

Rob Bot

Personal Finance Chatbot

May 23, 2024





Canada's National Newspaper

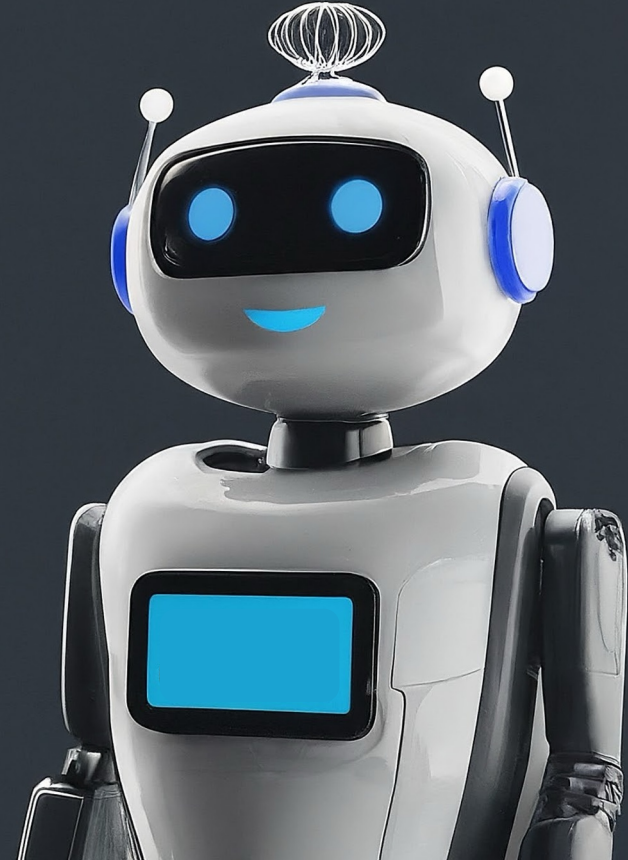
- Canada's most widely read national newspaper
- Award-winning journalism across news, politics, arts & culture
- Leading source for in-depth business reporting and analysis through Report on Business (ROB)
- Trusted by Canadians for over 180 years



Managing Director of
Product and UX

Rob Bot:

The Globe and Mail's Personal Finance Chatbot





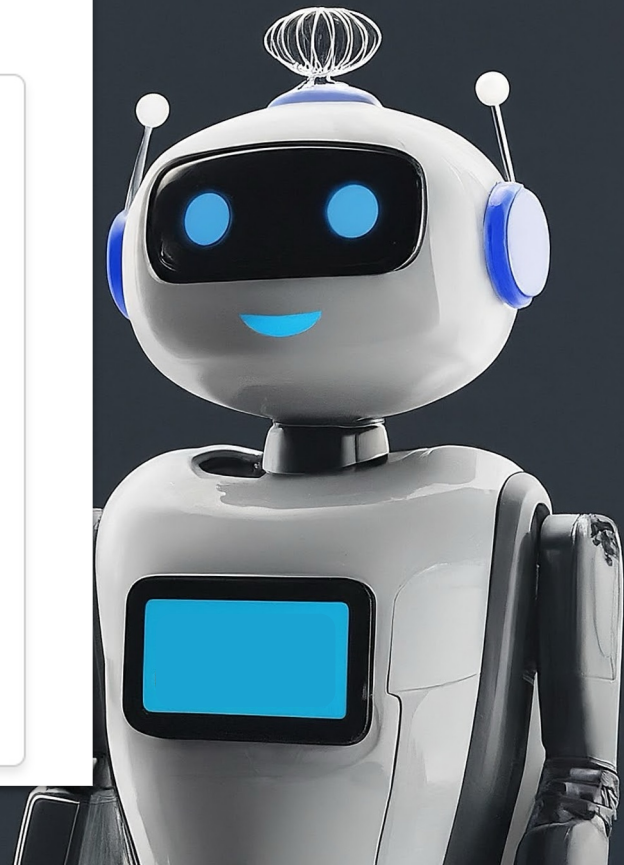
The Rob Bot

Whether you're a seasoned investor or just beginning your financial journey, Rob Bot searches through Globe and Mail articles to provide answers. Dive in, ask questions, and let Rob Bot guide you toward a more informed financial future. [Please share any issues or constructive feedback.](#)

Disclaimer: This chatbot is a work in progress. It uses AI to extract and refine information, although responses may not always perfectly align with inquiries.

Enter your personal finance question:

Submit



Enter your personal finance question:

How much will I need to retire?



