**Instructions**: Please complete and submit your work to the appropriate folder in LumiNUS. You may work in study groups, but each student must be responsible for their own submission.

Please submit all the following documents as a single zip file named StudentID-Name-HW1.zip:

1. Completed Word file named as StudentID-Name-HW1.docx (with all results)
2. Print preview of ipynb file named as StudentID-Name-HW1.pdf (with all results)
3. Working ipynb file named as StudentID-Name-HW1.ipynb
4. A machine learning application scenario can be seen from four perspectives: (i) what is the technical problem to be solved, (ii) the data requirements, meaning can you get the data needed, (iii) security and privacy considerations, meaning what happens if data is leaked and (iv) the value proposition that machine learning brings to the table.

Choose two industries from the list below (or be creative and come up with your own) and give one example from each industry of how supervised machine learning can be applied. Your examples should follow the 4 perspectives outlined above.

Try to give different examples from those given in lecture. You may consult the Internet, but you must think things through yourself.

|  |  |  |
| --- | --- | --- |
| Retail | Fashion | Industry 4.0 |
| Banking | Education | Social Media |
| Healthcare | Communication Networks | Smart Home |

**Answer：**

1.Healthcare

We can use supervised machine learning model to predict a person’s probability of have a disease based on his CT scan, such as Tumors and cancers. The data we need is the CT scans of previous patients, and the label is whether the scan owner has disease or not, maybe we also need to distinguish data sets according to age or gender. Healthcare data is closely related to people’s privacy, so if data is leaked it will disclose medical history of patients. So when we use the data, we mainly do not bind personal information. The use of machine learning in healthcare could allow patients to use computers to quickly assess their own health situation and help doctors to diagnose patients.

2.Smart Home

What is very important in the smart home is that the machine can recognize what the host has said. Similar to natural language processing, the machine needs to collect what the owner has said in the past to learn from the owner's commands, including recognizing accents. Because talk in the home is more private commonly, if recording data leaked, so likely important information to be stolen. Its value is that machines can accurately recognize what people say, so that smart home can be realized more thoroughly.

1. Redo Problem 1 for the unsupervised learning scenario. Give one example of an application scenario that is different from the examples discussed in the lectures.

**Answer:**

Retail

We can use unsupervised learning in the retail to make the commodity sells better. By collecting data on each purchase, we can perform cluster analysis to the commodities. Suppose we find that toothpaste and toothbrushes, beer and pork are likely to be bought together, so we can bundle them together and offer discount or put them next to each other to increase purchases. Similarly, when collecting purchase data, it should be careful not to attach users' personal information to avoid data leakage. Using machine learning in retail can increase the purchasing of customers.

1. Redo Problem 1 for the reinforcement learning scenario. Give one example of an application scenario that is different from the examples discussed in the lectures.

**Answer:**

Industry 4.0

In Industry 4.0, we will use many machines to do many tasks for us. In class we saw an example of reinforcement learning, where robots can automatically adapt to physical damage. I think we can also use reinforcement learning to help robots learn how to move autonomously, for example to avoid obstacles on a floor, create machines that can move from point A to point B automatically. The data is that we need to get it on autopilot in different obstacles, score it based on collisions and time of arrival. We don't have to worry too much about data leaking under this scenario. Using reinforcement learning for autonomous driving of a robot can make it more intelligent.

1. Suppose we want to remove vowels from a sentence. Write Python code to do this using iterators and list comprehension. The input sentence is: "The quick brown fox jumps over the lazy dog".
   1. Paste you Python code below, as well as the output of your program with the given input.
   2. Submit your iPython notebook file (ipynb file) as well as a pdf print preview of the ipynb file as instructed above.

**Answer**：

1.Iterators

def for\_soln(sentence):

vowels = 'aeiou'

filtered\_list = []

for l in sentence:

if l.lower() not in vowels:

filtered\_list.append(l)

return ''.join(filtered\_list)

2. list comprehension

def for\_soln(sentence):

vowels = 'aeiou'

return ''.join([l for l in sentence if l.lower() not in vowels])

3.output

Th qck brwn fx jmps vr th lzy dg