OMSCS CS7637 Fall 2018 Assignment 1

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# Question 1

Figure 1 shows the a semantic network representing this problem. The Red circle stands for the shuttle, blue square stands for Rey, yellow square stands for Snoke and green square stands for Kylo. The directions of the triangles represent the movement of the components during the transation from one state to another. At the initial state, all components are in planet Quesh (right side of the frame), and at the final state (problem solved), all components are in orbiting ship (left side of the frame).

  
**Figure 1.** A semantic network representing the problem.

Figure 2 include the entire semantic network that solves this problem. Here we assume we have dump generator and dump tester. Starting from the Initial state, the generator generated 4 states and then tester tested them:

1. State 1: Rey is in shuttle, Snoke and Kylo are together, passed.
2. State 2: Rey and Kylo are alone together without shuttle, ruled out.
3. State 3: Rey and Snoke are alone together without shuttle, ruled out.
4. State 4: Rey, Snoke and Kylo are all together without shuttle, passed.

Since the following state of State 4 is the Initial state, now the generator produced the following state of State 1 and tester tested it:

1. State 5: Snoke and Kylo are alone together with shuttle, passed.



**Figure 2.** The entire semantic network that solves the problem.

Now the generator produced the following states of State 5 and tester tested them:

1. State 6: Rey and Kylo are alone together with shuttle, passed.
2. State 8: Rey and Snoke are alone together with shuttle, passed.
3. State 1: Already visited.

Now the generator produced the following states of State 6 and tester tested them:

1. State 7: Rey and Kylo are alone together without shuttle, ruled out.
2. State 11: Rey and Snoke are alone together with shuttle, passed.
3. State 5: Already visited.

Now the generator produced the following states of State 8 and tester tested them:

1. State 9: Rey and Snoke are alone together without shuttle, ruled out.
2. State 10: Rey and Kylo are alone together with shuttle, passed.
3. State 5: Already visited.

Now the generator produced the following states of State 11 and tester tested them:

1. State 12: Snoke and Kylo are alone together with shuttle, passed.
2. State 3 and State 6: Already visited.

Now the generator produced the following states of State 10 and tester tested them:

1. State 12: Snoke and Kylo are alone together with shuttle, passed.
2. State 2 and State 8: Already visited.

Now the generator produced the following states of State 12 and tester tested them:

1. State 13: Snoke and Kylo are alone together without shuttle, passed.
2. State 10 and State 11: Already visited.

Now the generator produced the following states of State 13 and tester tested them:

1. Final State: problem solved.
2. State 12: Already visited.

# Question 2

In this question I chose Elon Mask, the co-founder, CEO, and product architect of Tesla as a prominent AI cynic and LiLi Cheng, the corporate vice president of Microsoft AI & Research as a prominent AI optimist.

## AI cynic: Elon Mask

Elon Mask’s opinions towards the risks of artificial intelligence could be summarized as followings:

1. AI could overwhelmingly collect data through Internet, and extract features and learn from them. Then there is a possibility that AI shall make fake news and documents, manipulate emails and spread out counterfeit information via mass media, which consequently may trigger world war.
2. With the development of AI technologies, autonomous weapons will arise in battlefield who could determine and engage targets without human intervention. It will surely be the third revolution in warfare.
3. Unlike nuclear weapon, the technical barriers of AI**-**based autonomous weapons are quite low, which makes it ubiquitous to mass-produce. And if one of the major military powers has breakthrough on AI**-**based autonomous weapons, a military AI arms race will definitely be inevitable. Moreover, there is no guarantee that these kinds of weapons will not flow in black market and in the hands of terrorists.
4. Based on the three points above, if one day AI goes rogue and becomes superintelligence, it would be the nightmare of entire human being, as described in “The Terminator” movies. Thus we should have regulatory oversight of AI at the national and international level.

## AI optimist: LiLi Chen

LiLi Chen’s opinions towards the opportunities of artificial intelligence summarized as followings:

1. There are tremendous amounts of data in our world, only AI with limitless computing power could interpret it to the maximum extend. So it could definitely give solutions for some challenges in human society, including but not limited to energy, climates, health care and transportations.
2. AI could create an invisible interface between the client and the task. It may understand the users’ speeches and languages, and have vision, producing a personal guide based on users’ habits and preferences. Thus AI-based technologies adopt to human rather than making human to adopt technologies.

