

SWE Python Intern Assignment

After all these details of each subtask i will tell you how to run the code.

Subtask 1: Fetching and Storing Option Chain Data :

In this subtask, I developed a script that fetches option chain data for **NIFTY** and **HDFCBANK** from the NSE India website at regular intervals of 3 minutes.

- **Function `get_cookie(sym)`**: This function retrieves the necessary cookies for authenticating requests based on the selected symbol.
- **Function `gen_headers(sym)`**: This generates headers required for the HTTP request, ensuring that the requests are formatted correctly for the NSE API.
- **Function `fetch_data(url, hdrs, fname)`**: This function handles the actual fetching of data from the API, checking for successful responses and saving the data to JSON files.
- **Function `run(test=False)`**: This function orchestrates the continuous fetching of data in a loop unless in testing mode, where it fetches the data once.

```
Running in testing mode...
Data is being saved to NIFTY_option_chain.json
Data is being saved to HDFCBANK_option_chain.json
Testing is complete.
```

Our fetched data will be saved to two json files. Now every time when 3 minutes complete it overwrites the json files to update the updated data.

Subtask 2: Parsing and Structuring Data

In this subtask we need to focus on extracting relevant information from the JSON data and organizing it into a structured format using Pandas. So i written these functions to complete this subtask.

- **Function `load_json_data(filename)`**: This function loads the JSON data from the previously saved files.
- **Function `extract_current_price(data)`**: This extracts the current price of the underlying asset.

- **Function `extract_option_chain_data(option_chain)`:** This processes the option chain data and prepares it in a list of dictionaries containing crucial metrics like `call_open_interest`, `put_open_interest`, `call_ltp`, etc.
- **Function `create_dataframe(rows)`:** This creates a Pandas DataFrame from the structured data.
- **Function `filter_by_expiry(data, expiry_dates)`:** This filters the data to retain only the rows relevant to the next weekly expiry.
- **Function `filter_above_below_current(data, current_price)`:** This function identifies and separates the options that are above and below the current price.

These are the screenshots of results after running the script :

```

Rows above current price for NIFTY:
  strikePrice  expiryDate  call_open_interest  put_open_interest  \
223      24250   31-Oct-2024          546885          238658
230      24300   31-Oct-2024          455022          204197
237      24350   31-Oct-2024          204694          43889
244      24400   31-Oct-2024          329263          80583
251      24450   31-Oct-2024          202343          58580

  call_ltp  put_ltp  call_change_in_oi  put_change_in_oi  call_volume  \
223     0.05   44.40          523105          153543      40482544
230     0.05   94.30          331596          -59996      31120610
237     0.05  144.65          107518          -58721      17267797
244     0.05  195.00           47152          -115114      14694181
251     0.05  245.05           17851          -19759       9246152

  put_volume
223  27291942
230  16729744
237   4507637
244  2927424
251   541078

```

Rows below current price for NIFTY:						
	strikePrice	expiryDate	call_open_interest	put_open_interest	\	
184	24000	31-Oct-2024	43946	302701		
196	24050	31-Oct-2024	13973	108342		
202	24100	31-Oct-2024	80231	288992		
209	24150	31-Oct-2024	60893	265558		
216	24200	31-Oct-2024	702886	763317		
	call_ltp	put_ltp	call_change_in_oi	put_change_in_oi	call_volume	\
184	204.60	0.05	5829	-86278	482236	
196	154.50	0.05	4501	40511	274758	
202	105.05	0.05	46976	84503	2296475	
209	55.20	0.05	44213	185780	6429666	
216	5.30	0.05	629732	538970	45018479	
	put_volume					
184	9472555					
196	7340841					
202	17067170					
209	31676547					
216	64328556					

Rows above current price for HDFCBANK:						
	strikePrice	expiryDate	call_open_interest	put_open_interest	call_ltp	\
65	1740	31-Oct-2024	1987	1114	0.05	
68	1750	31-Oct-2024	3655	864	0.05	
70	1760	31-Oct-2024	1919	648	0.05	
72	1770	31-Oct-2024	1468	533	0.05	
74	1780	31-Oct-2024	9757	389	0.05	
	put_ltp	call_change_in_oi	put_change_in_oi	call_volume	put_volume	
65	1.80	-1298	-340	6688	1228	
68	13.00	-1299	-298	8252	743	
70	20.35	-1402	-347	4769	1066	
72	34.35	-637	-45	1470	134	
74	47.30	-78	-38	421	129	