Submit

How much will I need to retire?

Answer: The amount you will need to retire depends on several key factors: when you plan to retire, the working income you plan to replace, other resources you expect in retirement, and how much money you plan to draw when you retire [1]. You can use tools like the Target Wealth Calculator to determine the dollar amount you need to have saved by your target retirement age [2]. It's also important to consider the cost of maintaining your independence in retirement, which could be around \$3,500 a month [3]. Thanks for asking!

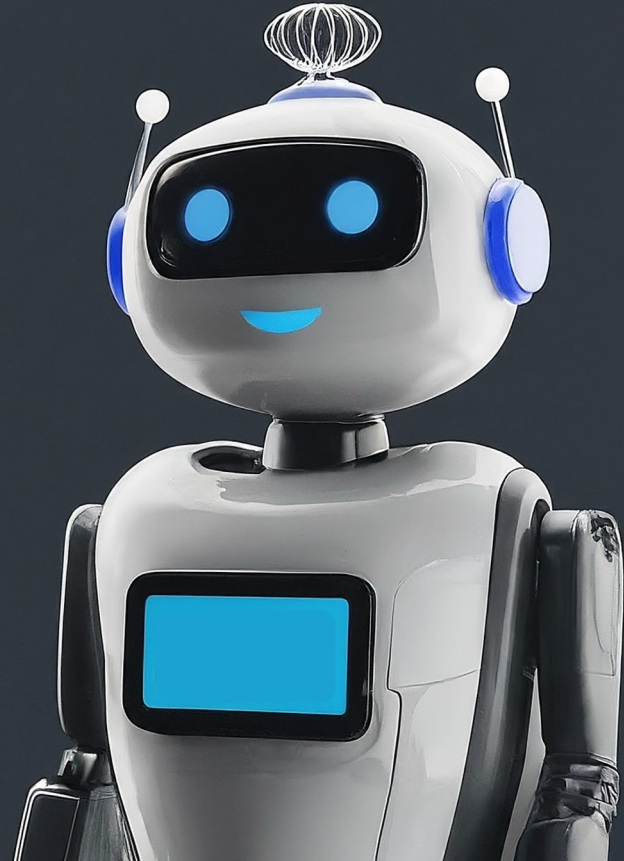
References:

- 1: <https://www.theglobeandmail.com/investing/personal-finance/retirement/article-retirement-plan-canada/>
- 2: <https://www.theglobeandmail.com/business/article-five-calculators-to-help-you-plan-your-retirement/>
- 3: <https://www.theglobeandmail.com/investing/globe-advisor/advisor-news/article-how-this-program-is-providing-unbiased-affordable-advice-to-women/>

Key Concepts

1. The user asks a question.
2. The chatbot searches a database of Globe and Mail personal finance articles.
3. The chatbot uses a language model (GPT-4) to understand the question and generate an answer based on the information found.
4. The chatbot delivers a helpful and relevant answer with citations to learn more.

How does it work?



RAG-based: Uses Retrieval-Augmented Generation

Sources: 5 years of Globe articles on personal finance

Tech Stack: LangChain, OpenAI's GPT-4, Chroma DB

Use Case: Instantly answers your money questions

Retrieval-Augmented Generation (RAG)

A process that combines the retrieval of information with the capabilities of pre-trained language models to enhance the generation of text.

Retrieval: Searches a large database to find relevant information before text generation.

Generation: Utilizes retrieved documents to produce contextually relevant and accurate text.

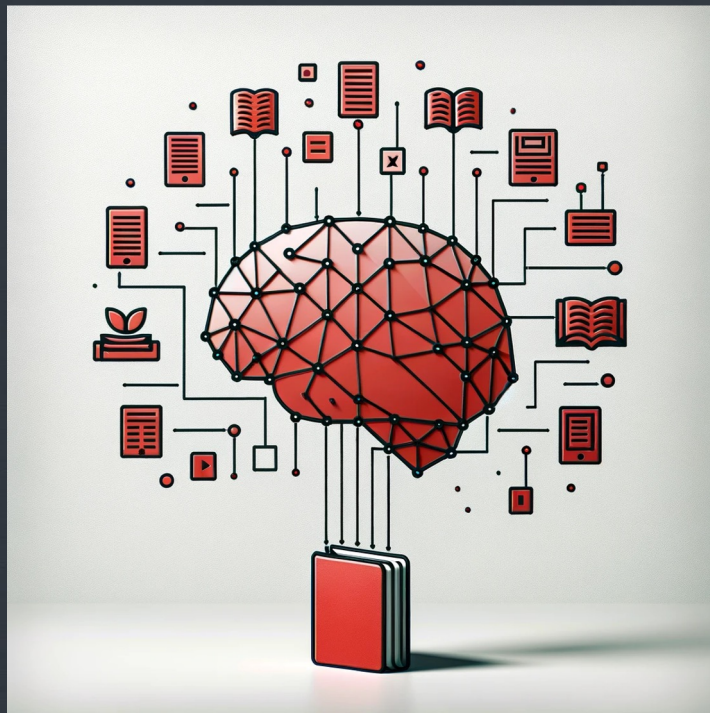
Retrieval-Augmented Generation (RAG)

