inevitably raises important issues of safety, ethics, and economics.
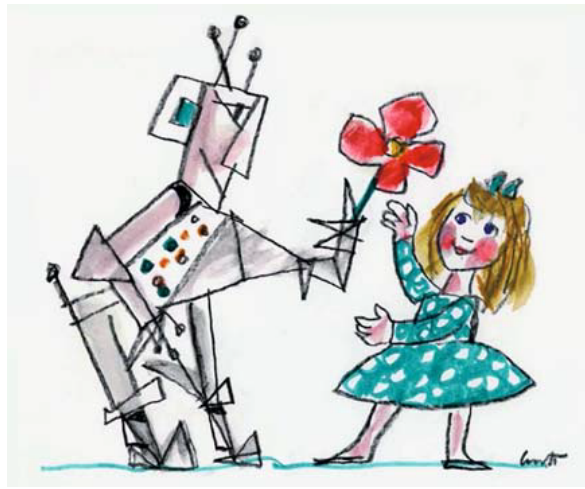
Figure 2: This graph was sketched by the renowned Italian artist Emanuele Luzzati (1920 – 2007), is represented by a young smiling girl receiving a flower from a chivalrous humanoid robot

The development of technology is speedy, and we need to prepare for the incoming challenge of ethics and policies. For example, we should consider sex robots and AI wives, which would be a popular market in the future. They could be used for sexual partners in many fields, ranged from medical recovery to prostitution. Their usage would raise problems like human-machine relationships, technology addiction, reliability, and so on.

Otherwise, the safety of entertainment robots is also a widely discussed topic. Nowadays, we could hear about accidents caused by robots frequently, like Tesla's autonomous cars and some industrial robotic arms. Entertainment robots need to interact with people at a very close distance, so it is much easier to hurt users. If we could not guarantee the safety of entertainment robots, then the public would lower their trust in this technology.

In a nutshell, research in entertainment robots is worthy and necessary. We designed a survey for it and I would introduce the questions and data of this survey in the next parts.

Methods

Here I would show the questions I designed (question 15 to question 23) for the entertainment robots part, and why I design them. The first question I designed is to ask the respondents some famous films, games, or anime. This is in order to draw the respondents' attention back, because this part is at the end of the questionnaire. Then, if the respondents choose a list of options here, they would jump to a list of correspondent questions relating to these options for the following survey.

Options Of Question 15	Count
钢架铁拳	36
Her	49
西部世界	51
Carol and Tuesday	39
底特律 变人	22
Available Overall Count	**93**

The correspondent questions are listed in the **Appendix B**.

After designing the above questions, I think of a final question, asking the respondents to choose some of the problems that the development of the entertainment robots would occur. It is somehow related to the questions asked above, and I would explain more about this in the following parts.

Options Of Question 23	Count
相关行业失业率增加，社会贫富差距扩大	51
产生伦理道德问题，尤其是仿人机器人的发展	68
机器人发展水平有限，工业化成本太高	49
机器人可能产生自己的意识，甚至有可能危害人类	46
机器人与人类关系密切导致人与人关系疏远	37
本题有效填写人次	93

After designing the questions, we moved to the next steps.

We use a platform powered by 'www.wjx.cn' to collect data for the survey. After collecting data from people of different age groups, genders, and knowledge extents of robots, I analyze the data involving entertainment robots.

Then, I use openpyxl-python to go through the data in the excel provided by the platform. Then I use the matplotlib module to plot the graphs for the results.

```python
import openpyxl
import matplotlib.pyplot as plt
```

I plotted three kinds of graphs, which correspondingly reflected the relationships of the collecting data with Age Group, Gender, and Knowledge degree of robotic. In this way, I could straightly see the differences of the opinions towards my questions of different groups.

After getting the figures, I started to find some unexpected conditions for each question and then tried to analyze why they happened. I tried to find the underlying principles and paradigms of different social groups and individuals in their relationships with entertainment robots.

