Homework One

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Abstract—This document discusses Semantic Networks through an example, and the implications of the recent General Data Protection Regulation ("GDPR") ruling.

1 SEMANTIC NETWORK

1.1 The Problem - Kilo, Rey, Snoke walk into a bar...

Three characters Rey, Kilo, and Snoke are on the planet Quest and need to shuttle to an orbiting ship. The shuttle vessel can only take one person and has autopilot. In jockeying back and forth, Kilo and Snoke cannot be left alone with Rey without the shuttle present. Kilo and Snoke may be left together. The problem is how to organize the logistics of the shuttle's trips without violating the rules of the described situation. The next section discusses the Semantic Network Representation which sets the foundation for the methods to solve the problem.

1.2 Semantic Network Representation

A Semantic Network Representation houses the key visual information needed to organize the potential solution space. As shown in figure 1, there are four key aspects pertaining to this problem: the Initial State, the Implicit Operator, the Ship Direction, and the Resulting New State.

A matrix representation of the Initial and Resulting New state succinctly arranges the status of each character's location and through matrix algebra, allows for easy quantification of the transitions between states. The row of the Initial State and other matrices represents the location status of the character. The columns constitute the status by character on either the Quest planet (left

column) or on the orbiting Ship (right column). Each cell of the matrix assumes the value one for present and zero for not present for each character.

To transition from the Initial State to the Resulting New State, the Semantic Network representation uses the Implicit Operator. The operator specifies the mathematical matrix operations that act on the initial state given the Ship Direction, and the intended character move. The operator is implicit because in the larger representation depicted in Figure 2, arrows depict the overall process and the calculations are not explicitly displayed. As shown in Figure 1, the Implicit Operator uses variables i, j, and k to reduce a Rey's, Kilo's, and Snokes's location status respectfully on one side of the matrix and add the status to the other side. The operator also leverages a directional modifier ("DM") which assumes the value one for when the shuttle departs from Quest, and negative one for when the shuttle departs from the Ship. Essentially, DM inverts operations based on the Ship Direction.
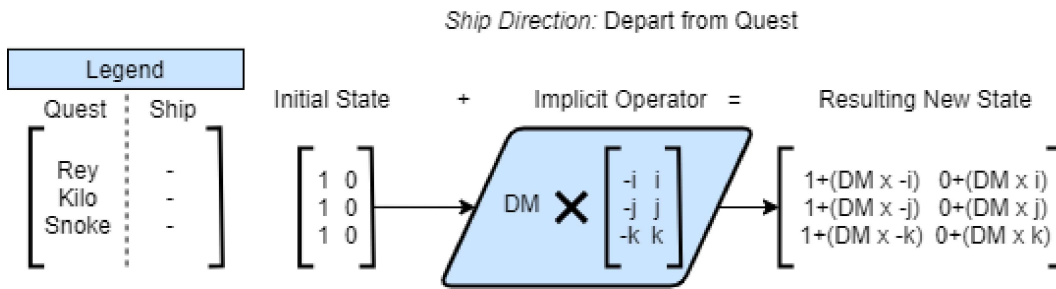

Figure 1—   A representation of the Semantic Network and
the implicit matrix algebra used to transition between states.

1.3   Apply the Generate and Test

Through application of the Generate and Test methodology, the Semantic Network will solve for the optimal solution. The generate aspect of the methodology attempts to minimize the unproductive states it produces. In the context of the problem, the generator ensures that the implicit operator shown in

Figure 1, produces states such that i, j, k follow the rule: $0 <= i + j + k <= 1$. The Test portion of the methodology tests the generated states for three rules: 1) if Rey and Kilo are together without a shuttle, 2) if Rey and Snoke are together without the shuttle, and 3) if the state was previously explored. Also, the Tester detects if the solution has been found when all zeros are on the left column.