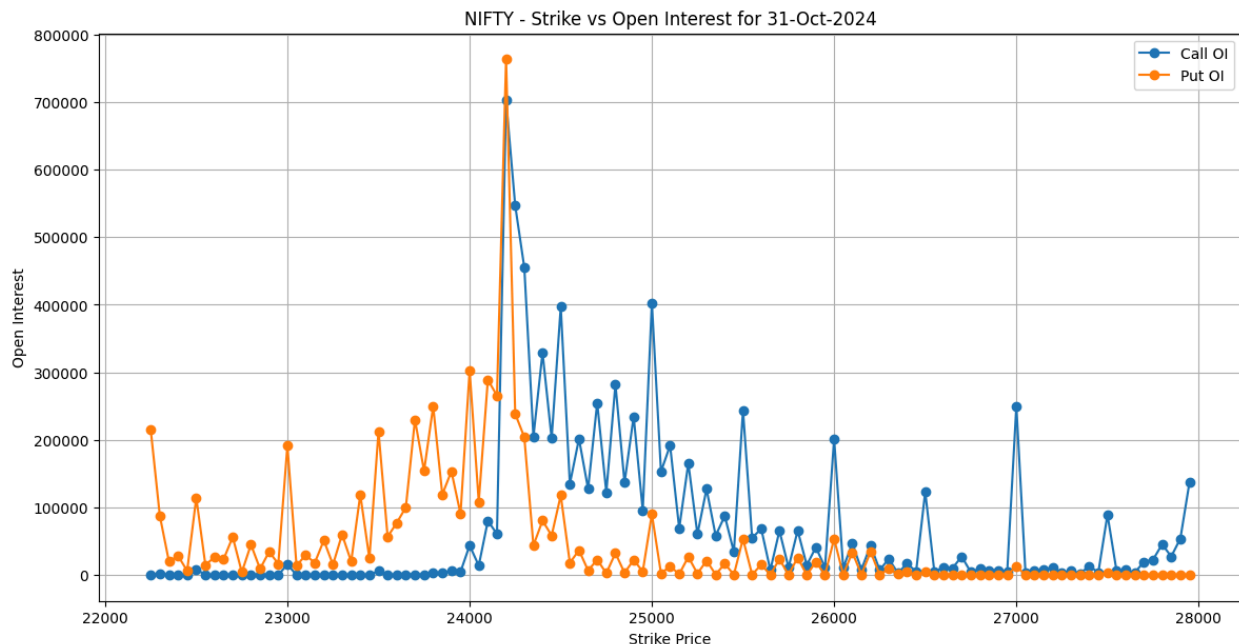
Rows below current price for HDFCBANK:						
	strikePrice	expiryDate	call_open_interest	put_open_interest	call_ltp	\
53	1690	31-Oct-2024	1812	1056	49.50	
55	1700	31-Oct-2024	3503	3144	34.00	
58	1710	31-Oct-2024	688	772	27.65	
60	1720	31-Oct-2024	1617	1382	16.80	
63	1730	31-Oct-2024	1974	1404	4.05	
	put_ltp	call_change_in_oi	put_change_in_oi	call_volume	put_volume	
53	0.05	-21	-106	84	182	
55	0.05	-469	-675	1165	2059	
58	0.05	-19	-215	159	1569	
60	0.05	-153	-785	1530	4221	
63	0.05	-212	-1106	5012	4299	