Results

Here are the graphs I plot for the corresponding questions 16 to 22, they involve Gender, Age Group, and Knowledge degree of robotic from left to right. Besides, the results of the question 23 are also plotted here:
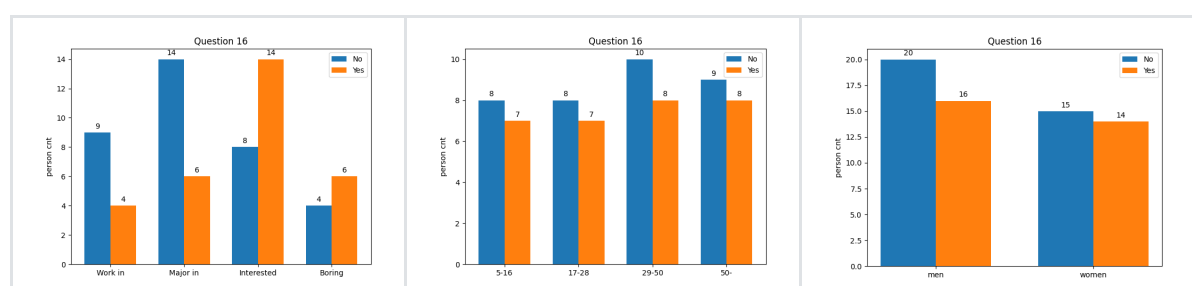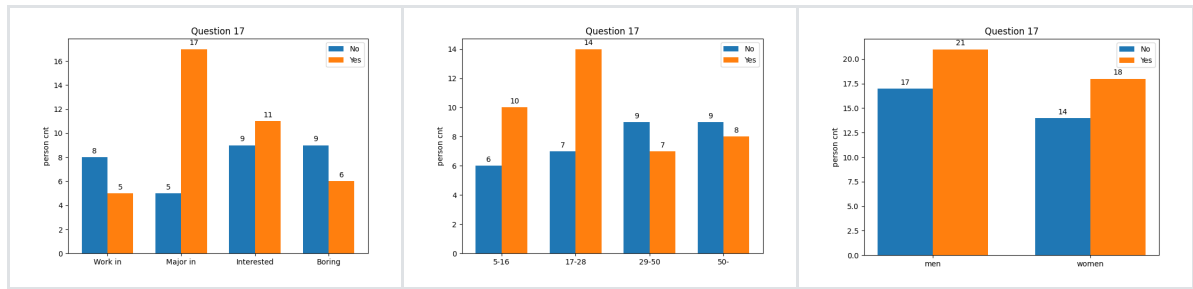
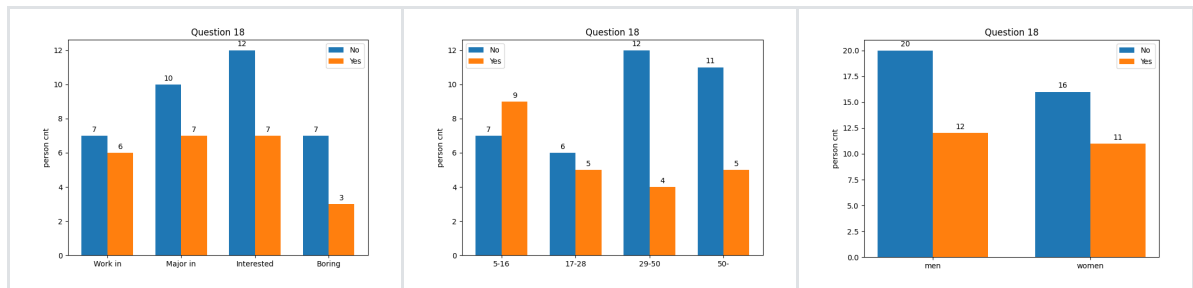Figure 4: The Graphes for question 17

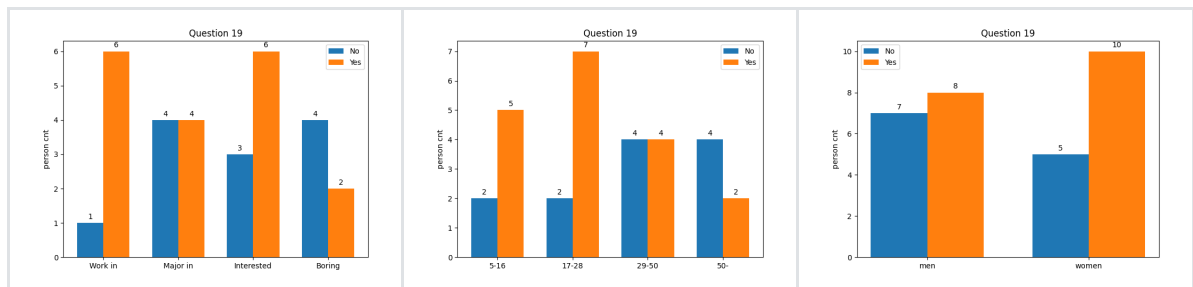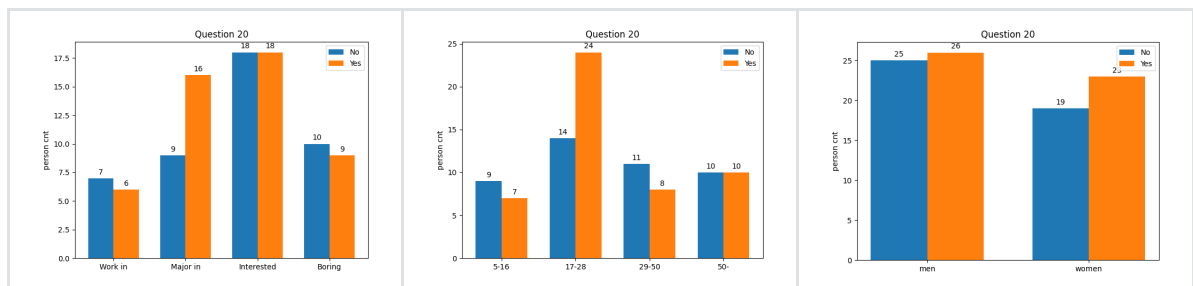Figure 5: The Graphes for question 18