Applying the Generate and Test methodology with the Semantic Network Representation yields the Network shown in Figure 2.
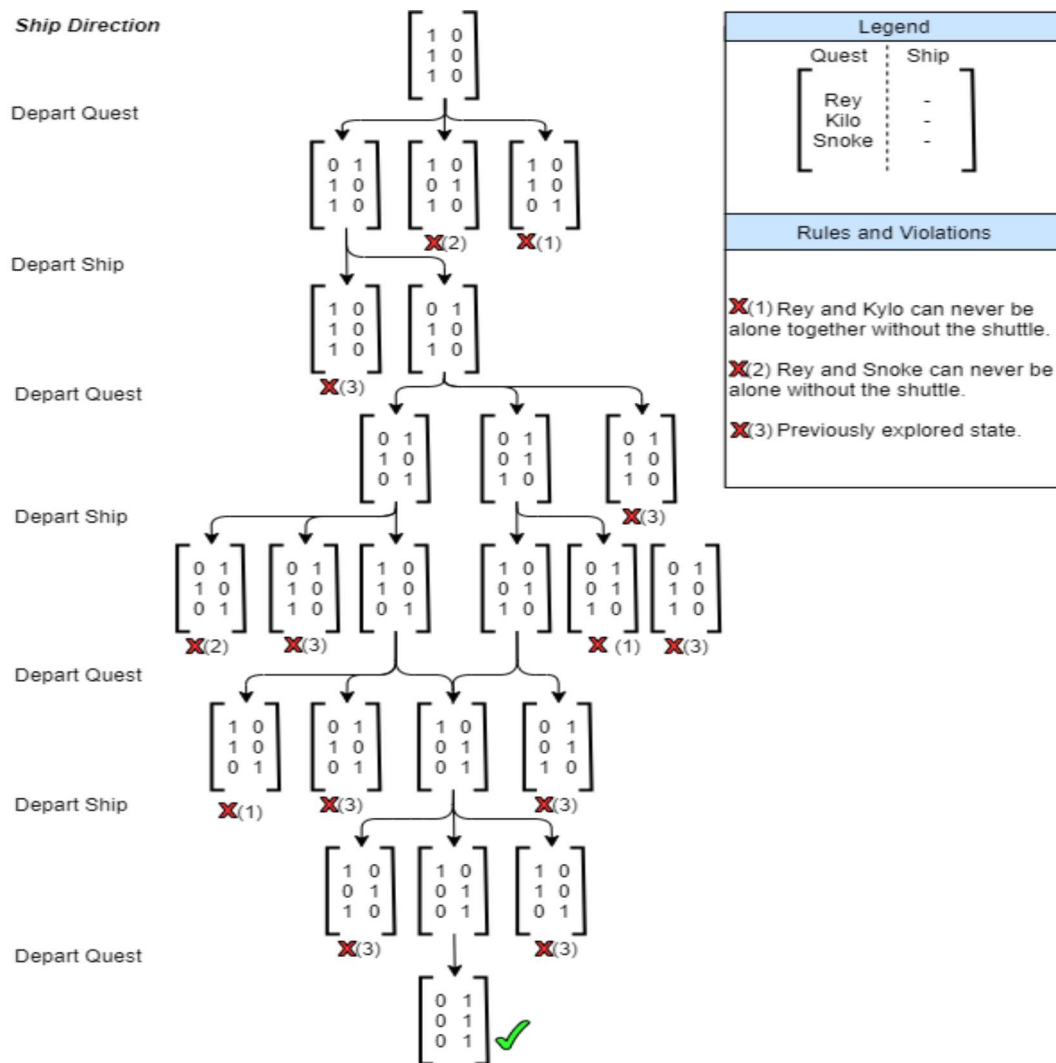

Figure 2— Network representation of the problem with tested states and the path to the solution.

2   GDPR

2.1   What Is GDPR

The GDPR bolsters the existing European Union ("EU") data regulations to benefit the data subject's personal data rights. GDPR mandates that data subjects have the right: to be informed on how data is being used; to access the subject's stored personal data; to obtain and rectify or correct inaccurate data; to erase the subject's personal data; to restrict processing of a subject's data; to obtain personal data from the data control in a portable, readable or useable format; to object or consent to processing of a subject's data; and to not be subject to a decision based solely on automated processing or profiling.

