ASSIGNMENT 1

**Q1-**

Google Assistant, Alexa, Siri – NLP, Information Sciences

Facial Recognition - Computer Vision

Face-unlock - Computer Vision

Cost comparison websites - Information Sciences

Chatbots - NLP

Faceapps, Snapchat filters – Computer Vision, Machine learning

**Q2-**

No, the sheer amount of information these applications collect, often without consent, is not moral in nature. It puts everyone at a privacy and security risk. Even when governments force companies to ask for consent, they often make it so long and complicated, full of legal and difficult terms, that the end-user just accepts it without reading it, which is exactly what these companies hope for. They even make features that shouldn’t require any user data at all, inaccessible, unless you consent. Privacy is a major issue, your data is sold between ISPs, companies and governments for cents per person. Security is another issue, nearly all big companies have been breached recently, and their users’ data has been sold on the dark web. Imagine if some bad actor gets a hold of your phone number, your address, or your bank details (your data may have been breached already, haveibeenpwned.com is a good resource to check). That’s the basic stuff. Tech giants like Meta (formerly facebook), Google, Amazon and Apple can track your every movement via phone. Where you go, at what time, what you eat, how much you spend, what you like, what you dislike, basically everything. Imagine how bad actors could use *that* data, from manipulating elections to toppling governments, nothing becomes impossible.

Thus, applications should only be allowed to collect the data they need to function, and those data requirements should be clearly and concisely communicated to the end user.

**Q3-**

Every person who has driven in a city for more than two days has thought to himself/herself, “wow, people are so stupid.” Humans are full of errors, driving too fast, driving too slow, parking in wrong spots, using the indicators incorrectly, driving on wrong lanes, driving the wrong way on one ways, and sometimes just being unaware of traffic rules and being inconsiderate of other drivers on the road. And that’s when people are at full capacity. When they sleep deprived, hungry, frustrated after a fight, distracted, or not getting a glasses prescription when they need them, these issues are further exacerbated. In 2015, the US Department of Transportation attributed 94% of crashes to human error.

Autonomous vehicles do not suffer from any of these problems. They can communicate with each other and smart checkpoints on the road instantaneously, and by managing speed, remove the need for any red lights or stoppages in your journey. The reason for their invention is easy to see.

As for hardware and software, they need loads of sensors. Camera, infrared and ultrasonic sensors all around the vehicle, plus the computational power and software (a real-time OS) that is able to instantaneously map the road, the condition of the road, the environment, and all of the objects on the road and their movement vectors. Then it needs software to compute on what it should do given the current road and environment conditions. Whether to accelerate, decelerate, steer, honk, or something else. Finally it needs software and hardware (screen and speakers) to effectively and concisely communicate the information to its passengers.

Currently in India there is no dedicated legislation to regulate self-driving cars. In the US, the present law assumes a human is present in the driver’s seat at all times. The most important thing any law needs to consider is who is going to be responsible in the case of an accident or a malfunction, given there will be human drivers along with self driven cars on the road at first. Then there are considerations about a separate lane, an acceleration or a speed limit, power consumption and charging, and subsidies to encourage consumers to buy them.

The moral issues that arise are akin to the trolley problem, and what the AI should prioritise. For example, if safety is of utmost priority, then your car would never leave the garage, since there is always a risk associated with going outside on the road (due to other errant drivers, equipment failure, poorly constructed roads, etc.). There is a trade-off between making progress towards the destination and incurring a risk of injury. How should this trade-off be made? Furthermore, to what extent can we allow the car to take actions that would annoy other drivers? How much should the car moderate its acceleration, steering, and braking to avoid shaking up the passenger? These kinds of questions are difficult to answer a priori. They are particularly problematic in the general area of human–robot interaction, of which the self-driving car is one example.

**Q4-**

**Healthcare**- Chatbots can help in identifying symptoms, then direct to the correct doctor based on compatibility. There are several AI based chatbots in development that can help in therapy. Complex surgeries could be performed by a sufficiently trained AI and a robotic arm. Precision medicine is known to be one of the most valuable examples of AI in healthcare. Its foundation relies on the large amounts of data gathered from several disruptive technological innovations, such as cheap genome sequencing, advanced biotechnology, and health sensors used by patients at home.

