

CS765 Assignment 3

Question (A)

Describe how your Dapp will handle the above issues. Explain in your own words. You can use diagrams, figures, equations etc. to explain. You may also want to ponder about what is asked below before framing your answer.

(1) Sybil attack:

Answer:

When a person registers in Dapp, we will do the KYC of the person or ask the user to submit government documents (like Aadhaar) which have to be verified. (Aadhaar Authentication)
The registration is considered complete only after KYC is complete.

(2) Method to evaluate or re-evaluate the trustworthiness of voters:

Answer:

For each user, we keep track of the total number of news he has voted for and the total number of votes where his vote was the same as the outcome for each topic. After voting, if the vote and outcome are the same (say the user said that the news is fake, and after all votes, the news is marked fake), then the trustworthiness increases or else decreases.

For each topic and each user, trustworthiness is re-calculated as

$$Trustworthiness_{domain} = \frac{CorrectVotes_{domain}}{TotalVotes_{domain}}$$

(3) The opinions of more trustworthy voters should be given more weight. However, we must keep in mind that someone may be more trustworthy for certain types of news and not others. For example, someone may give excellent opinions about news related to Physics but is not so trustworthy on topics related to Politics or Economics.

Answer:

Initially during registration, after KYC, the user is asked to select a few topics based on his expertise from a list of available topics. The selected topics can be called topics of expertise. Initially, this voter will have more weight for the topics of expertise. Later on, the vote is compared against the actual outcome (if the news is fake or not) to increase or decrease the trustworthiness.

So a user has 2 trustworthiness associated. One for his topic of expertise and one for the other.

(4) Rational voters are to be incentivised to participate and vote truthfully to the best of their ability.

Answer:

A registered user will have reputation points = 0, initially. They will be charged *FactCheckingFees* for every request.

Voter gets reputation points for predicting the correct outcome.

Reputation points will be independent of the domain and will help users get discounts on FactCheckingFees.

Users will get 5 reputation points for posting news articles for fact checking.

This reputation can help in getting discounts on fees to request fact-checking.

$$D = BaseDiscount * \log_{10}(R + 1) \text{ if } R \geq MinReputationThreshold \text{ else } 0$$

Where:

D: Discount on the fact-checking fees

R: The user's reputation score

BaseDiscount: The initial discount offered to all users.

MinReputationThreshold: The minimum reputation score required to receive a discount.

$$FactCheckingFees -= D$$

Reputation points will expire exponentially with time.

$$R(t) = R_0 * e^{-k(t-t_0)}$$

Where:

R(t): The reputation score at time t

R₀ : The initial reputation score

k: Decay rate constant, to determine how quickly reputation points decay over time.

t₀: The reference time point where the decay starts.

Voter needs to deposit a *VotingDeposit* amount before voting for a news item which can be confiscated if the predicted outcome is different.

The voters supporting the predicted outcome will be rewarded by distributing the collected & confiscated deposits equally.

$$BaseReward = TotalDeposits / \#CorrectlyVoted$$

$$Reward\ of\ Voter_i = BaseReward * VotingAccuracy$$

Also, their reputation points will be increased.

If a user votes for a news article, the max 4 reputation points will be awarded. The reputation points will be awarded as per the rating a voter gives i.e. VotingAccuracy.

$$ReputationPoints = MaxReputationPoints * AdjustedVotingAccuracy$$

if VotingAccuracy > 0.5 Reputation Points will be added else deducted

AdjustedVotingAccuracy handles poor VotingAccuracy on negative outcomes.

Ex. If a news article is voted 4 on a scale of 10 by the voter, 10 x 4 / 10 = 4 reputation points will be deducted if the news is not fake, else 10 x 6 / 10 = 6 reputation points will be added.

(5) Uploading a news item:

Answer:

Whenever a news article is added, it is tagged to one or more topics from the list of topics. A pre-trained Topic Detection NLP-based model can be used to identify the tags given a news article.