The regulation also sets forth several laws that data Controllers and data Processors must abide by when collecting and processing personal data of EU citizens. Authorized by a data subject, the Controller houses and uses personal data to provide services to the data subject. The Controller may process the data inhouse or outsource processing of the data to a third party called the Processor.

Data processors cannot collect personal data and distribute for profit. Data processing must follow the principles: processed Lawfully, fairly, and in a transparent manner; collected for specified explicit and legitimate purposes; adequate, relevant and limited to what is necessary; accurate, and where necessary up to date; retained only for as long as necessary; and processed in an appropriate manner to maintain security. In addition, the Controller and Process must have a legal basis for processing the data. The legal bases are: contractual obligation; legal obligation; vital interests; public interests; legitimate interests; and consent. (General Data Protection Regulation)

2.2   Online Personalization and Implications to GDPR

Companies that provide services for online personalized user experiences may be affected by GDPR. Typically, the term online personalized users experience is

a loaded term for targeted advertisements and recommendations. These "services" track personal data across multiple online and physical platforms. After gathering as much data as possible, the service then processes the data into a prediction and recommendation algorithm that outputs a tailored ad or recommended product.

A great example of tailored ads is with Target. Target's marking algorithm was so effective that the algorithm could predict when someone was pregnant based on consumption patterns. Depending on the prediction, Target would send coupons for pregnancy related products to customers. Some customers were so deeply disturbed by this intimate form of targeted advertisement that Target devised strategies to conceal that they knew by adding random coupons alongside the targeted ones. (Hill 2016)

While creepy, Target may have been operating under the terms and conditions at that time. However, with the new GDPR ruling, this would be a violation as the explicit purpose of Target processing personal data to predict pregnancies was likely not communicated to the customer. Thereby, the customer was not informed and could not object.

In 2018, Facebook had a scandal that affected over 87 million users. Personal data was unknowingly sold by the third-party vendor, Cambridge Analytica. The vendor, without the consent from the users, psychologically evaluated each user and developed voting profiles that were sold to political campaigns. In addition, the profiles created ads to target those who were likely to believe anything(Confessore 2018) To obtain the data, the vendor posed quizzes on Facebook. If a user took the quiz, the vendor collected personal data from the user's profile. But due to an exploit in Facebook's API, the vendor could not only pull information from the quiz taker but also from all of the user's Facebook friends. (Chang 2018)

The Facebook scandal exemplifies how a Controller and Processor of the personal data can violate the rules and regulations brought forth by the GDPR. Explicitly, the scandal brought to light how Facebook did secure personal data. Further, it showed that Cambridge Analytica did not process user's data in a lawful, fair, or transparent manner.

2.3 Implications to Artificial Intelligence

Artificial Intelligence ("AI") may be impacted by the regulations mandated by GDPR. In particular, any online personalization through recommendation or targeted ads may use AI to perform the calculations and processing of personal data. The great benefit of AI comes with inferring trends based on large amounts of training data. As GDPR becomes widely adopted, data pools for the AI to use may become less populated as Controllers will only maintain necessary data.

2.4 Social Media Implications

Social media like that of TikTok or Instagram primarily use personalized data to infer what content the user wants to see and will see. These companies face challenges like securing personal data, processing data in a lawful, fair and transparent manner.

2.5 Should EU Users Use Social Media

Given the current configuration of the GDPR, loopholes can give social media companies room to exploit personal data. As long as a legitimate interest to process data can be explained by a company, personal data is fair game. While consent is required to be freely given, many forms of gathering consent rely on opting in for the terms and conditions that are purposefully vague and not transparent. The GDPR does a great job of positioning an argument for rights of data subjects but the language does not guarantee the rights of EU Citizens; especially, those using social media apps designed to hoard and sell data.

3   REFERENCES

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