Figure 6: The Graphes for question 19

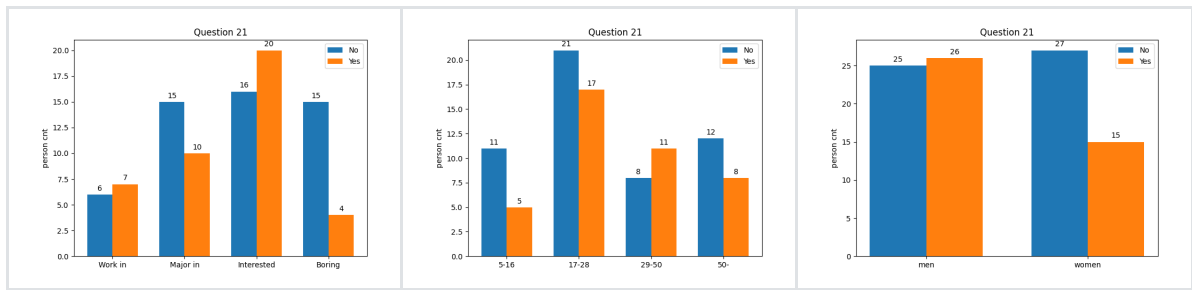Figure 7: The Graphes for question 20

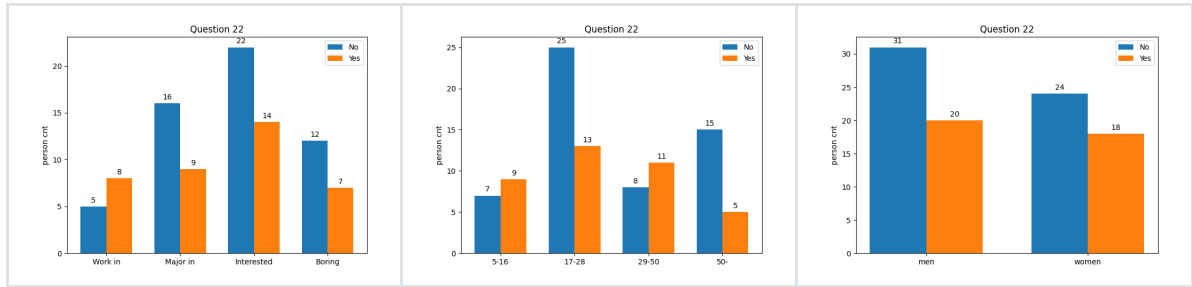**Figure 8:** *The Graphes for question 21*

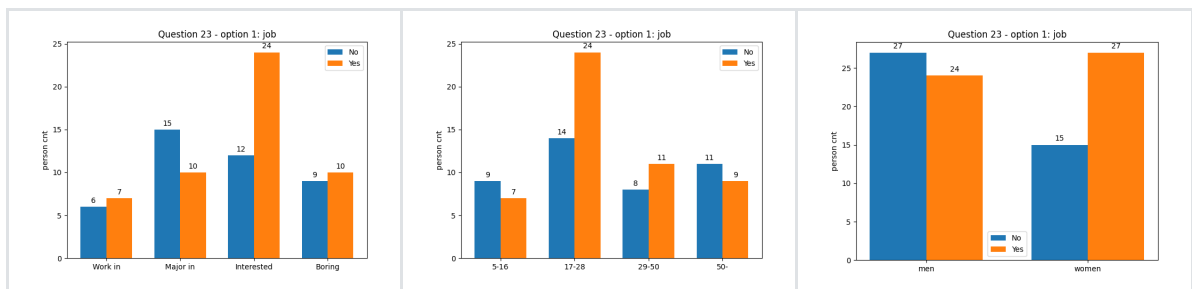**Figure 9:** *The Graphes for question 22*

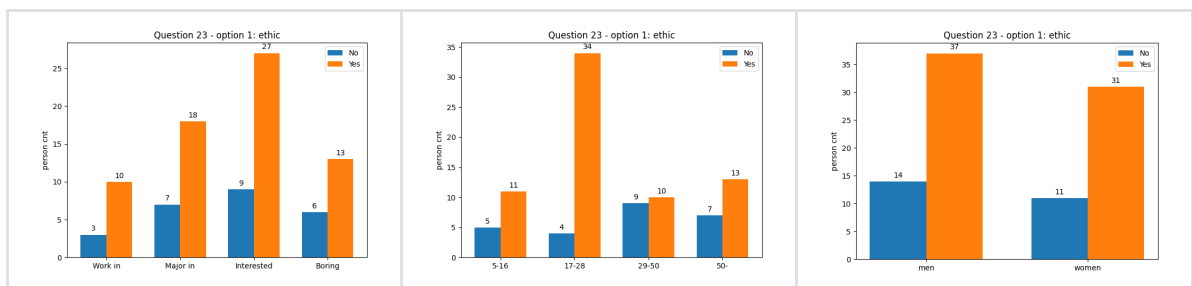**Figure 10:** *The Graphes for question 23 option 1, about unemployed*