If we compare the views of these two people, we could see they are focusing on different angles of the same idea. Both of them agree that AI is a data-driven technology yet their differences were which way AI will go after collecting and interpreting data. From my perspective, the route decisions depend on humanity instead of the AI itself, hereby these two visons of the future could co-exist. And according to my understandings of humanity, similar with Captain Nemo of *Nautilus,* I tend to agree with Elon Mask more that we should establish restricted regulations to supervise the development of AI. If the tendency has broken the boundary, some organizations could force it stopping to avoid the scenario becoming worse.

However that does not necessarily mean I totally agree all Elon Mask’s opinions. One of my biggest concerns about Elon Mask’s view is his attitude towards “Superintelligence”. I could use the development of airplane as an example to elucidate my opinions. For thousand years human beings have a dream to fly in the blue sky. And we tried enormous methods to mimic the bird behaviors and all of them are failed, until we encoded air dynamics, the First Principle of flying. Then human beings were able to produce airplane based on that, a masterpiece who could fly higher and longer than any birds. Similarly, the most powerful AI in this era is still in the stage of bionics. Superintelligence will never appear unless we thoroughly understand what is human consciousness and how it is originated, the First Principle of AI. And such tasks are almost impossible because they include things we do not know we don’t know. HBO Westworld series gave an answer of these questions on the basis of Julian Jaynes's book “The Origin of Consciousness in the Breakdown of the Bicameral Mind”, yet it is merely a hypothesis based on cognitive archaeology. In one word, I believe the development of AI technologies will accelerate, and AI itself will not significantly threat human society as Elon Mask’s apocalypse.

# Question 3

The General Data Protection Regulation (GDPR) of EU is applicable on as of May 25th, 2018, and comparing with its predecessor Data Protection Directive 95/46/ec, it has a few major changes in terms of using personal data to personalize individual user experiences online.

## Data collection and data ownership

In the past decades, most companies could collect all kinds of user data by merely receiving a vogue consent with user’s agreement. Now under the GDPR, companies have to disclose some information to the user before collecting the user’s personal data, including but not limited to 1). What they are using these data for; 2). What kinds of personal data they will store; 3). How they'll protect these personal data and prevent unauthorized access. All these questions mean the user has the full ownership of his/her personal data and companies have to unveil the full scope of personal data they collect. Needless to say, it makes data collection harder and more expensive than before, especially for start-up companies, who do not have strong first-party data stream as giant companies, and will encounter insufficient data source and imbalanced datasets and have to modify their AI models.

## Data storage

The GDPR also regulates that companies could not store user’s data to eternity. They are subject to set a limit about how long they will store the user’s personal data for their business purpose. And users have the right to require companies to alter and/or erase their data from companies’ database. However some users’ personal data, especially the metadata, might be stored in unstructured database. Thus companies receive such requests they might develop more powerful algorithms to change or get rid of users’ data and avoid false positive and false negative, which will increase companies’ costs for sure. For instance, if the user askes for deleting his/her Social Security number, and in some collected documents, it was marked as “SSN” and others were marked as “Social Security number”, companies may spend few months to clean all SSN information and avoid to mis-delete other information.

## Automated decision-making and Data explanation

According to Article 22(1) of GDPR, the user or any person has the right:

“not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her”.

That means companies could not make a decision solely based on automated processing if it has legal effects or similarly significantly affects on the user. More than that, if companies have made automated decisions within the scope of Article 22(1) GDPR, they have to notice the users about "the existence of automated decision-making" and provide them with

"meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject (Article 15, EU GDPR)."

This section is also known as “the right of explanation” and makes one of the biggest challenges AI industry has to encounter. Since the most popular machine learning model used in AI industry is deep neural network, which is composed of tremendous non-linear functions. After many rounds of training with colossal data, the weighting factors of the network were optimized and the decision was made. However even the most experienced data scientist could not fully explain the logic and reasons underlying the decision due to the complexity of the network. And if the training dataset changed, the decision may be altered as well. Hence currently the first priority of AI industry is not to increase the accuracy and predictive ability of their machine learning models, but to explain the AI results to the users in human language with meaningful information.