(6) Bootstrapping:

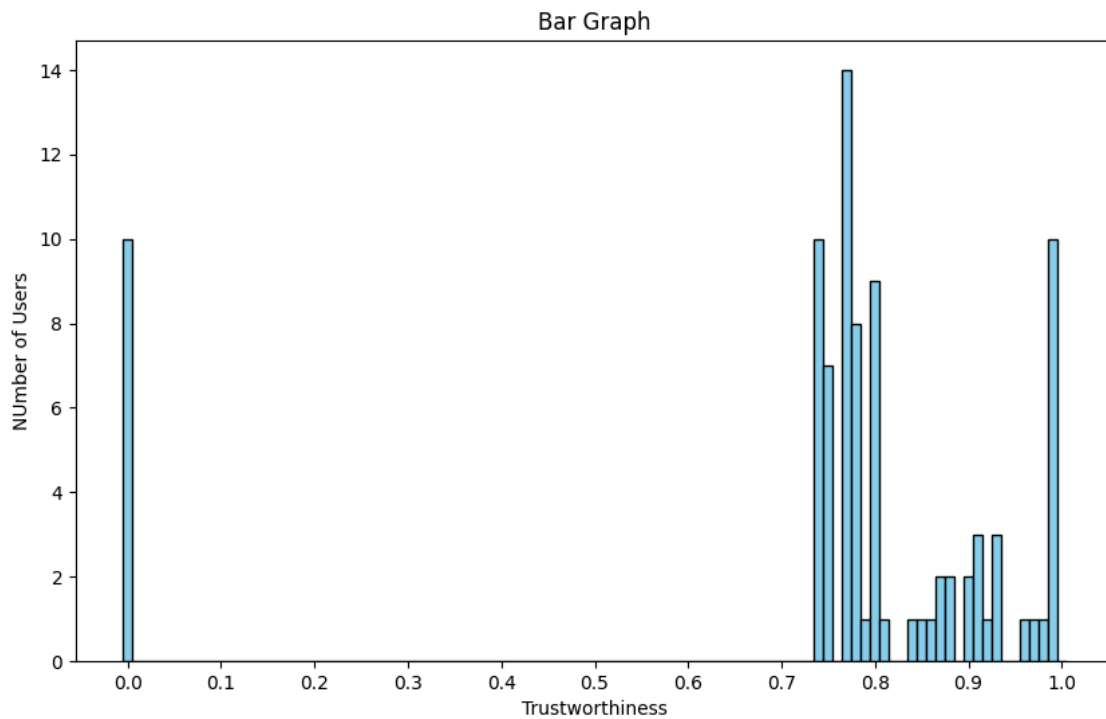
Answer:

Initially set trustworthiness to 0.67 for topics of expertise and 0.5 for remaining areas.

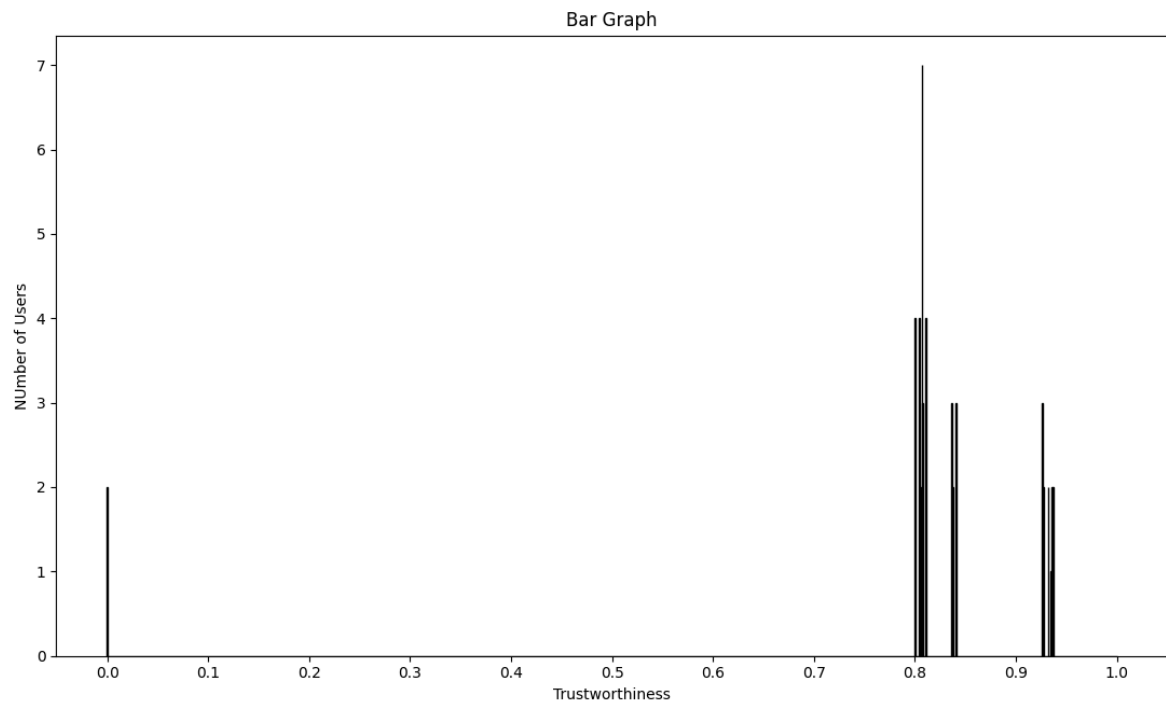
$Trustworthiness_{domain} = 0.67; \text{ if } domain \in \text{Topics of Expertise of user}$
 $= 0.5; \text{ otherwise}$