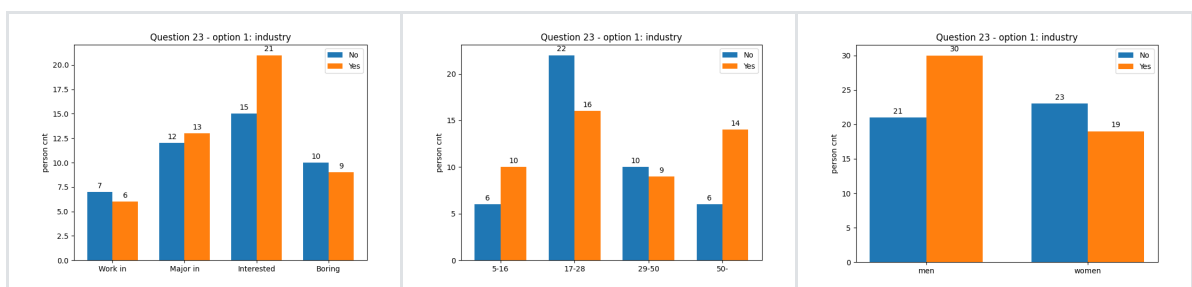**Figure 11:** *The Graphes for question 23 option 2, about ethic*

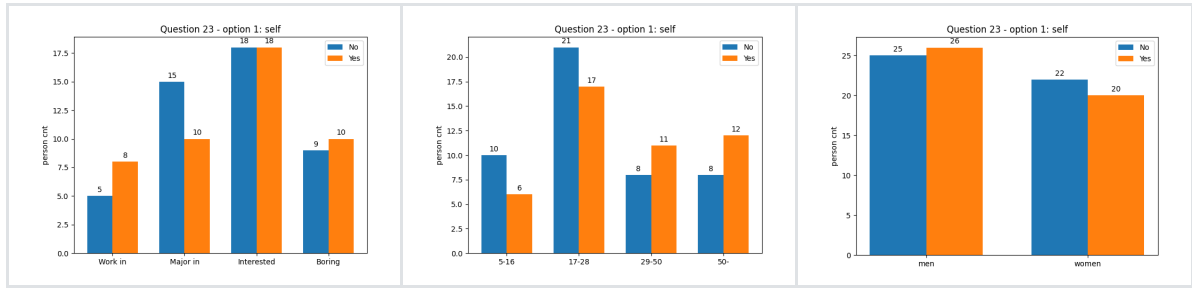**Figure 12:** *The Graphes for question 23 option 3, about industrial cost*

Figure 13: *The Graphes for question 23 option 4, about self consciousness*
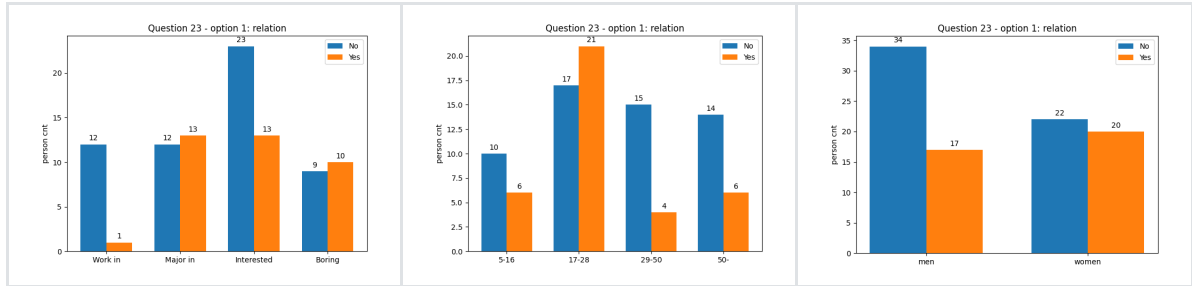

Figure 14: *The Graphes for question 23 option 5, about relationship with human*

Discussions

I would mainly discuss the five points of view introduced in the question 23, which are ethic, self consciousness, unemployment and fraud, human-machine relationship. The detailed discussions are as following:

Ethic

To begin with, let's have a look at the result of the **option 2 of the question 23**:

"Option: the development (especially humanoids) of robots would raise ethical problems in 20 years."

