

Assignment 5: HMMs, Bayesian Networks, and Decisions

Question 1:

Given speeds:

Rocky terrain speed = 2 kmph

Sandy terrain speed = 3 kmph

Smooth terrain speed = 5 kmph

Part 1:

Route 1 = $(0.2 * 2/3) + (0.3 * 2/5) + (0.5 * 2/2) = 0.133 + 0.12 + 0.5 = 0.753$ hours

Route 2 = $(0.4 * 1.8/3) + (0.2 * 1.8/5) + (0.4 * 1.8/2) = 0.24 + 0.072 + 0.36 = 0.672$ hours

Route 3 = $(0.5 * 3.1/3) + (0.4 * 3.1/5) + (0.1 * 3.1/2) = 0.517 + 0.248 + 0.155 = 0.92$ hours

Therefore, the best route is the route with less expected time, which is **Route 2**.

Part 2:

New Route 1 = $0.753 + (0.3 * 0.75) = 0.753 + 0.225 = 0.978$ hours

New Route 2 = $0.672 + (0.6 * 1) = 0.672 + 0.6 = 1.272$ hours

Therefore, taking into consideration the new expected times for Route 1 and Route 2, the best route is **Route 3**.

Part 3:

If Route 3 has a smooth terrain, then its expected time will be $(3.1 / 5) = 0.62$ hours, which is less than Route 1 and Route 2. It is also less than the expected time of Route 3, which is 0.92 hours.

The value of this information is $(0.92 - 0.62) = 0.3$ hours.

So it is helpful to find out whether Route 3 is smooth or not. And we can afford to wait up to 0.3 hours to get the information from the satellite.

Part 4:

I asked GPT=4 this question and it answered it correctly. The following is its response:

Question 1: Which Route Should We Pick Initially?

1. **Route 1:** Expected travel time is 0.753 hours.
2. **Route 2:** Expected travel time is 0.672 hours.
3. **Route 3:** Expected travel time is 0.920 hours.

The best choice initially is Route 2 , as it has the shortest expected travel time.

Question 2: Which Route After Learning About Additional Obstacles?

1. **Route 1 (with crater):** Adjusted expected travel time is 0.978 hours.
2. **Route 2 (with bridge):** Adjusted expected travel time is 1.272 hours.
3. **Route 3:** Remains the same at 0.920 hours.

Considering the additional obstacles, the best choice now is Route 3 , as its adjusted expected travel time is the shortest.

Question 3: Is Information About Route 3 Being Smooth Helpful?

- If Route 3 is known to be smooth, its travel time would be 0.62 hours.
- The value of the information (the improvement in expected travel time if Route 3 is smooth) is 0.300 hours.
- We are willing to wait for this information up to 0.300 hours, as this is the difference between the current best option (Route 3's expected time) and the time if Route 3 is known to be smooth.

In summary, obtaining information about Route 3 being smooth is valuable, and we can afford to wait up to 0.300 hours for this information before making a decision.

Question 2:

Part 2:

Go to the folder where HMM.py exists and run `python HMM.py partofspeech.browntags.trained --generate 20` .

Part 3:

Go to the folder where HMM.py exists and run `python HMM.py partofspeech.browntags.trained --forward ambiguous_sents.obs` .

Part 4:

Go to the folder where HMM.py exists and run `python HMM.py partofspeech.browntags.trained --viterbi ambiguous_sents.obs` .

Question 3:

Run the `submission.py` file.

Question 4:

What are the three dimensions along which Big Tech has an advantage in AI?

1. **The Data Advantage:** Big Tech firms have access to a vast amount of behavioral data, giving them an edge in creating consumer AI products. Their economic power has enabled them to become integral to many industries, from healthcare to education, by focusing on expanding their data advantage.
2. **Computing Power Advantage:** AI requires significant computing power for training, tuning, and deploying models. Only a few companies possess the necessary infrastructure and resources, like cloud and compute resources, which are foundational for AI development. This creates a scenario where smaller AI startups are dependent on Big Tech for infrastructure, often aiming to be acquired by these larger companies.
3. **Geopolitical Advantage:** AI systems and their producing companies are increasingly seen as strategic assets in economic and security contexts. This has led to a narrative that conflates Big Tech's dominance with national economic strength, resulting in these companies accruing more resources and political capital.

Why does AI Now think it's important to focus on Big Tech?

AI Now focuses on Big Tech due to their unique scale of operation, network effects, data and infrastructural advantages, and financial leverage. These companies have consolidated advantages across various sectors and have influenced regulatory environments to protect these advantages. The term "Big Tech" is often used to refer to major US-based corporations like Google, Apple, Facebook, Amazon, and Microsoft (GAFAM). This focus is important as it addresses root causes of concerns like invasive data surveillance, manipulation of autonomy, economic power consolidation, and exacerbation of inequalities and discrimination. Moreover, the dependencies on Big Tech across industries and government position them as both a choke point and a single point of failure, making them critical targets for policy interventions.

Priority 1 discusses Algorithmic Accountability. What does this mean? Why is it important to shift responsibility for detecting harm on companies themselves?