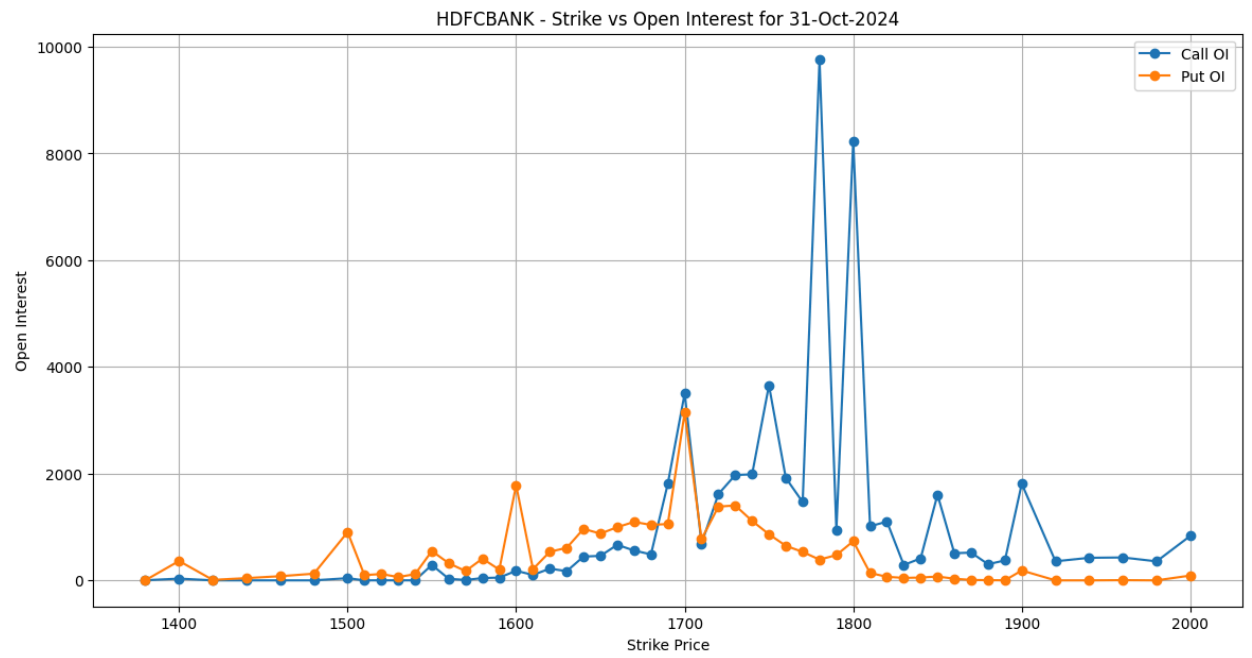
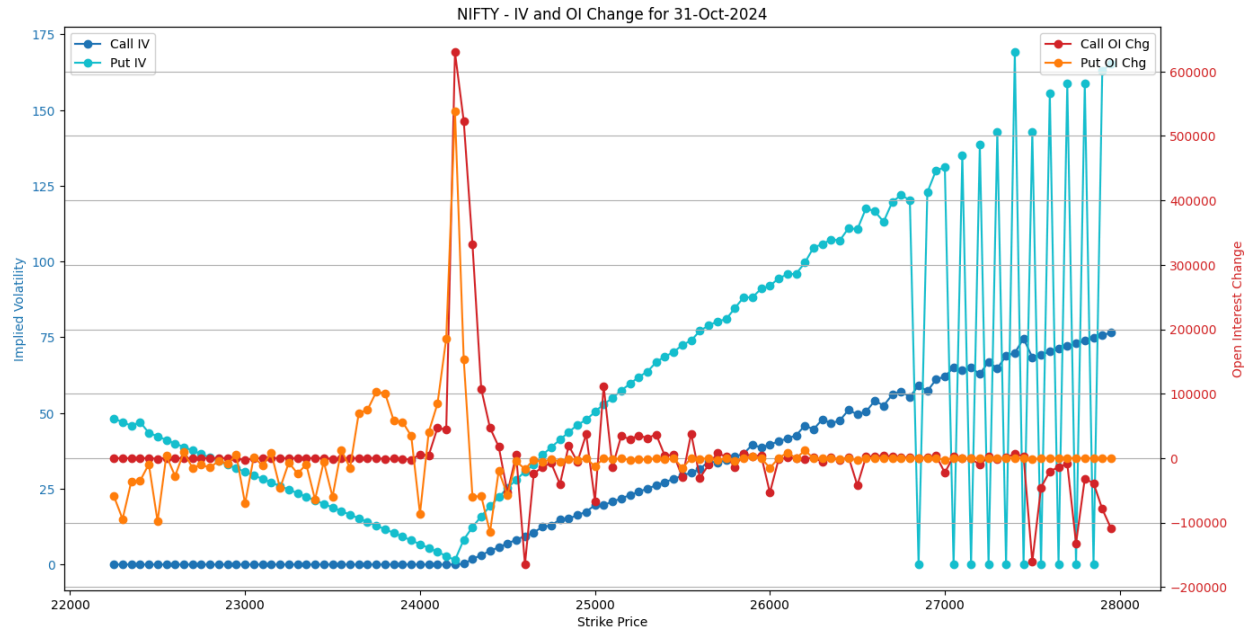
Subtask 3: Data Visualization

In this subtask, I implemented data visualization using Matplotlib to provide insights into the option chain data.