Reduces hallucinations, grounds responses in facts.

Accesses latest information beyond training data.

Provides citations for verification.

Easily adapts to new information.



Libraries and Tools

LangChain: Simplifies building language model apps.

Chroma: Vector database for quick text search.

OpenAI: Provides language model APIs.

Flask: Python framework for web applications.

AWS: Cloud infrastructure for deployment.



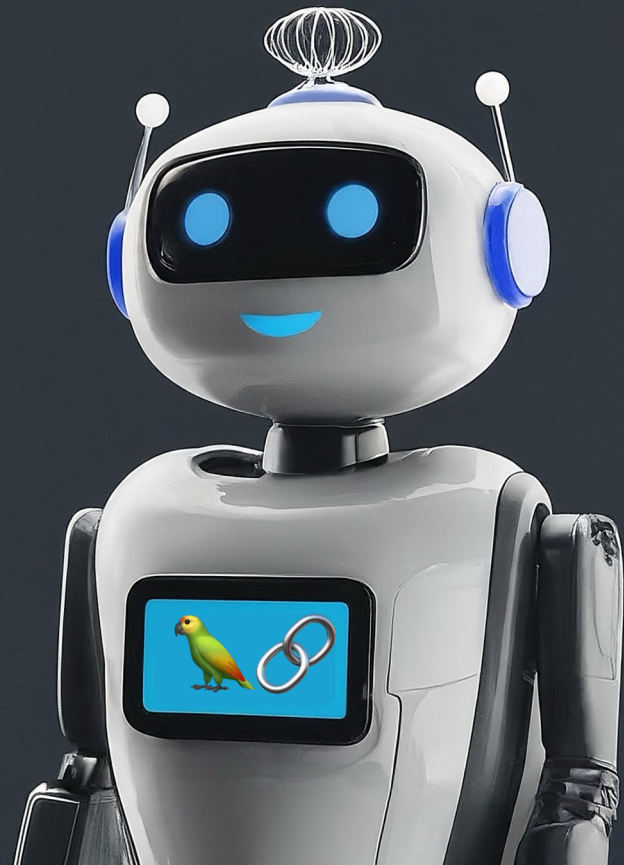
LangChain + Chroma



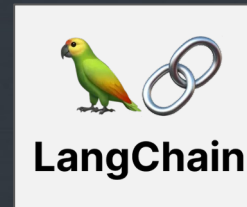
OpenAI



LangChain: The Chatbot's Toolkit



LangChain: Pre-built Components



Components:

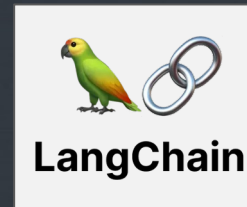
Chains: Connect different steps of the chatbot process (loading info, generating responses, etc.).

Prompt Templates: Standardized ways to give instructions to the language model.

Retrievers: Help find the most relevant information in your database.

Callbacks: Monitor what the model is doing and provide feedback for debugging.

LangChain: In Our Code



A toolbox that assembles the chatbot's different parts:

Organizes how the chatbot handles a question using chains.

Uses a prompt template to guide the language model's responses.

Employs retrievers to search the "Chroma" database efficiently.

