

Comparison Report

Banking & Finance FAQs Chatbot

Approach:

I tried below 4 different approaches to the problem:

1. **Cosine only:** First, tokenize using spaCy and then calculate the cosine similarity score.
2. **Tf-Idf Vectorization:** First, tokenize using spaCy, then learn vocabulary & idf using Tf-Idf vectorizer, and then calculate cosine similarity score.
3. **Word2Vec:** Build a Word2Vec model on tokenized questions and get the cosine similarity score.
4. **BERT:** Use the BERT tokenizer and BERT pre-trained model to generate embeddings & compare using the cosine similarity score.

Comparison:

To compare these 4 approaches, I have taken the below 3 questions for inference:

Question 1: How can I change the password of my debit card?

Question 2: I want to know about the security and privacy of my personal details in bank records?

Question 3: I want a higher limit for my credit card, what is the procedure?

Let's have a look at the top 3 similar matches from each of these:

Question 1:

How can I change the password of my debit card?

1. Cosine only model:

Top 3 matching answers:

1. **Similarity score: 0.909**

Question: How can I request a copy of my account statement?

Answer: You can request a copy of your account statement through online banking, at a branch, or by contacting customer service. Statements are typically available in digital and paper formats.

2. **Similarity score: 0.882**

Question: How can I check the status of my loan application?

Answer: To check the status of your loan application, contact our loan department or log in to your online banking account for real-time updates.

3. **Similarity score: 0.871**

Question: How can I change the PIN for my debit card?

Answer: To change the PIN for your debit card, visit an ATM, follow the on-screen instructions for PIN change, or contact customer service for assistance.

2. Tf-Idf model:

Top 3 matching answers:

1. **Similarity score: 0.785**

Question: How can I change the PIN for my debit card?

Answer: To change the PIN for your debit card, visit an ATM, follow the on-screen instructions for PIN change, or contact customer service for assistance.

2. **Similarity score: 0.384**

Question: How can I order a replacement for a damaged debit card?

Answer: If your debit card is damaged, contact customer service or visit a branch to request a replacement. We'll block the damaged card and issue a new one.

3. **Similarity score: 0.348**

Question: How can I dispute an unauthorized transaction on my debit card?

Answer: If you notice an unauthorized transaction, contact customer service immediately to dispute the charge. They will guide you through the process of resolving the issue.

3. Word2Vec model:

Top 3 matching answers:

1. **Similarity score: 0.905**

Question: How can I change the PIN for my debit card?

Answer: To change the PIN for your debit card, visit an ATM, follow the on-screen instructions for PIN change, or contact customer service for assistance.

2. **Similarity score: 0.781**

Question: How can I check the status of my loan application?

Answer: To check the status of your loan application, contact our loan department or log in to your online banking account for real-time updates.

3. **Similarity score: 0.764**

Question: How can I apply for a credit card with the bank?

Answer: You can apply for a credit card online through our website or by visiting a branch. Alternatively, contact our credit card department for assistance with the application process.

4. BERT model:

1. **Similarity score: 0.999**

Question: How can I apply for a mortgage loan with the bank?

Answer: To apply for a mortgage loan, visit a branch or contact our mortgage department. You'll need to provide financial information and complete the necessary application forms.

2. **Similarity score: 0.999**

Question: Can I add a beneficiary to my savings account?

Answer: Yes, you can add a beneficiary to your savings account. Visit a branch or contact customer service to complete the necessary documentation for beneficiary designation.

3. **Similarity score: 0.999**

Question: How can I set up automatic bill payments for my credit card?

Answer: To set up automatic bill payments for your credit card, log in to online banking, navigate to the credit card section, and follow the instructions for bill pay setup.

Question 2:

I want to know about the security and privacy of my personal details in bank records?

1. Cosine only model:

Top 3 matching answers:

1. **Similarity score: 0.642**

Question: Can I set up automatic transfers between my accounts and those of family members?

Answer: Unfortunately, automatic transfers between accounts held by different individuals are not supported. Each account owner should manage their transfers.

2. **Similarity score: 0.554**

Question: Are there penalties for early withdrawal from a certificate of deposit (CD)?

Answer: Yes, early withdrawal from a CD may incur penalties. Review the terms of your CD or contact customer service for information on withdrawal penalties.

3. **Similarity score: 0.543**

Question: What is the process for ordering a new set of checks for my account?

Answer: You can order a new set of checks by visiting a branch, contacting customer service, or using the check ordering feature in your online banking account.

2. Tf-Idf model:

Top 3 matching answers:

1. **Similarity score: 0.363**

Question: How can I obtain a copy of the bank's privacy policy?

Answer: The bank's privacy policy is available on our website. You can also request a copy by visiting a branch or contacting our customer service.

2. **Similarity score: 0.302**

Question: What security measures are in place for online transactions?

Answer: We employ advanced security measures, including encryption, multi-factor authentication, and secure connections, to protect your online transactions and personal information.

3. **Similarity score: 0.278**

Question: What types of personal loans does the bank offer?

Answer: We offer various personal loans, including personal installment loans and lines of credit. Contact our loan department or visit a branch for details on available options.