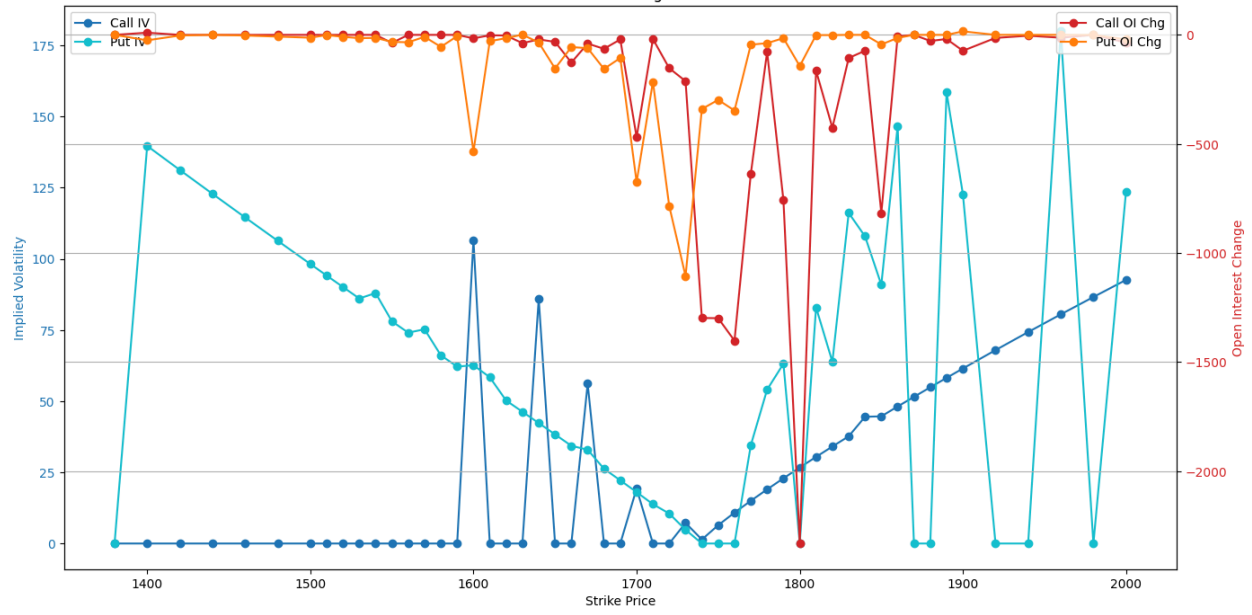
- **Function `load_data(file_path)`:** This loads the JSON data to be visualized.
- **Function `extract_data(data)`:** This prepares the data for visualization, focusing on relevant metrics like open interest and implied volatility.
- **Function `plot_oi(df, sym, expiry)`:** This visualizes the open interest for both call and put options.
- **Function `plot_iv_oi(df, sym, expiry)`:** This creates plots for implied volatility and changes in open interest, providing a comprehensive view of the options market.
- **Overall Structure:** My code is designed to create clear, informative plots based on the filtered DataFrame, enabling easy interpretation of the data.

These are the screenshots of the result :





HDFCBANK - IV and OI Change for 31-Oct-2024

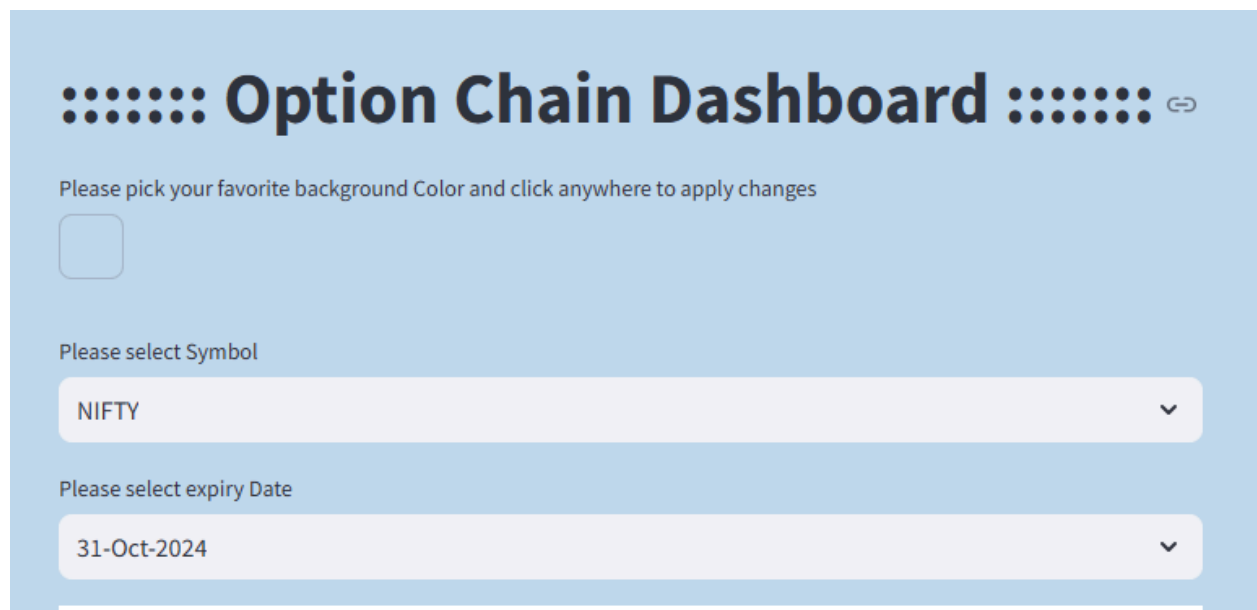


Subtask 4: Interactive Dashboard

The final subtask I developed an interactive dashboard using Streamlit, allowing users to interact with the option chain data dynamically.