And we look at **Figure 11**, which is shown below:
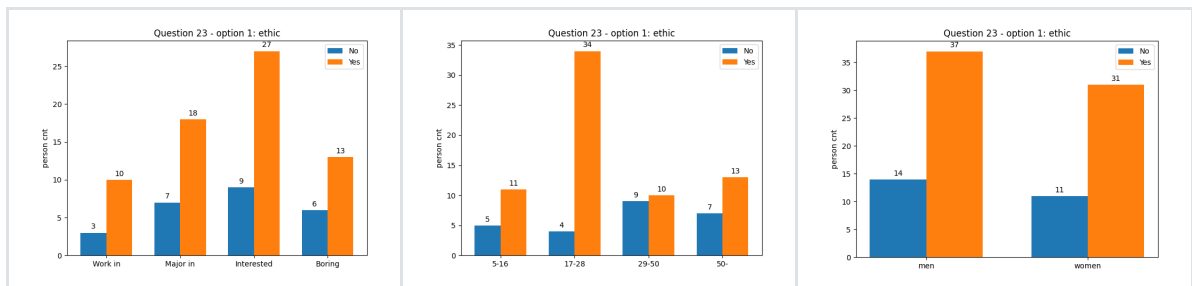
The Graphes for question 23 option 1, about ethic

Apparently, from the graphs:

1. There is not great difference for groups in the first graph. People are generally agree that robots would raise ethical problem.
2. Briefly, all age groups agree with this statement. Young people with age from 17 to 28 show strong agreement with this statement.
3. Men and Women do not differ greatly for this question;

Humanoids surely could do great benefits for humans, it could help to care for hospital patients and the elderly, and providing therapy to cope with emotional problems. But on the other side, if it could develop to a level that humans could not detect any robot elements from it, the relationship of humanoids with a human might be changed. Like motioned in the book Love and sex with robots: The evolution of human-robot relationships written by David Levy:

> Accepting that huge technological advances will be achieved by around 2050, my thesis is this: Robots will be hugely attractive to humans as companions because of their many talents, senses, and capabilities. They will have the capacity to fall in love with humans and to make themselves romantically attractive and sexually desirable to humans. Robots will transform human notions of love and sexuality.

Let's have a look at the result of the **question 21**:

"If the sexual robot in Detroit: Become Human become reality in 20 years, can you accept using it?"

And we have a look at the **Figure 8**, which is shown below:
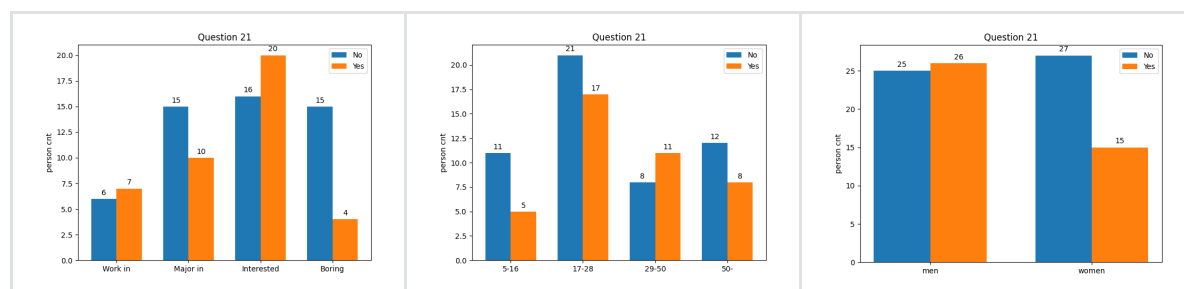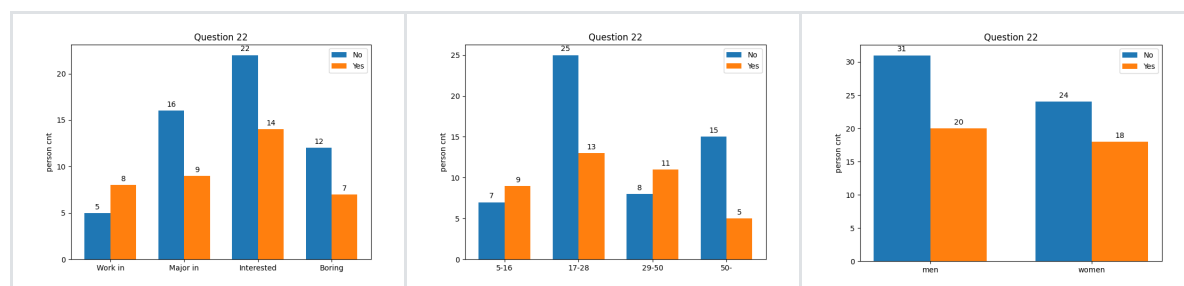

The Graphes for question 21

Apparently, from the graphs:

1. People who work in relevant industries and people who are interested in robots have better ability to accept sexual robots, while people who feel boring about robots show strong refusion for sexual robots.
2. Surprisingly, people whose age is from 29 to 50 have more agree voice than disagree for this question.
3. Relatively, men could accept sexual robots better than women, while this is as we expected.