3. Word2Vec model:

Top 3 matching answers:

1. **Similarity score: 0.747**

Question: How do I update my email address linked to the bank account?

Answer: You can update your email address by logging into your online banking account and navigating to the profile settings. Alternatively, visit a branch or contact customer service.

2. **Similarity score: 0.727**

Question: How can I update my personal identification information with the bank?

Answer: You can update personal identification information by visiting a branch, contacting the manager at the concerned branch

3. **Similarity score: 0.724**

Question: How can I obtain a copy of the bank's privacy policy?

Answer: The bank's privacy policy is available on our website. You can also request a copy by visiting a branch or contacting our customer service.

4. BERT model:

1. **Similarity score: 0.999**

Question: Is there a limit on the number of transactions I can make in a month?

Answer: Transaction limits vary based on the type of account. Review your account terms, fee schedule, or contact customer service for information on transaction limits.

2. **Similarity score: 0.998**

Question: Can I add a joint account holder to my existing account?

Answer: Yes, you can add a joint account holder by visiting a branch together and completing the necessary paperwork. Contact customer service for details on adding joint account holders.

3. **Similarity score: 0.998**

Question: How can I change the PIN for my debit card?

Answer: To change the PIN for your debit card, visit an ATM, follow the on-screen instructions for PIN change, or contact customer service for assistance.

Question 3:

I want a higher limit for my credit card, what is the procedure?

1. Cosine only model:

Top 3 matching answers:

1. **Similarity score: 0.736**

Question: What is the process for disputing a charge on my credit card statement?

Answer: To dispute a charge on your credit card statement, contact our credit card services immediately. They will guide you through the process of investigation and resolution.

2. **Similarity score: 0.717**

Question: What is the procedure for updating my email address for account notifications?

Answer: To update your email address for account notifications, log in to online banking and navigate to the communication preferences section. You can also visit a branch for assistance.

3. **Similarity score: 0.704**

Question: Can I request a temporary increase in my credit card limit for a specific purchase?

Answer: Temporary increases in credit card limits may be possible. Contact our credit card services department to discuss your specific situation and request a temporary limit increase.

2. Tf-Idf model:

Top 3 matching answers:

1. **Similarity score: 0.63**

Question: Can I request a higher credit limit on my credit card?

Answer: Yes, you can request a higher credit limit on your credit card. Contact our credit card services department for assistance and to discuss eligibility.

2. **Similarity score: 0.413**

Question: What is the procedure for updating my email address for account notifications?

Answer: To update your email address for account notifications, log in to online banking and navigate to the communication preferences section. You can also visit a branch for assistance.

3. **Similarity score: 0.358**

Question: What is the process for changing the billing address on my credit card?

Answer: To change the billing address on your credit card, log in to online banking, visit a branch, or contact our credit card services. Proper identification may be required for the address change.

3. Word2Vec model:

Top 3 matching answers:

1. **Similarity score: 0.81**

Question: Can I request a higher credit limit on my credit card?

Answer: Yes, you can request a higher credit limit on your credit card. Contact our credit card services department for assistance and to discuss eligibility.

2. **Similarity score: 0.743**

Question: How can I apply for a credit card with the bank?

Answer: You can apply for a credit card online through our website or by visiting a branch. Alternatively, contact our credit card department for assistance with the application process.

3. **Similarity score: 0.734**

Question: Can I request a temporary increase in my credit card limit for a specific purchase?

Answer: Temporary increases in credit card limits may be possible. Contact our credit card services department to discuss your specific situation and request a temporary limit increase.

4. BERT model:

1. **Similarity score: 0.998**

Question: How can I request a copy of my account statement for tax purposes?

Answer: To request a copy of your account statement for tax purposes, log in to online banking, visit a branch, or contact customer service. We can provide electronic or paper statements as needed.

2. **Similarity score: 0.997**

Question: Can I request a higher credit limit on my credit card?

Answer: Yes, you can request a higher credit limit on your credit card. Contact our credit card services department for assistance and to discuss eligibility.

3. **Similarity score: 0.996**

Question: Can I apply for a business loan with the bank?

Answer: Yes, you can apply for a business loan by contacting our business banking department or visiting a branch. We offer a range of business loan products to suit your needs.

Discussion:

- From the above comparisons, it is very clear that the best-performing approach is the Tf-Idf approach.
 - The results from BERT were expected to be the best. However looking at the similarity score, it is evident that the pre-trained model isn't able to differentiate much between each question in the input dataset.
 - Only taking the cosine similarity score without using any indexing (Tf-Idf) results in correct top-1 results in a few cases, but majorly fails to understand the correlation.
 - Word2Vec also lacks correctness as the model isn't properly trained on the input set.
 - As the training set is relatively small (70 sentences), it may not be sufficient for BERT or Word2Vec to learn robust representations.
 - Another reason why Tf-Idf outperformed other approaches can be that TF-IDF performs better when specific characteristics, such as a focus on keyword matching or when the importance of specific terms is crucial.
 - More deeper analysis of why Tf-Idf is better can be understood by knowing how the Tf-Idf vectorizer works and fits vectors.
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