End Sem Viva

Simplifying Agreements using MRC and OD

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Abstract

Privacy Agreements are critically important from the company as well as the user's point of view. Upon surveying, we realise there are three most common issues faced by the user while trying to read their privacy agreements. First is excessive use of complex language and jargons that make it extremely difficult for the user to comprehend the agreement. Second issue is that if the user has a few questions with respect to the agreement, they are not answered directly. Lastly, there lies an absence of an agreement evaluator, that can help compare the document with the standards of the industry. We aim to alleviate this situation by proposing a three fold technique involving Text Summarization, automated question answering and a Document Evaluator.

Introduction

The protection of privacy is an important issue in modern information society. The release of personal information in electronic communication environments may cause severe privacy issues in the future, if people are completely unaware of their privacy.[1]

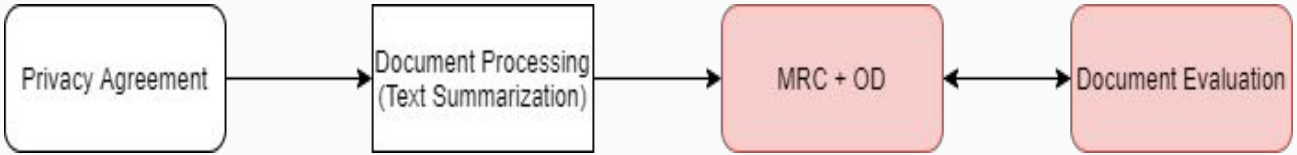
- The higher an individual *believed* in having understood a website's privacy policy, the higher he or she trusted the website.[2]
- Consumers are more likely to purchase from commercial websites that are higher on privacy protection scale.
- Without intervention, individuals do not often understand privacy implications, nor do anything to address it.[3]

Hence, it seems imperative that some efforts need to be taken to improve our understanding of privacy policies.

Literature Review (Link)

- Privacy Agreements do not have a defined architecture to make agreements more useful for the user. We propose MRC and OD combination for the same.
- Existing works in NLP do not focus on the merger of MRC and Open Domain. The proposed system aims to merge both these concepts by using MRC and OpenDomain and will output an answer which has the highest accuracy.
- There lies a lack a standardized document evaluator that can help companies gauge the relevance of their agreement. We propose a semantic comparator based document evaluator
- Most MRC models only focus on relating the question with the context, relation between the sentences within the context is often overlooked.

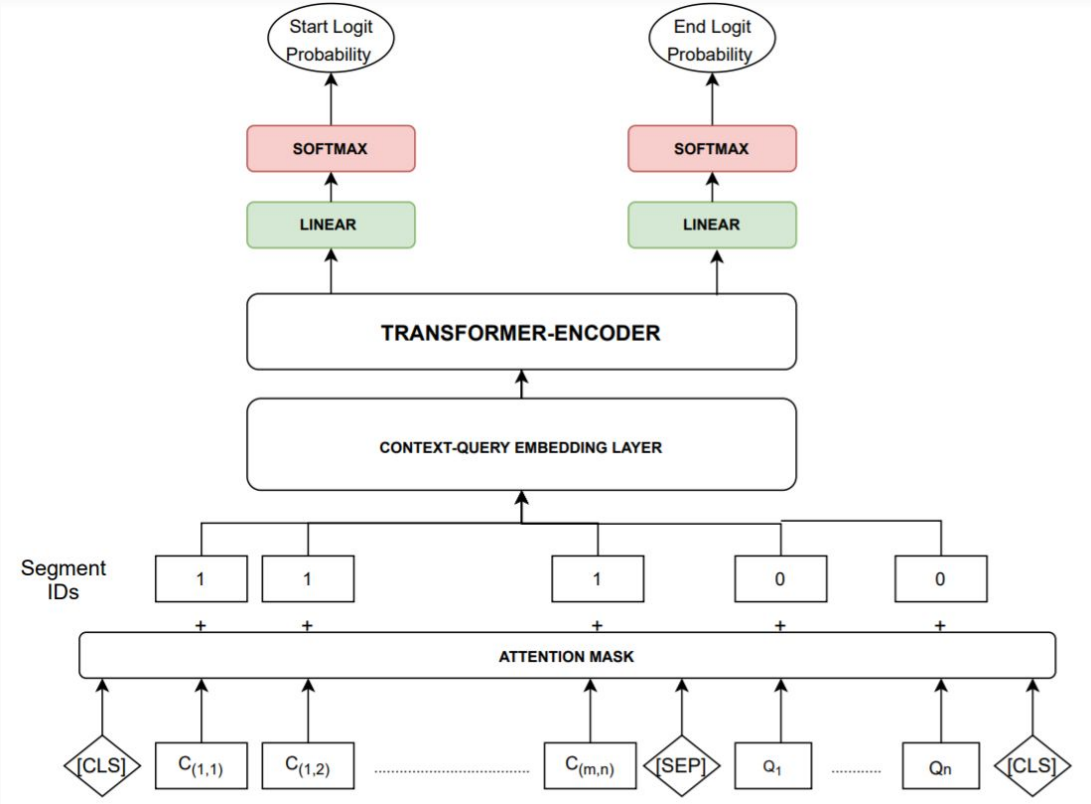
Our Proposition (Why & What)



We resolve the issues related to Privacy agreements using a three-fold technique.

