Homework 1

GSND 5345Q, Fundamentals of Data Science

Due Friday, January 17th, 2025

Homework Questions, Part 1: Ethical Considerations (50 points)

Instructions: For each of the following questions, provide a thoughtful (but brief) response that demonstrates your understanding of ethical considerations in data science. Your answers should reference relevant principles, frameworks, or real-world examples where applicable. Aim for clarity, directness, and critical thinking. For the examples provided with each question, discuss how they relate to the broader ethical challenges posed by the topic. Be sure to support your arguments with evidence or reasoning, and consider multiple perspectives where appropriate.

1. How do we address bias in data science models? Example: What steps can be taken to mitigate biases in healthcare AI?
2. What are the limits of informed consent in big data applications? Example: How do we ensure consent is meaningful in large-scale social media data use?
3. How can transparency and interpretability be balanced with complexity? Example: Should there be mandatory explainability for AI systems impacting financial decisions?
4. How should organizations disclose the use of AI tools like ChatGPT?

Homework Questions, Part 2: Ethics Case Studies (50 points)

Instructions: For each case study below, research the scenario described and summarize:

1. *The ethical issues involved* — Identify and explain the key ethical dilemmas or problems in each case.
2. *The lessons learned* — Discuss the takeaways or improvements that could be made to prevent similar issues in the future.

Your answers should be detailed and include references to relevant ethical principles, real-world consequences, and potential solutions. Where applicable, consider how laws, policies, or best practices could address the issues. The comments below provide partial answers; use them as guidance but provide expanded detail in your own words.

Case Study 1: Biased Algorithms
Description: Amazon's AI hiring tool showed bias against female candidates.

- Ethical Issues: Algorithm trained on historical data reflecting gender bias.
- Lessons Learned: Importance of diverse and unbiased training datasets.

Case Study 2: Data Privacy Breach
Description: Cambridge Analytica's misuse of Facebook data.

- Ethical Issues: Unauthorized use of personal data for political campaigns.
- Lessons Learned: Strengthening data consent mechanisms and user awareness.

Case Study 3: Facial Recognition Technology
Description: Use of facial recognition by law enforcement.

- Ethical Issues: Privacy invasion and racial bias in accuracy.
- Lessons Learned: Need for strict regulations and ethical guidelines.

Case Study 4: Redlining

Description: Historically, mortgage lenders once widely redlined core urban neighborhoods and Black-populated neighborhoods in particular.

- Ethical Issues: Discrimination and perpetuation of economic inequalities through biased practices.
- Lessons Learned: Need for equitable lending practices and proactive measures to address systemic bias.