## Data outsourcing

One renowned scandal of data outsourcing occurred recently was Cambridge Analytica improperly access to more than 50 million Facebook users’ private information, and by abusing such data it developed tools that is capable to influence the behaviors of American voters. Under GDPR, such data outsourcing is surely forbidden and more than that, even outsourcing AI itself is highly regulated. For instance, if a genetic test company has collected a group of patients information from hospital A and enhanced its cancer prediction AI model based on that. Once the company uses such model to foresee the cancer risk of patients in hospital B, it has to guarantee the private information of patients in hospital B are fully protected and will not be unnecessarily used for other purpose.

# Question 4

In this question I chose R2-D2 in Star Wars as an example in popular culture that portrays AI in a positive light, and the “ArkAngel” system in second episode of the fourth series of anthology series Black Mirror as an example in popular culture that portrays AI in a negative light.

## Portraying AI in a positive light

R2-D2 is one of the classical characters in Star Wars movie series. It is a 0.96 meter high astromech droid with masculine programming and was designed as starship mechanic and fighter pilot's assistant. Its major function is to repair and maintain starships, and it could also compute hyperspace coordinates and program it into the ship's navicomputer. R2-D2 does not have vocal modules so it can’t directly talk to human beings with human languages (considering the existence of loquacious C-3PO, the speaking function of R2-D2 seems not necessary), yet it could display its opinions and share information through the displays within the starships and communicate with other intelligence. Moreover R2-D2 could not receive new programming and its memories were never fully wiped out, which brought it more adventurous and independent characteristic than other AIs in the films.

In the ten Star Wars films to date, R2-D2 appears nine of them and it was portrayed as a royal servant of its masters. It always managed to bring the tough scenarios through at the last minutes, and its bravery and ingenuity saved the galaxy many times. Followings are some highlight moments of R2-D2 in the films:

1. After Trade Federation invaded Naboo, Queen Amidala try to escaped her world with the Royal Starship. It was R2-D2 successfully repaired the damaged shields of Royal Starship under heavy fire and allow it to jump to the hyperspace.
2. In the Battle of Yavin, R2-D2 and C-3PO navigated the Imperial computer system and offered timely assistances to the rescuers of Princess Leia who was finally being free.

## Portraying AI in a negative light

ArkAngel is a fictional AI system that allows parents to track and monitor their children and becomes dangerous hinderance. It implants a neural chip into kid’s head without any pain and has the following major features:

1. Parents could check the geolocation and healthy status of children in real-time via a tablet connected to the chip.
2. Parents could access the immediate eyesight of the children and determine if censoring their views is necessary. And the AI system will pixelizing all obscenities that may cause stress and uncomfortable feelings, along with audio distortions.
3. Parents could use reverse image search and find out what their children have seen in the past.

This leading actress, Sara, was implanted this AI system when she was a little girl. Yet she becomes more social outcast and frustrated while growing up, since she was never fully exposed to stressful scenario and eager to see the real world. Sara’s overprotective mom, Marie, who initiated the implanting of ArkAngel, finally brought her to the psychologist and was told this AI-system was banned because of its disadvantages in children recognition and emotion development. The implanted device could not be removed yet the parents could turn off the tablet and throw it away. Not surprisingly, Maria selected to keep monitor and track Sara’s behaviors. After Sara entering into adolescence, the mother-daughter relationship becomes strained. At the end of the drama Sara injured Maria unconscious due to the activation of obscenity blockage and ran away from home.

From my perspective, these two portraits of AI could exist in the same fictional universe, since they are the two sides of the same coin. One major motivation of developing AI is that human beings intend to simplify complicated tasks with more “automation”. Human body is vulnerable to repair and maintain spaceship in the outer space, and AI could finish such complex tasks quicker and better. Yet not all sophisticated jobs, such as parenting and educating children, could be simplified by AI. I always believe the technology itself is 'neutral' or 'value-free', and it is the way we use it to make it “good” or “evil”.

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## Data outsourcing

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### Heading 3

Heading 3 should be bold and 12 point font. Like the other headings, it should be preceded by 12pt spacing and followed by 6pt spacing.

#### Heading 4

Use of headings beyond Heading 3 is not recommended. If need be, though, Heading 4 should be bold, italicized, and 12 point font. Like the other headings, it should be preceded by 12pt spacing and followed by 6pt spacing.