1. The purposes for summarizing documents before implementing MRC is:
   a. Easier document for the user to understand.
   b. Smaller spans for MRC for better accuracy.
2. We propose a unique MRC architecture (finds answer from a smaller document/paragraphs) coupled with Open Domain (finds answer from a scaled database) to increase effectiveness of the document.
3. To cater to the need for a document evaluator, we implement an answer comparator technique where we compare answers (from MRC and industry standards) for a predefined set of questions to establish a threshold value for the companies.

MRC MODEL ARCHITECTURE



Performance Metrics:

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exact match score=0.29

f1 score = 0.5518181564587945
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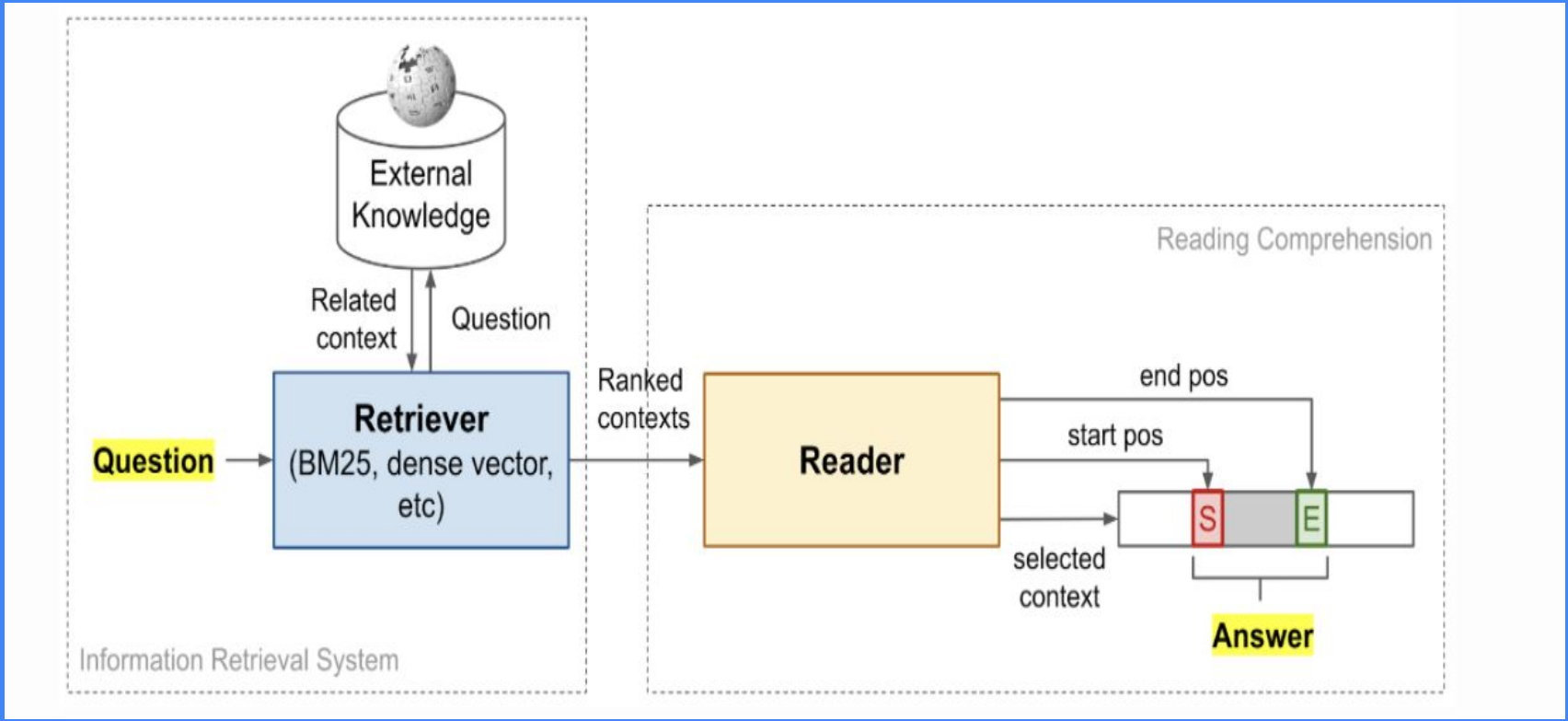
Exact Match: This metric is as simple as it sounds. For each question+answer pair, if the *characters* of the model's prediction exactly match the characters of (one of) the True Answers.