Algorithmic Accountability emphasizes the need for tech companies to proactively ensure their AI and algorithmic technologies do not cause harm, mirroring responsibilities seen in the financial sector. This concept is vital because it addresses the complexity and opacity of these technologies, shifting from a reactive to a preventative approach in dealing with potential harms. It relieves regulators and the public from the arduous task of continually monitoring and rectifying issues, placing the onus on those who best understand and control these systems. By demanding ethical and legal compliance, particularly in sensitive areas like biometric surveillance, it upholds public trust and prevents the misuse of technology. Furthermore, it advocates for clear boundaries and prohibited zones in technology application, preventing the gradual intrusion of harmful technologies into sensitive life aspects. Overall, this approach is crucial for a responsible and socially conscious deployment of advanced technological systems.

What are the windows for action that are identified? Which do you personally think are the most effective or promising?

Windows for action:

1. Contain tech firms' data advantage.
2. Build support for competition reforms as a key lever to reduce concentration in tech.
3. Regulate ChatGPT and other large-scale models.
4. Displace audits as the primary policy response to harmful AI.
5. Future-proof against the quiet expansion of biometric surveillance into new domains like cars.
6. Enact strong curbs on worker surveillance.
7. Prevent "international preemption" by digital trade agreements that can be used to weaken national regulation on algorithmic accountability and competition policy.

Personally, the most effective or promising windows of action are regulating large-scale models and displacing audits as the primary policy response to harmful AI. The actions mentioned under these windows for action directly target the core of AI development and deployment, addressing potential harms at the source and ensuring that companies take responsibility for their technologies before they impact society, leading to more responsible and ethical AI practices.

Regarding the executive summary, do you agree with this assessment? How might we rethink our relationship with AI and with technology in order to avoid these potential negative outcomes?

I agree with the assessment as it cautions against viewing the trajectory of AI as inevitable and synonymous with progress. This is insightful and underscores the critical need to reevaluate our relationship with AI. This perspective is important as it recognizes that AI, shaped by human choices and values, can have significant social, economic, and political impacts, including the potential to exacerbate inequalities in various sectors. Due to this, I think adopting a multi-faceted approach in rethinking our relationship with AI is essential. This includes fostering ethical and responsible AI development guided by principles of fairness, transparency, and accountability. Implementing robust regulatory frameworks is crucial for evaluating and mitigating AI's potential harms, alongside promoting public awareness and engagement to empower communities in AI-related decision-making processes. Education and training in digital literacy and AI ethics are key for developers, policymakers, and the public. Additionally, focusing on human-centric AI that augments human capabilities and addresses societal challenges is vital. By adopting these strategies, we can guide AI towards beneficial societal outcomes, steering clear of the pitfalls of unchecked development that could worsen existing societal issues.

ChatGPT response:

The assessment you've provided raises several valid concerns about the impact of artificial intelligence on society. As AI continues to advance and integrate more deeply into various aspects of our lives, it's important to consider both its benefits and potential drawbacks. Addressing these concerns requires a multifaceted approach:

1. **Regulation and Oversight** : Governments and international bodies can play a crucial role in regulating AI technologies. This involves setting standards and guidelines that ensure AI is developed and used ethically and responsibly. Regulations can help prevent or minimize issues like bias in AI algorithms, which can exacerbate inequality in areas like housing, credit, healthcare, and education.
2. **Transparency and Accountability** : AI systems should be transparent in their decision-making processes. This is particularly important in sectors like healthcare, criminal justice, and finance, where decisions can significantly impact individual lives. Knowing how an AI system arrives at a decision can help in identifying biases or errors in the system.
3. **Public Engagement and Education** : Increasing public awareness and understanding of AI is essential. This involves educating people about how AI works, its potential benefits, and its risks. An informed public is more likely to demand ethical AI practices and can contribute to a more democratic control over the technology's trajectory.
4. **Ethical AI Development** : This involves the integration of ethical considerations in the development process of AI. Developers and companies should be encouraged, or required, to consider the societal impacts of their AI systems. Ethical AI involves fairness, privacy, non-discrimination, and ensuring that AI systems do not harm humans.
5. **Promotion of Human-Centric AI** : AI should be designed to augment human abilities and to work in partnership with humans rather than replace them. This approach can help mitigate the issue of job displacement and can ensure that AI technologies are used to enhance human capabilities.
6. **Addressing Mental and Physical Health Concerns** : With the rise of AI in content production and social media, there needs to be a focus on how these technologies impact mental health, especially among young people. This could involve designing AI systems that promote healthy content consumption habits or regulations that limit harmful AI-driven content practices.
7. **Fostering AI Literacy in the Workforce** : As AI changes the nature of work, there's a growing need for workers to adapt. This could involve re-skilling or up-skilling initiatives to ensure that the workforce is prepared for an AI-augmented job market.
8. **International Collaboration** : AI is a global phenomenon, and its challenges cross national borders. International collaboration can help in setting global standards and sharing best practices in AI governance.

In summary, rethinking our relationship with AI involves a balanced approach where its development is coupled with ethical considerations, regulatory oversight, and public engagement. This can help ensure that AI serves the greater good, avoids exacerbating existing societal

issues, and is developed in a manner that is beneficial and equitable.

The output of chatGPT is very similar to what I suggested for the question. It went into more depth/description of some of the suggestions. However, there were also other suggestions that I did not have in my answer like International Collaboration and Addressing Mental and Physical Health Concerns.