Let's have a look at the result of the **question 22**:

"In the film Blade Runner 2049, an AI wife is available as a product. Do you think that it could be commercialized and validified if AI wife appears in 20 years?"

And we have a look at the **Figure 9**, which is shown below:

The Graphes for question 22

Apparently, from the graphs:

1. Surprisingly, people who work in the robotic field hold confidence that AI wife could be validified and commercialize, while the the age groups hold a passive opinion towards this technology.

2. Young people do not think that AI wife would be allowed as product, which is coherent with the result of the figure 11. This proved that the former guess that young people think the development of entertainment robots would raise ethic problems.
3. Men and Women do not differ greatly for this question;

Unemployment and Fraud

To begin with, let's have a look at the result of the **option 1 of the question 23**:

"Option: Relative industries would encounter higher unemployment rate, the economic inequality will be more severe."

And we look at **Figure 10**, which is shown below:
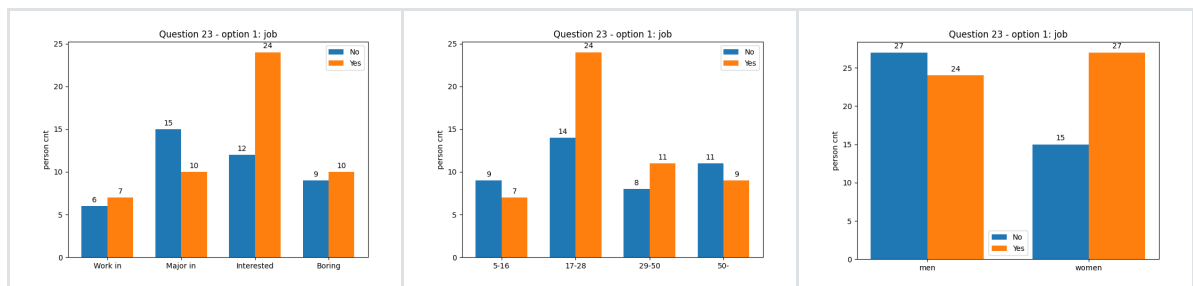
The Graphes for question 23 option 2, about unemployment

Apparently, from the graphs:

1. While the second graph shows that young people are afraid that their jobs would be stolen by robots in the future, the first graph shows that students whose majors are relating to robotic are not as passive as the peer students.
2. Young people whose ages are from 17 to 28 believe that it would cause significant unemployment for developing entertainment robots. In my opinion, they are encountering the engagement problem at this age, so they might have already experienced some pressure caused by robots now. The other age groups are not facing engagement in this decade, so they might not feel the pressure like the young adults do.
3. Women relatively adopt a more passive perspective than men towards the influence of robots for entertainment industries in 20 years. My assumption is that generally some women's jobs are more likely to be affected by the development of intelligence robots, like nursing, teaching, office working, and so on.

Think about that: if robots could create music that has no different from human creation one day, what could happen. Human musicians might lose their jobs. What is more frightened is that if the robot could perfectly mimic one's music style and create new works, this will greatly affect the balance of the market. Lots of fraudulent works would crash in the market, and occupy the space of musicians. This is the same with the literature part.

The development of the flutist robot at Waseda University since 1990 could play the flute and teach it with interactors[4]. It proves that humanoids could achieve acting like a real person in the entertainment fields. This would be a threat for people who works in these fields.

Let's have a look at the result of the question 19:

"Do you think that robot creating music just like in the anime could be achieved in 20 years?"

And we have a look at the **Figure 6**, which is shown below:
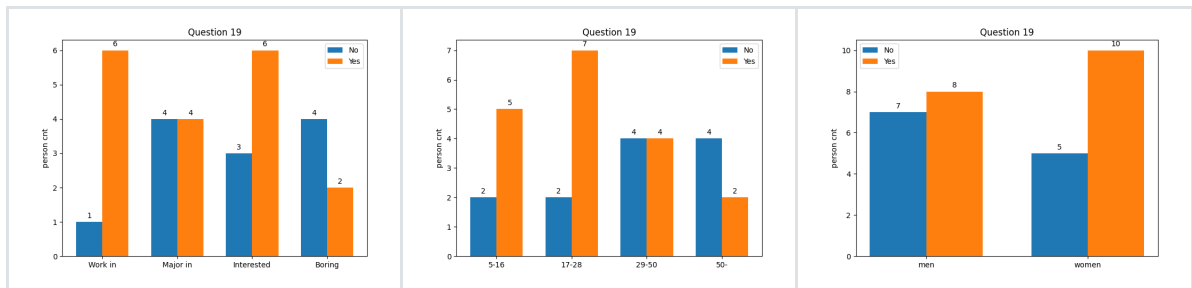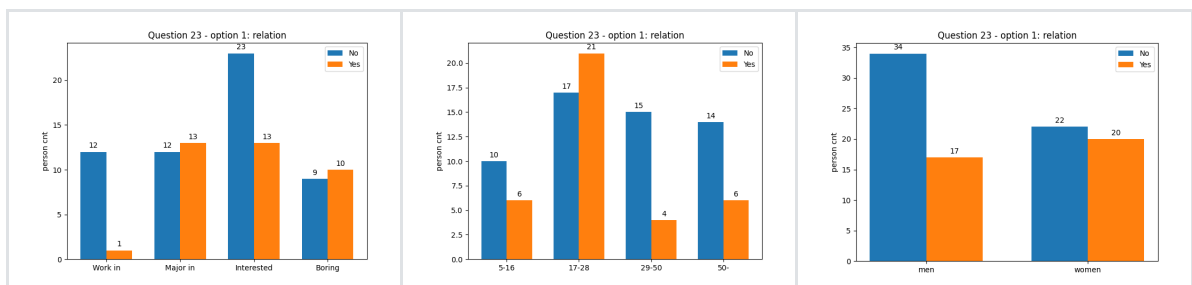
The Graphes for question 19