LangChain: In Our Code



RetrievalQA:

```
qa_chain = RetrievalQA.from_chain_type(  
    retriever=vectordb.as_retriever(search_kwargs={"k": 3}, search_type='mmr'),  
    llm,  
    chain_type_kwargs={"prompt": QA_CHAIN_PROMPT},  
    return_source_documents=True)
```

In this case, **qa_chain** is a chain that orchestrates the process of:

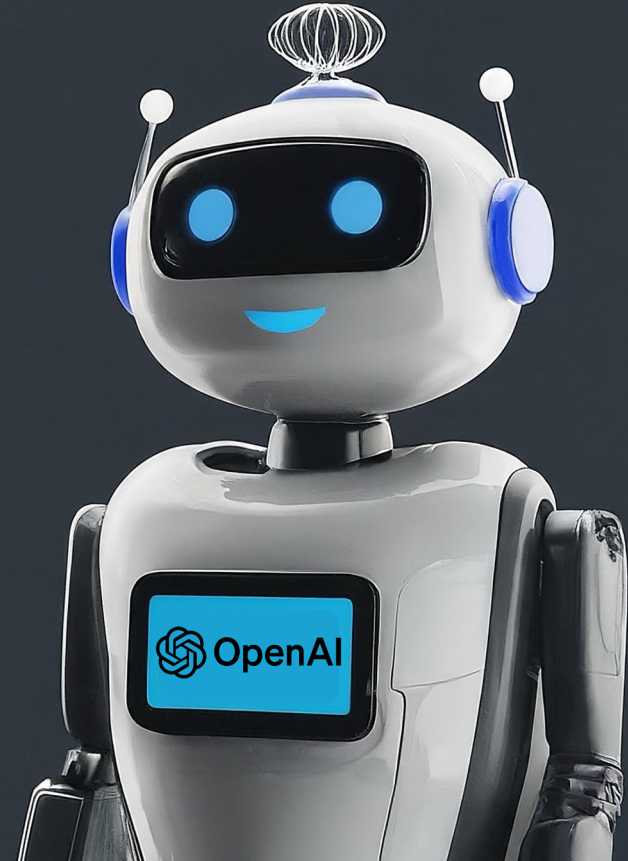
- Configuring a retriever using a vector database to return the top 3 relevant documents, and passing 'MMR' variable to ensure diversity.

- Llm, tells it to use OpenAI's GPT 4

- Passes a predefined prompt, QA_CHAIN_PROMPT, to guide the language model.

- Returns the language model's answer along with the source documents.

Prompt Engineering



Prompt Engineering

The code also includes a "prompt" that gives the language model instructions on how to answer:

- Focus on Canadian finance topics.

- Provide accurate information.

- Avoid giving opinions.

- Give sources for facts.

Prompt Engineering

The code includes a "prompt" that gives the language model instructions on how to answer:

Focus on Canadian finance topics

Provide accurate information.

Avoid giving opinions.

Give sources for facts.

template = """Only utilize the context to answer the query and provide a response corresponding to the identified category. Take time to think and classify the query into one of the five categories (Real Time, Time-sensitive, Regular Finance Query, Answer Not Available, Non-Finance Query). \n

- Real Time queries seek immediate, up-to-the-minute information. Check the query if it's based on Real Time finance (For e.g., 'dollar worth', 'current', 'currency', 'upcoming', etc) then provide a prompt exactly: 'Sorry, I don't provide real-time information. Stay up-to-date! For real-time information about stocks and the market, click [The Globe and Mail](<https://www.theglobeandmail.com/investing/markets/>).' Omit URLs in this case. \n

- Time-sensitive queries that require the latest information are requests for data based on a specific timeframe for specific topics. If the query is based on time-sensitive temporal indicators like 'recent', 'last week', 'last year', 'this year', 'quarter', etc., Please Use {today} {date} {current_year} {weekday} {last_year} to provide best answer for that specific timeframe on that topic query mentioned in query or match the year of the published date from the source with the

Prompt Engineering

- Guide the LLM to focus its responses solely on relevant personal finance information.
- This reduces the risk of the model generating off-topic or inaccurate answers, leading to more reliable and trustworthy financial guidance.

template = Only utilize the context to answer the query and provide a response corresponding to the identified category.

Prompt Engineering

- **Classify user queries:** Determine if the query is about real-time financial information, time-sensitive financial information, a regular financial query, a question the LLM cannot answer, or a non-financial query.
- **Handle real-time queries:** If the query seeks real-time financial data (e.g., current stock prices), respond with a message that the LLM cannot provide that information and suggest a reliable url on The Globe.

Take time to think and classify the query into one of the five categories (Real Time, Time-sensitive, Regular Finance Query, Answer Not Available, Non-Finance Query).

Real Time queries seek immediate, up-to-the-minute information.

Check the query if it's based on Real Time finance (For e.g., 'dollar worth', 'current', 'currency', 'upcoming', etc) then provide a prompt exactly:

'Sorry, I don't provide real-time information. Stay up-to-date! For real-time information about stocks and the market, click [The Globe and Mail](<https://www.theglobeandmail.com/investing/markets/>).'

