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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION — SUMMER SEMESTER, 2022-2023

DURATION: 3 HOURS — FULL MARKS: 150

Hum 4441: Engineering Ethics

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer **all 6 (six)** questions. Figures in the right margin indicate full marks of questions with corresponding COs and POs in parentheses.

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1. a) Sophia and David are loan officers at a bank. Sophia tends to be cautious with loan approvals, often preferring applicants with stable employment history and high credit scores. David, however, unconsciously leans towards applicants who remind him of his successful friends, assuming they are more likely to repay their loans. They review an application from Maria, a single mother who recently started her own business. Despite Maria presenting a solid business plan and demonstrating determination during their meeting, Sophia immediately assumes that Maria's entrepreneurial endeavor may not be stable enough to guarantee loan repayment. Meanwhile, David, who could not relate to Maria's situation, subconsciously underestimates her financial prospects and the potential success of her business. Due to these biases, Sophia and David decline Maria's loan application, despite its potential for success. This decision, along with numerous others, is recorded by the bank's lending system and inadvertently influences future loan recommendations.

   i. Identify the biases possessed by the interviewers. Also, make a comparative analysis of the characteristics of these biases. — 9 (CO2) (PO2)

   ii. Explain the different data collection biases in the case of the bank's lending system. — 9 (CO5) (PO1)

   b) *Cognitive bias can allow people to be manipulative* - With proper examples, justify this statement. — 7 (CO1) (PO1)

2. a) Identify four issues that biases assist us in resolving. — 10 (CO5) (PO1)

   b) Sarah, a small business owner running an Etsy shop selling digital designs, seeks to enhance her team's efficiency by acquiring new software. This tool will facilitate inventory tracking, sales management, and workload organization for her team. In this endeavor, Sarah prioritizes reliable performance and robust support from the software provider. She anticipates the need for clear metrics, such as uptime guarantees, response times for technical assistance, and structured procedures for issue resolution, ensuring uninterrupted operations. Moreover, the customers can purchase her designs from the Etsy shop and use them for personal usage, any commercial usage needs explicit permission.
   Analyze the situation to determine the different contract types. — 6 (CO4) (PO2)

   c) Consider the following incidents: — 9 (CO5) (PO1)

   - In 2014, Brisha Borden was running late to pick up her god-sister from school when she spotted an unlocked kids blue Huffy bicycle and a silver Razor scooter. Borden and a friend grabbed the bike and scooter and tried to ride them down the street. Then a woman came running after them saying, "Thats my kids stuff." Borden and her friend immediately dropped the bike and scooter and walked away. But it was too late.

- A neighbor who witnessed the heist had already called the police. Borden and her friend were arrested and charged with burglary and petty theft for the items, which were valued at a total of $80. Borden had a record of misdemeanors committed when she was a juvenile.
- 41-year-old Vernon Prater was picked up for shoplifting $86.35 worth of tools from a nearby Home Depot store. He had already been convicted of armed robbery and attempted armed robbery, for which he served five years in prison, in addition to another armed robbery charge.

  Yet something odd happened when Borden and Prater were booked into jail: A computer program spat out a score predicting the likelihood of each committing a future crime. Borden, who is black, was rated a high risk. Prater, who is white, was rated a low risk. Two years later, Borden has not been charged with any new crimes. Prater is serving an eight-year prison term for subsequently breaking into a warehouse and stealing thousands of dollars worth of electronics.

Examine the case to find out the problems in Machine Learning and AI models.

3. a) A city, facing excessive traffic congestion and air pollution, implement a smart transportation system to address these challenges. The system utilizes advanced traffic monitoring technology and real-time data analysis to optimize traffic flow, reduce congestion, and minimize emissions. Additionally, the city introduces a rewards program to incentivize residents to use public transportation, carpool, or opt for alternative modes of transportation such as biking or walking during peak hours. Participants in the program earn points for each environmentally-friendly commute they make, which can be redeemed for discounts on public transportation fares, bike-sharing memberships, or eco-friendly products. This approach not only alleviates traffic congestion and reduces air pollution, but also promotes sustainable transportation options and encourages individuals to make eco-conscious choices in their daily commutes. 6 + 7 (CO5) (PO2)

   i. Justify how the scenario achieves the Moralization of Technology.

   ii. Analyse the factors affecting moralization in the mentioned case.