1. What surprised me is that many people who work in the robotic field believe that this technology could be achieved in the recent future. As a result, the discussion we have is not meaningless, it is important to prepare for the incoming impact.
2. Young people show great confidence in this technology, while the elderly adopt a more passive view.
3. Similar with the results shown above, women seem like more anxious for the future. Many of them believe that robots could create music that have no difference with human beings. In conclusion, women are more confident with the robotic technology improvement in 20 years and they expect that it would be a disaster for employment.

Human-machine Relationship

To begin with, let's have a look at the result of the **option 5 of the question 23**:

"Option: Individuals would construct closer relationships with robots, and drift apart with the other human beings."

And we look at **Figure 14**, which is shown below:

The Graphes for question 23 option 5, about relationship with human

Apparently, from the graphs:

1. Nearly all the people who work in the robotic field disagree with this statement. For people who are interested in robots, disagree is nearly twice more than agree.
2. Except for people who are from 17 to 28, disagree is dominant for the other age groups. This might reveal that contemporary young adults are not very confident with their control against technology addiction. Otherwise, it might also result from a large amount of science fiction films, animes, and novels they watch.
3. Relatively, men are more confident that they would not lose bounds with other humans and build close relations with robots. However, women that agree and disagree with this problem are in an equivalent state.

The future robots would have better and better performance, which is judged by comparing with objects or creatures among us. For example, we often compare the speed of the fastest under-water robot with fish. As a result, we always want to create robots that based on things in the real world. However, if robots do not have difference with the real world anymore in the future, it

might cause some problems.

Humanoid is just one of them. We have seen so many films and novels about it, knowing what kinds of disaster it would bring to us. People would confuse between the real and the imaginary , the natural and the artificial.

We know that in the film Her, the main character Theodore fall in love with a chatting robot in the screen. Reeves and Nass shown that this kind of technology addiction could really happen, not just in fictions or films[3]:

> Authors Reeves and Nass present the results of numerous psychological studies that led them to the conclusion that people treat computers, television and new media as real people and places. Their studies show that people are polite to computers; that they treat computers with female voices differently than male-voiced computers; that large faces on a screen can invade a person's body space; and that motion on a screen affects physical responses in the same way that real-life motion does.

If we pay attention, our would is already conquered by many technology addictions at all, like rooting on phones, addicting to video games, and so on. Many of the young people have already lost touch with the real world, addicting to their imaginary world. These kinds of problems should be avoided before it gets severe.

Let's have a look at the result of the question 17:

"Do you think that the chatting robot in Her will be prevalent in 20 years?"

And we have a look at the **Figure 4**, which is shown below:
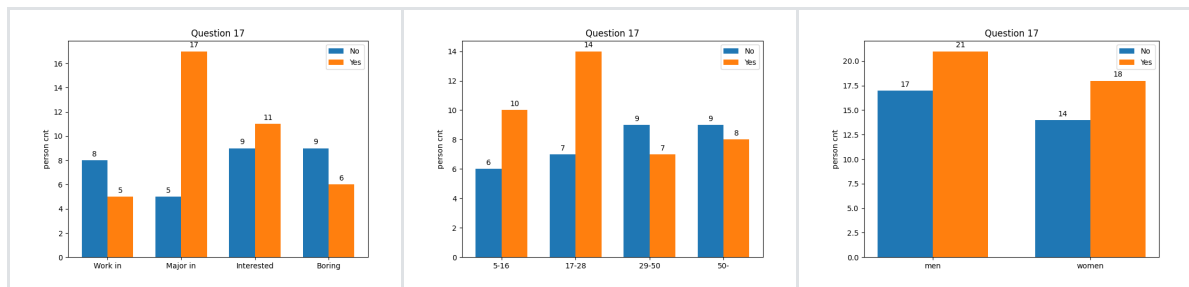
The Graphes for question 17