Prompt Engineering

- If the query contains time-sensitive indicators (e.g., "recent," "last year"), use placeholders like {today}, {current_year} to provide up-to-date answers.
- Prioritize information from sources published within the relevant timeframe mentioned in the query.

Time-sensitive queries that require the latest information are requests for data based on a specific timeframe for specific topics. If the query is based on time-sensitive temporal indicators like 'recent', 'last week', 'last year', 'this year', 'quarter', etc.,

Please Use {today} {date} {current_year} {weekday} {last_year} to provide best answer for that specific timeframe on that topic query mentioned in query or match the year of the publish_date from the source with the timeframe mentioned in the query.

Prompt Engineering

- **Clear Definitions:** Define "recent" and "latest" as within 3 years of the current year to ensure consistent responses.
- **Timeframe Priority:** Prioritize information within the specified timeframe to provide the most relevant answers.
- **Graceful Handling:** If the timeframe doesn't match, offer the closest and latest information with a brief summary and a link to the source.

'recent' and 'latest' timeframe is information in the answer that is within 3 years of {current_year} present if its within 3 years of {current_year} or it goes to condition 1.

condition 1:

If the information in the answer matches the query but the timeframe doesn't align, start with:"I apologize, but I couldn't find specific details to answer based on the timeframe you mentioned. However, the closest and latest information mentions (SHARE BRIEF, SUMMARIZED ANSWER AND PHRASE IT AS IT'S SELF-CONTAINED)," and embed the relevant URL.

Prompt Engineering

- Honestly acknowledge when a direct answer isn't available.
- Offer the closest relevant information with a summary and source link.
- Encourage exploration of the source material for further details.
- Demonstrate problem-solving skills even when faced with limitations.

Answer Not Available:

If the question is ambiguous and not clear or paragraphs don't provide a direct answer to the query, present a concise, summarized response without referencing articles. Start with 'I apologize, but I couldn't find specific details to answer your question directly.'

However, the closest information available mentions' (SHARE BRIEF, SUMMARIZED ANSWER AND PHRASE IT AS ITS SELF-CONTAINED), and embed the relevant URL.

Prompt Engineering

Non-Finance Query:

- Redirect to Canadian personal finance questions.

Regular Finance Query:

- Use all information to answer thoroughly, extract relevant details, and include clickable links.

Non-Finance Query:

If the topic of the query is other than canadian finance then start with "Sorry I only provide answers from Personal Finance articles. please ask any question relevant to Canadian personal finance." \n

Regular Finance Query:

Thoroughly leverage the context to answer the query. Extract ONLY relevant information and directly embed clickable links using numerical references and hyperlinks.

Prompt Engineering

- Verify full names in sources for accurate attribution.
- Acknowledge when full names are not found and provide the closest information.
- Embed source links for easy verification and further exploration.
- Avoid attribution to prevent plagiarism and copyright issues.

Ensure when referencing a full name, such as 'Mike Smith,' ensure that the entire name is present in the source material. If the complete name cannot be found, start with 'it appears we don't have the name in the articles but this is closet information available.'

Ensure responses avoid any form of attribution or citing. Embed source links for each sentence LIKE [^NUMBER^][NUMBER], ensuring that clicking on each sentence directs to the original URL providing the information.

Prompt Engineering

- Prioritizing accuracy from context.
- Ensuring high-quality, relevant responses.
- Clarifying timeframes with reference dates.
- Maintaining consistent conclusions.

Ensure obtained information or answer solely based on the context, without relying on any hallucinations or speculative information.

Ensure responses remain self-content, accurate, consistent, with respect to {today} and concise within three sentences.

Ensure If there is any mentioning of Timeframe in answer or response like 'last week', 'last year', 'this year', etc,. Start with 'timeframe from the date of the article published publish_date.' example :- 'Last week from the date of the article published on 2022-10-10.'

Conclude with 'Thanks for asking!' and MAINTAIN CONSISTENT FORMAT.

Prompt Engineering

- Formatting the citations

MAINTAIN CONSISTENT FORMAT OF THE Responses,
EXAMPLE of forming the ANSWERS:

Sentence^[1][1]^[2][2]. sentences^[2][2].
sentence^[3][3]. Thanks for asking!

^[1] or [1]: <https://www.example1.com/> \n
^[2] or [2]: <https://www.example2.com/> \n
^[3] or [3]: <https://www.example3.com/> \n

or

For example Sentence^[1]^[2]. sentences^[2].
sentence^[3]. Thanks for asking!

