Homework 6

Due: Friday, March 22, 2024

All homeworks are due at 11:59 PM on Gradescope.

Please do not include any identifying information about yourself in the handin, including your Banner ID.

Be sure to fully explain your reasoning and show all work for full credit.

Problem 1

Watch the following video and share your thoughts for each of the questions below.

a. Explain how Alan Turing resolved the decision problem (or *Entscheidungsproblem* in German). What did he create, and how did he use this to answer David Hilbert's question of decidability?

b. What made the Enigma so hard to decipher? For example, why couldn't we just use a simple substitution cipher (where you map each letter to a different letter in the alphabet and rewrite all of the words) to decipher the messages?

c. How did Alan Turing and the code breakers break the Enigma code? What were the impacts of their creation? How did this impact WWII?

Problem 2

Let's take a step back and look broadly at Turing's creation.

a. [1-2 sentences each] List 3 individuals or groups of people who were impacted by The Bombe (Turing's device) and explain how they were affected by its creation.

b. [5-6 sentences] What are the main ethical justifications for prioritizing the strength of encryption systems? What are the arguments against it (in other words, arguments for imposing limits on encryption)? What responsibilities do encryption service providers owe their clients and the public at large? Think back to the SRC section from recitation, about the tradeoff between individual right to privacy and circumstances that might require access to encrypted data.

c. [5-6 sentences] Reflecting on the death of Alan Turing and the belated apology from the British government prompts us to consider the broader implications of historical injustices within the field of computer science. Turing, a pioneer in the field and a key figure in the Allied victory during World War II, tragically faced persecution and discrimination due to his sexual orientation, leading to his untimely death.

   How do the experiences of individuals like Alan Turing highlight the persistent challenges faced by minority groups within the realm of computer science, and what can we learn from these instances to foster a more inclusive and equitable environment in the field?

Problem 3 (Mind Bender — *Extra Credit*)

Make a video of a short rap, song, performance, or skit (1-2 minutes) about Alan Turing or encryption in general for extra credit! The best videos will receive additional points of extra credit, and recognition on Edstem. Please submit your video as a Google Drive link that has the permissions set for everyone to view. We will not be able to grade it otherwise.

You can do this collaboratively! You may work in groups of up to 4 people. Each person in your group should include the Google Drive link in their homework submission and indicate who they worked with.

Example solution:

https://googledrive/somelink, partners: Jania Vandevoorde and Allie Masthay.