Apparently, from the graphs:

1. Students whose majors relate to robotic extraordinarily agree with this statement, which is coherent with data of the people aged from 17 to 28. This reveals that university students anticipate the technology of chatting robots and believe that it could be achieved in 20 years. However, the young students might be disappointed 20 years later because more people who worked in the robotic industry do not think that this technology could be achieved in 20 years.
2. Young people generally agree and adopt a positive perspective towards this technology, while the elderly prefer to disagree with it and adopt a negative perspective. This is as we expected.
3. Men and Women do not differ greatly for this question;

Conclusions

Through the entertainment part of research, we find some interesting points, showing as following:

- Young people generally adopt a positive attitude towards the new development of robots, like Ai wife, sexual robots, chatting robots, and so on. However, most of them also realize the effect that these kinds of developments would bring to our society and values, for example, the impact of sexual robots on the common ethic concepts. In conclusion, young people are a very rational age group, but they have enough intention and courage to experience new technologies as well.
- The elderly do not want to change their life habits and entertainment approaches throughout all the questions. Most of them are not so confident with the development of entertainment robots in 20 years. Besides, they do not need to be anxious about engaging as well.
- Women feel more anxious about the unemployment caused by entertainment robots in 20 years than men. Compared to women, men do not worry a lot about the future human-robot relationship that would break the relationship between human beings. About the ethical problem, men accept sexual robots better than women.
- People who work in robotics-related industries generally hold confidence for the development of robots in the recent future, while the students major in it sometimes would disagree with the judgment of them.
- Young people have already experienced great pressure of the unemployment caused by robots, and many of them think this problem would be more severe in 20 years. The other age groups do not worry about unemployment as the young.

Appendix

Appendix A: Citations

[1] Brooks, R. (2002). Flesh and Machines: How Robots Will Change Us.

[2] Veruggio G., Operto F. (2008) Roboethics: Social and Ethical Implications of Robotics. In: Siciliano B., Khatib O. (eds) Springer Handbook of Robotics. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-30301-5_65

[3] Reeves, B., & Nass, C. (1996). The media equation - how people treat computers, television, and new media like real people and places.

[4] Solis, J., Chida, K., Suefuji, K., & Takanishi, A. (2006). The development of the anthropomorphic flutist robot at Waseda University. *International Journal of Humanoid Robotics*, *3*(2), 127-151. https://doi.org/10.1142/S0219843606000709

[5] David L. (2009). Love and sex with robots: The evolution of human-robot relationships.

Appendix B: Questions

第15题 请问您看过以下哪些机器人相关的番剧、电影、电视剧、新闻或者游戏   [多选题]

选项	小计	比例	
钢架铁拳	36		38.71%
Her	49		52.69%
西部世界	51		54.84%
Carol and Tuesday	39		41.94%
底特律 变人	22		23.66%
本题有效填写人次	93		

第16题 你认为在20年后，机器人拳击比赛是否会成为一种新的流行竞技形式？ [单选题]

选项	小计	比例	
是	30		46.15%
否	35		53.85%
本题有效填写人次	65		

第17题 您认为类似《Her》中的聊天机器人的娱乐形式未来20年后是否会流行 [单选题]

选项	小计	比例	
是	39		55.71%
否	31		44.29%
本题有效填写人次	70		

第18题 20年后，您是否认为会有类似仿人机器人主题娱乐公园的出现 [单选题]

选项	小计	比例	
是	23		38.98%
否	36		61.02%
本题有效填写人次	59		

第19题 20年后，您认为类似番剧中的机器人写作音乐是否会实现 [单选题]

选项	小计	比例	
是	18		59.79%
否	12		40.21%
本题有效填写人次	30		

第20题 您是否认为类似底特律 变人游戏中的机器人绘画会在20年后出现 [单选题]

选项	小计	比例
是	49	52.69%
否	44	47.31%
本题有效填写人次	93	

第21题 底特律 变人中的性爱机器人，20年后如果成为现实，您是否能够接受　[单选题]

选项	小计	比例
是	41	44.09%
否	52	55.91%
本题有效填写人次	93	

第22题 影片《银翼杀手》中出现了机器人AI 妻子，您觉得20年后如果有AI妻子的出现，是否会合法化，商业化，并达到广泛推广　[单选题]

选项	小计	比例
会	38	40.86%
不会	55	59.14%
本题有效填写人次	93	

第23题 你认为以下哪些事项是20年后娱乐机器人发展可能引发的社会问题　[多选题]

选项	小计	比例
相关行业失业率增加，社会贫富差距扩大	51	54.84%
产生伦理道德问题，尤其是仿人机器人的发展	68	73.12%
机器人发展水平有限，工业化成本太高	49	52.69%
机器人可能产生自己的意识，甚至有可能危害人类	46	49.46%
机器人与人类关系密切导致人与人关系疏远	37	39.78%
本题有效填写人次	93	