^[1]: <https://www.example1.com/> \n
^[2]: <https://www.example2.com/> \n
^[3]: <https://www.example3.com/> \n

Enter your personal finance question:

What's the difference between a secured and unsecured credit card?

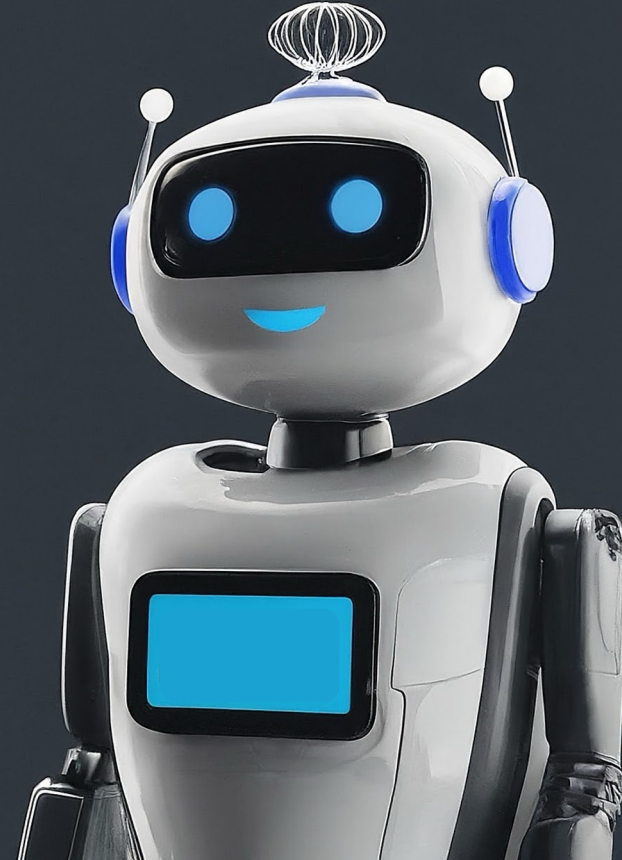
Submit

What's the difference between a secured and unsecured credit card?

Answer: A secured credit card requires you to deposit funds first, which acts as collateral for the card issuer in case you can't make payments. They are ideal for people who have made credit mistakes in the past and are looking to raise their credit score [1]. On the other hand, an unsecured credit card does not require collateral but is offered based on the borrower's credit-worthiness [3]. Thanks for asking!

References:

- 1: <https://www.theglobeandmail.com/investing/article-how-to-choose-a-credit-card/>
- 3: <https://www.theglobeandmail.com/investing/article-what-is-good-vs-bad-debt-canada/>



Enter your personal finance question:

What are the best ways to finance post-secondary education in Canada?

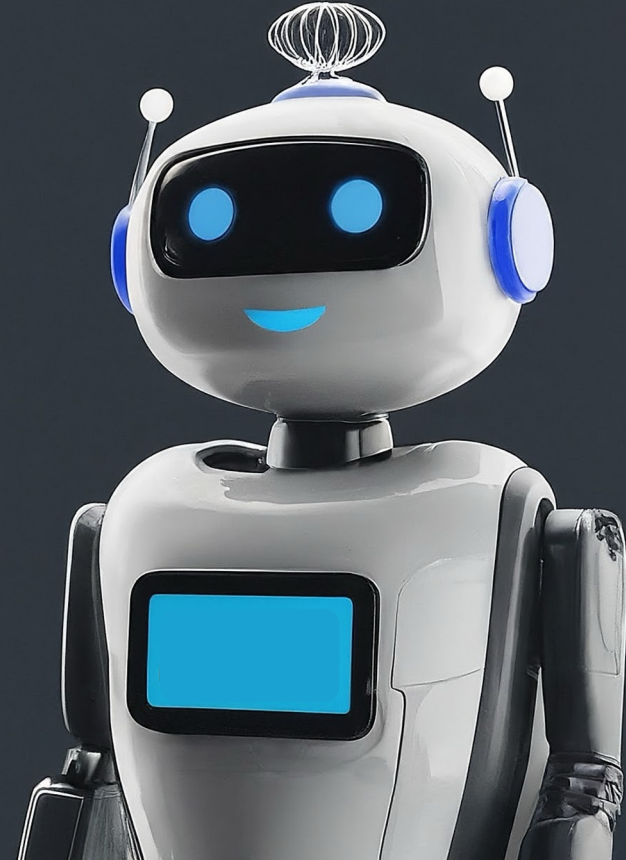
Submit

What are the best ways to finance post-secondary education in Canada?