F1 Score: It is computed over the individual *words* in the prediction against those in the True Answer.

IMPLEMENTATION OVERVIEW:

Q: What does this policy describe?
A: The Adobe Privacy Policy describes the privacy practices of Adobe apps and websites. If you are a resident of North America, your relationship is with Adobe Inc and the laws of California and the United States apply. If you reside outside of North America, your relationship is with Adobe Systems Software Ireland Limited, which is the controller with regard to your personal information collected by Adobe and the laws of Ireland apply. Please note that in order to use our apps and websites, you authorise Adobe to transfer
Q: What if I am a resident outside of America?
A: If you are a resident of North America, your relationship is with Adobe Inc and the laws of California and the United States apply. If you reside outside of North America, your relationship is with Adobe Systems Software Ireland Limited, which is the controller with regard to your personal information collected by Adobe and the laws of Ireland apply. Please note that in order to use our apps and websites, you authorise Adobe to transfer your personal information across national borders
Q: Will they expose the data collected from me in social networking sites?
A: We will obtain your permission before sending you news and promotional material about Adobe, accessing information stored on your device relating to your use and engagement with, websites and apps and crash reports, and analysing your content. You can withdraw your consent to such activities at any time. This policy explains when we process personal information for our legitimate interests. You can ask us to stop processing this information. We use your personal information to enable you to register with Adobe and to provide you with our websites and apps and other products or services that you request. We provide interactive features that engage with social media sites
Q: Are my websites and apps tracked by cookies?
A: cookies and other technologies

Open Domain Question Answering



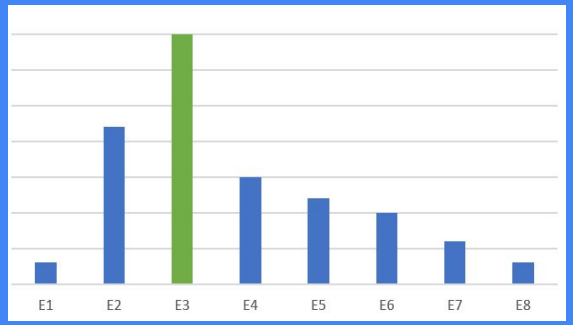
Open Domain Question Answering

- Open Domain aims to return a answer in response to the given question from a large corpus of data
- The overall process includes 2 steps:
  - Document Retrieval
  - Document Reader

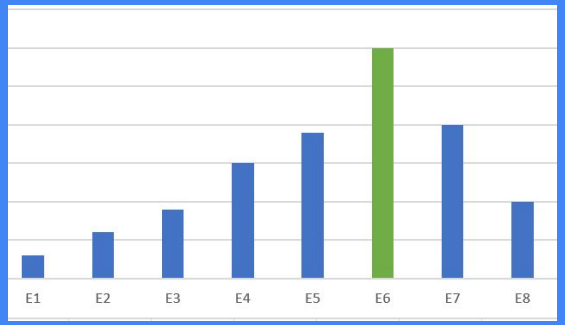
- **Document Retrieval** uses TF-IDF (“Term Frequency — Inverse Document Frequency”) to rank the documents for a given question.
  - TF - Term Frequency - (Frequency of given words in) - This measures the frequency of a words in a document.
  - IDF - Inverse Document Frequency - This measures the importance of documents in a whole set of the corpus.
  - IDF(words) = log(Total documents in corpus / No. of documents with given words)
  - tf-idf(t, d) = tf(t, d) * log(N/(df + 1))

Open Domain Question Answering

- Document Reader
  - Question + Passage is passed to the Bidirectional RNN and Output of the RNN is passed to the softmax function with W_S and W_E
  - W_S and W_E are pre learned parameters of the model.
  - Probability distribution is the output of the softmax function for Start of the sentence and End of sentence.
  - Position of 2 highest probabilities from the distributions defines the answer span