RESULTS OF SIMULATION

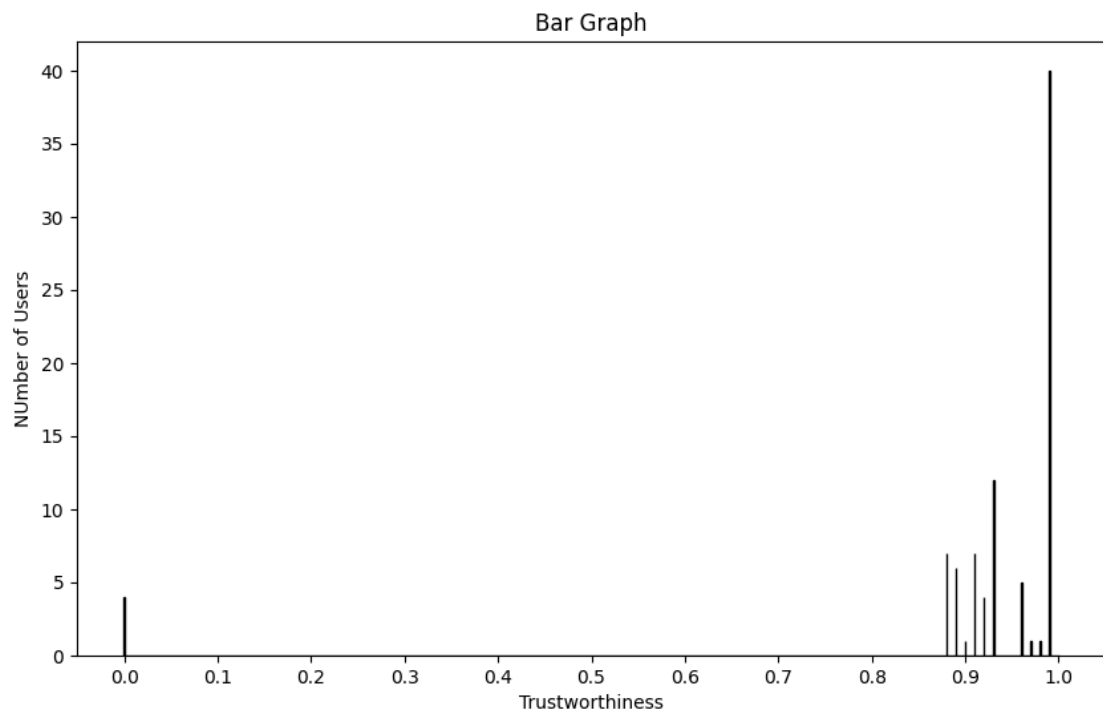
1) $N=100$, $p=0.9$, $q=0.7$, $step=100$



2) $N=100$, $p=0.9$, $q=0.7$, $step=1000$



3) $N=100$, $p = 0.6$, $q = 0.6$



4) $N=100$, $p = 0.6$, $q = 0.6$