Answer: There are several ways to finance post-secondary education in Canada. One option is to apply for scholarships, which can be found on websites like www.scholarshipscanada.com and www.yconic.com [1]. Another option is to seek government student assistance, as both the federal and provincial governments provide funding in the form of grants and loans to help cover the cost of post-secondary education [2]. Additionally, the Canada Education Savings Grant, available through Registered Education Savings Plans (RESPs), provides up to \$500 a year, or 20% of the first \$2,500 contributed to an RESP, with a lifetime maximum of \$7,200 per student [3]. Thanks for asking!

References:

- 1: <https://www.theglobeandmail.com/investing/personal-finance/taxes/article-five-ways-to-pay-for-a-postsecondary-education/>
- 2: <https://www.theglobeandmail.com/investing/personal-finance/household-finance/article-borrowing-money-canada-car-lease-education/>
- 3: <https://www.theglobeandmail.com/investing/personal-finance/young-money/article-student-debt-postsecondary-canada/>



Enter your personal finance question:

What is the current stock prices of Apple?

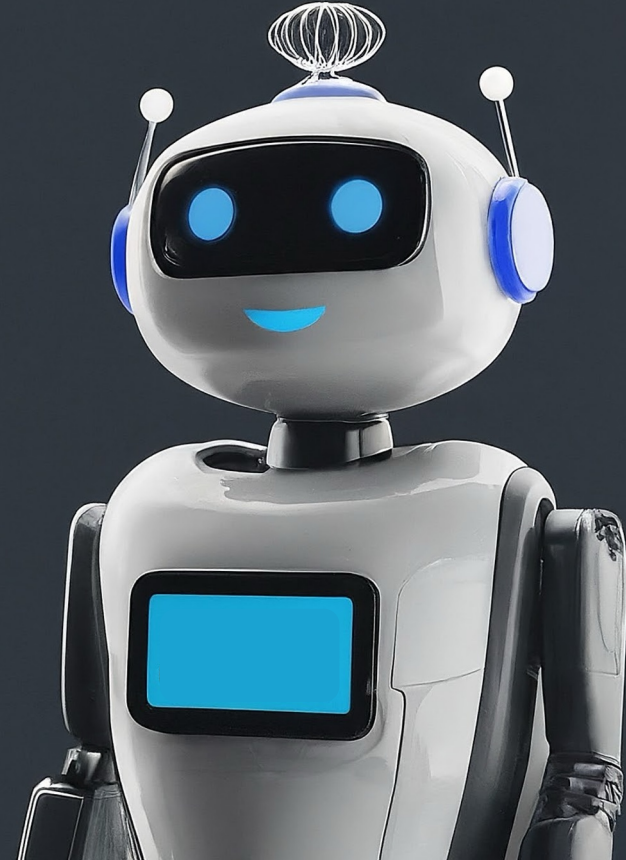
Submit

What is the current stock prices of Apple?

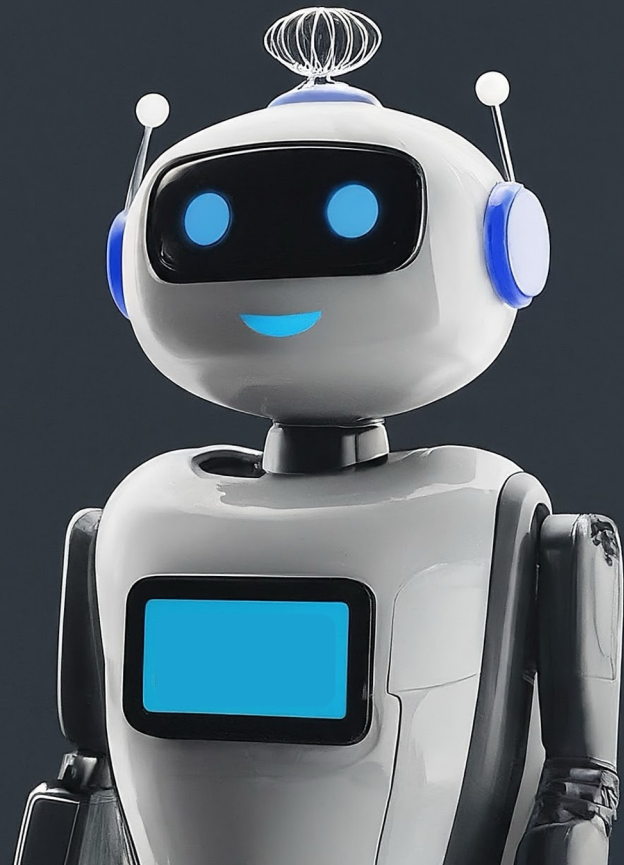
Answer: Sorry, I don't provide real-time information. To stay updated on the latest stock market trends and data, please visit The Globe and Mail's Market Section. Thank you! [1]