**Environment**- AI is being used to assess weather patterns and the damage caused by disasters. A project, named Protection Assistant for Wildlife Security (PAWS) from the University of Southern California, is using machine learning to predict where poaching may occur in the future. Currently the algorithm analyses past ranger patrols and poachers’ behaviour from crime data; a Microsoft grant will help train it to incorporate real-time data to enable rangers to improve their patrols. In Washington State, Long Live the Kings is trying to restore declining steelhead and salmon populations. With a grant from Microsoft, the organization will improve an ecosystem model that gathers data about salmon and steelhead growth, tracks fish and marine mammal movements, and monitors marine conditions. The model will help improve hatchery, harvest, and ecosystem management, and support habitat protection and restoration efforts. AI is increasingly used to manage the intermittency of renewable energy so that more can be incorporated into the grid; it can handle power fluctuations and improve energy storage as well. Artificial intelligence can enhance energy efficiency, too. Google used machine learning to help predict when its data centres’ energy was most in demand. The system analysed and predicted when users were most likely to watch data-sucking YouTube videos, for example, and could then optimize the cooling needed. As a result, Google reduced its energy use by 40 percent. In China, IBM’s Green Horizon project is using an AI system that can forecast air pollution, track pollution sources and produce potential strategies to deal with it. It can determine if, for example, it would be more effective to restrict the number of drivers or close certain power plants in order to reduce pollution in a particular area.

**Agriculture-** AI can help monitoring crop and soil information. Can help in observing crop maturity. It eliminates a lot of manual labour, which is extremely time and money saving at large scales. It can also help in detecting insects, and whether they are good or bad for crops. Can help in disease detection. AI can automatically spray any needed pesticides, insecticides, water, or fertilizer as it deems necessary for the specific variety of crop. And in the lab, AI can quickly sequence crop genes and determine which one will be better for future production. Similar advances are seen in livestock rearing.

**Q5-**

The rationale is simple. To sell you more things. The recommendation system looks at products you’ve looked at, for how long you’ve looked at them, and what you’ve bought. It also looks at what you have previously bought, and what your neighbours and relatives have bought. And then it recommends other products based on that.

It can be beneficial, if set up and configured properly, it can significantly boost revenues, CTRs, conversions, and other important metrics. 35% of Amazon’s revenue is generated by its recommendation engine. Moreover, they can have positive effects on the user experience as well, which translates into metrics that are harder to measure but are nonetheless of much importance to online businesses, such as customer satisfaction and retention. For example, if you are buying a book for your electronics course it may recommend you other books that people often buy with it. Those books are likely to be a part of your course as well, and you may even get a better deal buying them together like this.

Media streaming sites such as YouTube and Netflix use similar systems as well.

The downside is that it needs to start somewhere, and thus initial recommendations may not be accurate. Trends change with time. Customer intentions change with time. It’s not good for eccentric, divisive, or controversial content. Most importantly, the customer may feel their privacy violated.

**Q6-**

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| TASK ENVIRONMENT | OBSERVABLE | DETERM./STOCHASTIC | EPISODIC/SEQUENTIAL | STATIC/DYNAMIC | DISCRETE/CONTINUOUS | AGENTS |
| Crossword puzzle | Fully | Deterministic | Sequential | Static | Discrete | Single |
| Chess with clock | Fully | Deterministic | Sequential | Semi | Discrete | Multi |
| Poker | Partially | Stochastic | Sequential | Static | Discrete | Multi |
| Backgammon | Fully | Stochastic | Sequential | Static | Discrete | multi |
| Taxi driving | Partially | Stochastic | Sequential | Dynamic | Continuous | Multi |
| Medical diagnosis | Partially | Stochastic | Sequential | Dynamic | Continuous | Single |
| Image analysis | Fully | Deterministic | Episodic | Semi | Continuous | Single |
| Partpicking robot | Partially | Stochastic | Episodic | Dynamic | Continuous | Single |
| Refinery controller | Partially | Stochastic | Sequential | Dynamic | Continuous | single |