   b) Joey is a Quality Assurance (QA) Engineer responsible for testing the login functionality of a new e-commerce platform developed by his company. Joey is facing personal issues that distract him from thoroughly testing the login process. Despite not completing all necessary test cases, Joey reports to his manager, Phoebe, that the login feature is ready for deployment. Trusting Joey's assessment, Phoebe approves the deployment of the platform. After the platform goes live, it is discovered that users can bypass the login authentication by entering incorrect credentials multiple times, which grants them unauthorized access to certain parts of the platform. This loophole leads to security vulnerabilities and unauthorized access to sensitive user information, causing significant problems for the company and its users. 12 (CO4) (PO2)

   Based on the scenario, analyze the responsibilities of Joey and Pheobe based on the active and passive responsibilities.

4. a) Doodle, a prominent tech company, wants to create an AI-driven recommendation system for a social media platform. This innovative system will scrutinize user behavior, interactions, and preferences to deliver tailor-made content, including posts, articles, and advertisements, to each individual user. As an ethical AI engineer working on this project: 8 + 8 (CO1) (PO1)

   i. How would you keep ethics a priority?

   ii. What kinds of questions would you have to ask about the data Doodle will be using?

b) Provide one real-life example for each of the following cases: 3 × 5 (CO5) (PO2)

i. Data is being used in such a way that it was not foreseen.
ii. AI models are used to generate fake information.
iii. Some known biases are repopulated by AI models due to their lack of ethics.
iv. To ensure fairness and non-discrimination risks, AI models need to be analyzed in different environments.
v. Click-through agreements are deliberately made longer and tougher to read for the general public.

5. Gunther, the project manager overseeing the development and deployment of an AI-driven insurance company recommendation software, faced tight deadlines, limiting the team's ability to thoroughly analyze risks and vulnerabilities. In response, Gunther instructed the developers to proceed cautiously, considering potential risks throughout the project's development cycle. Additionally, the software incorporated various third-party components, adding complexity to the project's landscape. However, despite their efforts, post-deployment issues emerged, causing inconvenience for users.

a) Explain each step of the risk management process that could prevent that unfortunate event. 9 (CO3) (PO1)

b) Identify different sources of each type of ethical risk in the given scenario. 10 (CO2) (PO1)

6. a) It is a well-known fact in privacy paradox research: "if you ask respondents if they are concerned about internet privacy, they will say yes. But in practice, those same individuals share their personal privacy data readily online." 9 (CO4) (PO2)

In a study published in the latest Proceedings of Computer-Human Interaction (CHI 2020), a team of Penn State researchers identified a dozen subtle – but powerful – reasons that may shed light on why people talk a good game about privacy, but fail to follow up in real life.

"Most people will tell you they are pretty worried about their online privacy and that they take precautions, such as changing their passwords," said S. Shyam Sundar and James P. Jimirro, Professor of Media Effects in the Donald P. Bellisario College of Communications and co-director of the Media Effects Research Laboratory respectively. "But, in reality, if you really look at what people do online and on social media, they tend to reveal all too much. What we think is going on is that people make disclosures in the heat of the moment by falling for contextual cues that appear on an interface."

Sundar also said that certain cues analyzed by the researchers significantly increased the chance that people would turn over private information such as social security numbers or phone numbers. The cues exploit common pre-existing beliefs about authority, bandwagon, reciprocity, sense of community, community-building, self-preservation, control, instant gratification, transparency, machine, publicness, and mobility.

Based on the aforementioned scenario, analyze different contributing factors to the Privacy Paradox.

b) Most mobile applications (apps) require users to grant various permissions in order to access certain features, such as camera, microphone, and location data. While some of these permissions are necessary for the app to function properly, many others are not. A 2019 study by researchers at the University of Oxford found that users tend to grant app permissions without fully understanding the risks, despite expressing concerns about data privacy in surveys. 10 (CO5) (PO2)

The researchers analyzed data from more than 1,000 Android users who had installed a custom app that logged their app usage and permission requests. They found that users granted 97% of requested permissions, even when they had previously expressed concerns about data privacy. Furthermore, users were more likely to grant permissions if they perceived the app to be useful or entertaining and if the permission request was framed in a positive or neutral way.

How can we use privacy by design principles to make sure that mobile apps follow the best practices for protecting user privacy and managing permissions?

c) Is a biased system still better than humans? Compare MDR AI and Beijing AI to justify your decision. 6 (CO3) (PO2)