Probability Distribution for Start token



Probability Distribution for end token

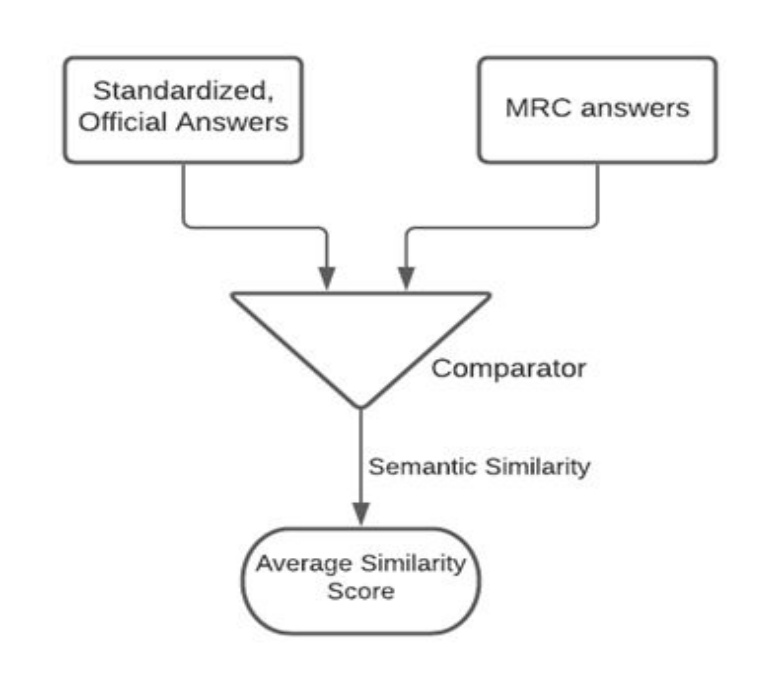
Document Evaluator

A privacy document is mainly evaluated based on 3 parameters:

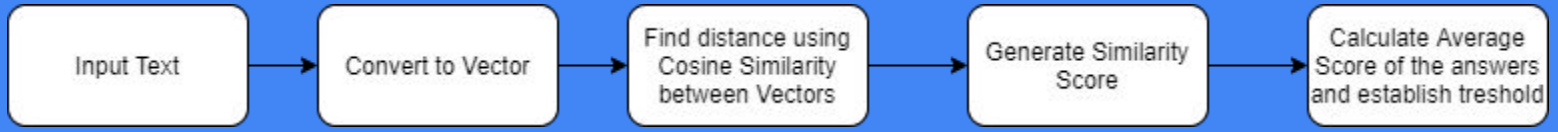
1. Legalibility
2. Accessibility
3. Effectiveness

Given a set of questions regarding the above three parameters and their industry accredited answers, we aim to find answers using MRC on the privacy agreement.
Upon comparing both the answers, we try to establish a similarity score.
This similarity score would act as a threshold for other privacy agreements to be evaluated.

Text similarity has to determine how ‘close’ two pieces of text are both in surface closeness [**lexical similarity**] and meaning [**semantic similarity**].



Working of Comparator



- Conversion to Vector (Library based)
- Finding Soft Cosine Similarity (Optimized Cosine Similarity with dictionary)
- Generating similarity score for each pair of answers
- Finding Average of the scores and establishing threshold

Conclusion

With this project, we have thus implemented a method that helps us simplify privacy agreements using modern tools such as Text Summarisation, Machine Reading Comprehension and Document Evaluation using Semantic Answer Comparator. To answer the main objective, our project helps us to

- Understand what the Privacy Policy is stating in a condensed format and in a layman’s language.
- Answer any commonly asked question that the user might have regarding the agreement.
- Compare the given agreement to a set industry standard for benchmarking.

Future Scope

- Fine tuning MRC architecture with more data and increased iterations.
- Finding a dataset for document evaluation to setup a threshold score.
- Finding a relevant set of questions for each of the three parameters involved in scoring a document
- Preparing an algorithm to distinguish between MRC and OD answers effectively.

Thanks!

Implementation Links:

Colab Link for MRC

Colab Link for Text Summarization

Colab Link for Open Domain

Colab Link for SoftCosineComparator

Some Important References:

[1] Varian, H.R.: Economic aspects of personal privacy. In: Privacy and Self-Regulation in the Information Age, National Telecommunications and Information Administration (1996)
[2] Ermakova, Baumann, Fabian, Krasnova: Privacy Policies and Users' Trust: Does Readability Matter? (2014)
[3] Pilton, Daily, Henriksen-Bulmer: Evaluating privacy - determining user privacy expectations on the web. (2021)
[4] Reading Wikipedia to Answer Open-Domain Questions
[5] Dense Passage Retrieval for Open-Domain Question Answering
[6] Saloni Lerisa Pinto: Privacy and Data Protection: A Study on Awareness and Attitudes of Millennial Consumers on the Internet (2018)
[7] Pelteret, Ophoff: A Review of Information Privacy and Its Importance to Consumers and Organizations (2016)
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[9] Guo, Wang: Impact of privacy policy content on perceived effectiveness of privacy policy: the role of vulnerability, benevolence and privacy concern (2008)
[10] Shade, Chan, Pathak-Shelat: Digital Privacy Policy Literacy (2020)