##### Heading 5

Use of headings beyond Heading 3 is not recommended. If need be, though, Heading 5 should be italicized and 12 point font. Like the other headings, it should be preceded by 12pt spacing and followed by 6pt spacing.aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

###### Heading 6

Use of headings beyond Heading 3 is not recommended. If need be, though, Heading 6 should 12 point font and otherwise unformatted. Like the other headings, it should be preceded by 12pt spacing and followed by 6pt spacing.

## Margins

Margins should be 1.5 inches on all sides. The page number should be included in the top right corner of the page in the margin.

# Figures & Tables

You are encouraged to use figures in your submissions. An example of a figure inserted into a paper is below.

  
**Figure 1.** The “Cats Playing Scrabble” drawing I commissioned as a birthday present for my wife. Those are our cats, as well as her childhood dog and fish.

Figures should always be centered on the page, although they may also take up the entire width of the page. They should not, however, exceed the page margins. Figures should always be referenced in the text. Figures may also be equations, diagrams, or other kinds of content.

## Figure Captions

Figures captions should be centered underneath the corresponding figure. The label for the figure, e.g. “Figure 1”, should be bolded, and the entire caption should be 10 point font. If need be, you may have one figure caption corresponding to multiple consecutive figures, and use either locational descriptors (e.g. “Top Left”, “Middle”) or labels (e.g. “A”, “B”) to map parts of the caption to parts of the figure.



**Figure 2.** Top left: my daughter Lucy and the moon. Top right: Boggle. Bottom left: Achilles. Bottom right: Artemis.

## Table Captions

Table captions should be formatted the same way as figure captions, but they should be placed above the table. The popular mnuemonic for this is: figures at the foot, tables at the top. Like figures, tables should not exceed the margins on the page and should be centered on the page. You have freedom to format the table in the way that works best for your data.

Make sure that captions are on the same page as the corresponding figure or table. If a figure or table’s size is such that it cannot fit in the text without leaving considerable blank space on a page or separating the caption from the table or figure, consider rearranging the text. For example, this paragraph was moved before the table below so that the table would not span two pages. You may also place the figure or table and its caption in a textbox with no outlines and use that to position the figure or table at the top or bottom of a page while the text rearranges around it.

**Table 1.** A chart of the number of references to various animals and children in this document.

|  |  |
| --- | --- |
| **Name (species)** | **# of References** |
| Boggle (cat) | 2 |
| Artemis (cat) | 2 |
| Achilles (cat) | 2 |
| Lucy (human) | 1 |
| Sparky (cat) | 1 |
| Snickers (dog) | 1 |
| Flower (dog) | 1 |
| Feesh (fish) | 1 |

# Citations and References

Works should be cited in-line. All works cited in-line should be compiled into a references list at the end of the paper. APA format is preferred for both in-line citations and the reference list.

## In-Line Citations

Other articles or sources to which you refer should be cited in-line with the authors’ names and the year of publication. The citation should be placed close in the text to the actual claim, not merely at the end of the paragraph. For example: students in the OMSCS program are older and more likely to be employed than students in the on-campus program (Joyner 2017). In the event of multiple authors, list them. For example: research finds sentiment analysis of the text of OMSCS reviews corresponds to student-assigned ratings of the course (Newman & Joyner 2018). You may also cite multiple studies together. For example: several studies have found students in the online version of an undergraduate CS1 class performed equally with students in a traditional version (Joyner 2018a; Joyner 2018b; Joyner 2019). If you would like to refer to an author in text, you may also do so by including the year (in parentheses) after the author’s name in text. If a publication has more than 4 authors, you may list only the first author followed by ‘et al’ . For example: Joyner et al. (2016) claim that a round of peer review prior to grading may improve graders’ efficiency and the quality of feedback given. This applies to parenthetical citations as well, e.g. (Joyner et al. 2016).

## Reference List

References should be placed at the end of the paper in a dedicated section. Reference lists should be numbered and organized alphabetically by first author’s last name. If multiple papers have the same author(s) and year, you may append a letter to the end of the year to allow differentiated in-line text (e.g. Joyner 2018a and Joyner 2018b in the section above). If multiple papers have the same author(s), list them in chronological order starting with the older paper. APA citation and reference style is preferred, but MLA, Chicago, Harvard, and Vancouver styles are accepted. Only works that are cited in-line should be included in the references section.