References:

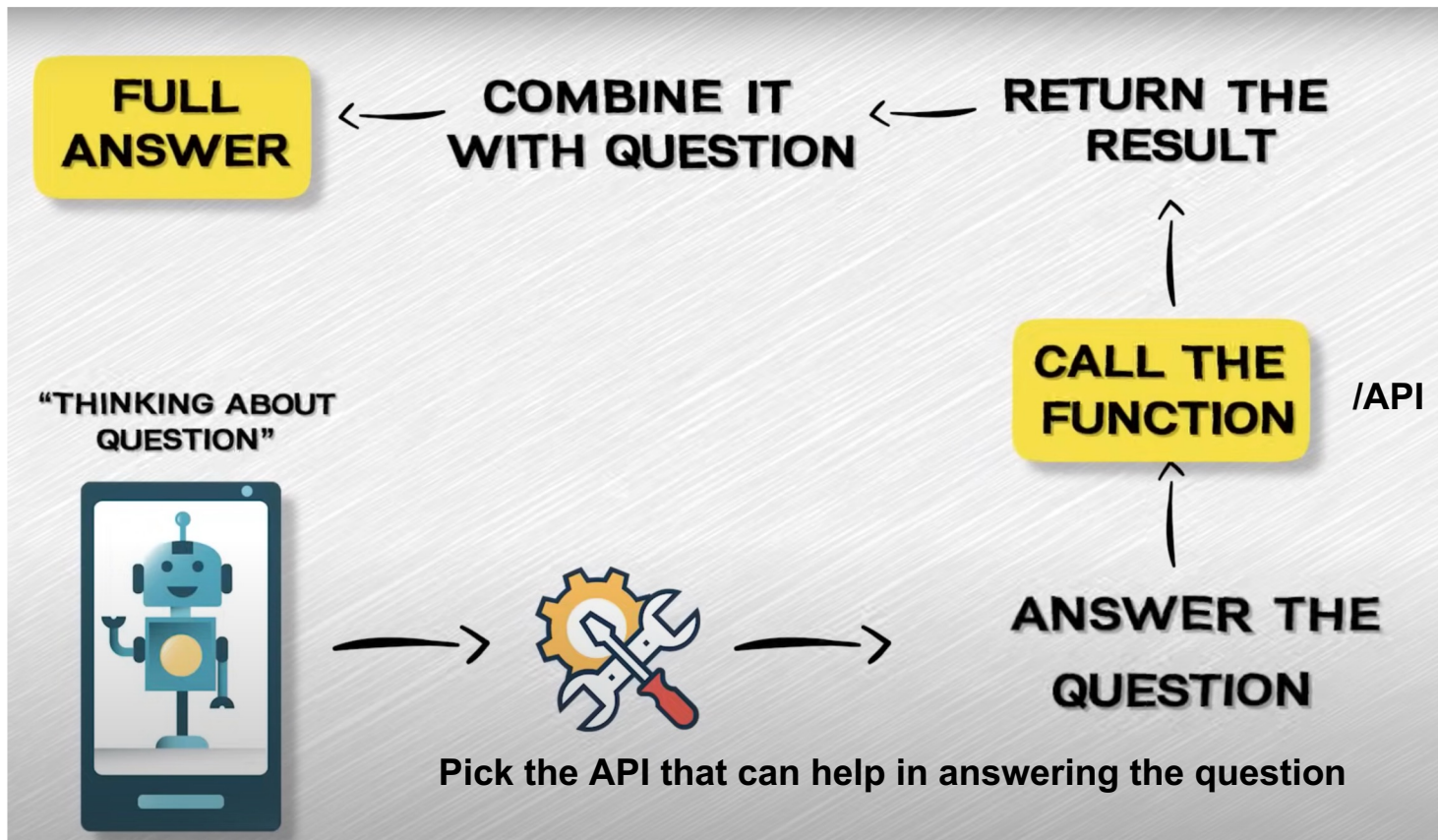
- 1: <https://www.theglobeandmail.com/investing/markets/>



Next Step: AI News Agent



Project Objective: AI Agent for Stock Information



Thank you