For more information on in-line citations and reference sections, we recommend looking at the [Purdue Owl](https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_style_introduction.html) (Purdue Owl 2018). Note that references are *not* counted against the length requirements in any of the listed classes. If the length limit for a particular assignment is 4 pages, then the main text must stop by the end of the fourth page, but the reference list may extend into and past the 5th page.

# Additional Components

There are additional components you may need to include in your paper: in-line quotes, block quotes, bulleted lists, numbered lists, and more.

## In-Line and Block Quotes

If you would like to quote an outside source, you may do so with quotation marks followed by an in-line citation. If the quote is fewer than three lines, you may quote it in line. It is acceptable to replace pronouns with their target for clarity. For example, “Heavy use of peer grading would compromise [the school’s] reputation” (Joyner 2016). If a quote is more than three lines, you should offset it as its own paragraph with half-inch larger margins on each side. For example:

“Whether or not the grades generated by peers are reliably similar to grades generated by experts is only one factor worth considering, however. Student perception is also an important factor. A recent study indicated that reliance on peer grading is one of the top drivers of high MOOC dropout rates. This problem may be addressed by reintroducing some expert grading where possible” (Joyner 2016)

## Bulleted and Numbered Lists

Bulleted and numbered lists half their text indented a half-inch from the left margin, with the bullet or number within that space (the standard format for bullets and margins in Word and Google Docs). For example:

1. This is an item.
2. Note that the left side of the text is aligned, as are the numerals.
3. Notice also that a second line corresponding to the same bullet is also indented at the same level of the previous lines.

Bulleted lists follow the same format:

* Here’s an item.
* Like numbered lists, the second line along a single line in a bulleted list is at the same level of indentation.

## Other Content

For other content not covered here, you have reasonable flexibility in determining how it should be used in this format. Generally, nothing should lay outside the margins. You may specify new types of captions if you would like, such as Equations, Diagrams, or other kinds of content.

# References

1. Joyner, D. A., Ashby, W., Irish, L., Lam, Y., Langston, J., Lupiani, I., Lustig, M., Pettoruto, P., Sheahen, D., Smiley, A., Bruckman, A., & Goel, A. (2016). Graders as Meta-Reviewers: Simultaneously Scaling and Improving Expert Evaluation for Large Online Classrooms. In *Proceedings of the Third Annual ACM Conference on Learning at Scale*. Edinburgh, Scotland.
2. Joyner, D. A. (2017). Scaling Expert Feedback: Two Case Studies. In *Proceedings of the Fourth Annual ACM Conference on Learning at Scale*. Cambridge, Massachusetts.
3. Joyner, D. A. (2018a). Intelligent Evaluation and Feedback in Support of a Credit-Bearing MOOC. In *Proceedings of the 19th International Conference on Artificial Intelligence in Education*. London, United Kingdom. Springer.
4. Joyner, D. A. (2018b). Toward CS1 at Scale: Building and Testing a MOOC-for-Credit Candidate. In *Proceedings of the Fifth Annual ACM Conference on Learning at Scale*. London, United Kingdom. ACM Press.
5. Joyner, D. A. (2019). Building Purposeful Online Learning: Outcomes from Blending CS1. In Madden, A., Margulieux, L., Kadel, R., & Goel, A. (Eds) *Blended Learning in Practice*. MIT Press.
6. Newman, H. & Joyner, D. A. (2018). Sentiment Analysis of Student Evaluations of Teaching. In *Proceedings of the 19th International Conference on Artificial Intelligence in Education*. London, United Kingdom. Springer.

# Appendices

Appendices may be include after the reference list. If you have multiple appendices, you should label the appendix section in general as a level-1 section called Appendices, and each Appendix with a level-2 header with a label and title, e.g. “Appendix A: Interview Transcripts”. If you have only one appendix, you may simply label it as something like “Appendix: Interview Transcripts”.

Appendices do not count against the page limit, but appendices should also not contain any information *required* to answer the question. The body text should be sufficient to answer the question, and the appendices should be included only for you to reference or to give context. Some assignments may also require you to include certain things in the appendices: these will not count against the page limit either.