- **Function `load_and_prepare_data(file_path, selected_expiry)`:** This function prepares the option chain data for the selected expiry, ensuring that only relevant information is displayed.
- **Streamlit Interface:** The dashboard includes user-friendly features like color selection for the background and dropdowns for symbol and expiry date selection.
- **Plotting with Plotly:** The dashboard utilizes Plotly for creating interactive visualizations of the option chain data, enhancing user engagement and experience.
- **Dynamic Updates:** The dashboard allows real-time updates and interaction, ensuring that users can see the latest data and visualizations based on their selections.

The dashboard look like this :



The screenshot shows a web application titled "Option Chain Dashboard" with a light blue background. At the top, there's a title "Option Chain Dashboard" flanked by decorative colons and a share icon. Below the title, there's a prompt "Please pick your favorite background Color and click anywhere to apply changes" followed by a small square color selection button. Further down, there's a prompt "Please select Symbol" followed by a dropdown menu currently showing "NIFTY". Below that, there's a prompt "Please select expiry Date" followed by a dropdown menu currently showing "31-Oct-2024".

How to get cookies for Nifty :

Steps :

The screenshot shows a Google search bar with the text "nse option chain nifty". Below the search bar, the "All" tab is selected. The search results show a link to "NSE India" with the URL "http://www.nseindia.com > option-chain". The title of the result is "Option Chain - NSE India". Below the title, there is a description: "Option Chain (Equity Derivatives) Futures contracts. View Options Contracts for: Select **NIFTY** NIFTYNXT50 **FINNIFTY** **BANKNIFTY** MIDCPNIFTY OR Select Symbol."

After going to the webpage check for developer tools :

The screenshot shows the NSE India Option Chain page. The "Strike Price" section is visible, with a dropdown menu and a text input field. Below this, there is a "Terms of Use" link. The page is divided into two main sections: "CALLS" and "PUTS". The "PUTS" section is currently active, showing a table with columns "STRIKE" and "BID QTY". A loading spinner is visible in the "PUTS" section. The Chrome Developer Tools menu is open, showing options like "Zoom", "Print...", "Search with Google Lens", "Translate...", "Find and edit", "Cast, save, and share", "More tools", "Help", "Settings", and "Exit". The "More tools" option is highlighted.

After this go to networks click on refresh blue ticked :

The screenshot shows the NSE website interface on the left and a browser's network tab on the right. The NSE website displays the 'Calls' section for NIFTY 24,205.35, with a table of call options. The browser's network tab shows a 'Fetch/XHR' request for 'marketStatus' with a status of 200. The console shows the request details.

OI	CHNG IN OI	VOLUME	IV	LTP	CHNG	BID QTY
616	-18	312	61.79	1,962.50	-171.90	300
1,324	-89	415	-	1,910.50	-156.10	200
32	-	-	-	2,105.00	-	1,775
13	-1	8	-	1,801.45	-123.55	25
20	-	-	-	1,886.55	-	1,775
8,843	-922	2,094	-	1,704.40	-163.75	25
4	-	2	-	1,624.05	-150.05	100
15	-10	13	-	1,607.35	-199.65	75
3	2	4	-	1,544.10	53.15	75
40	-10	48	-	1,510.00	-182.55	50
1	-	-	-	1,297.40	-	1,775
46	-4	41	-	1,405.10	-274.90	50

Go to option-chain-indices?symbol=NIFTY and scroll to request headers then copy the cookie :

The screenshot shows the NSE website interface on the left and a browser's network tab on the right. The NSE website displays the 'Calls' section for NIFTY 24,205.35, with a table of call options. The browser's network tab shows a 'Fetch/XHR' request for 'option-chain-indices?symbol=NIFTY' with a status of 200. The console shows the request details.

OI	CHNG IN OI	VOLUME	IV	LTP	CHNG	BID QTY
616	-18	312	61.79	1,962.50	-171.90	300
1,324	-89	415	-	1,910.50	-156.10	200
32	-	-	-	2,105.00	-	1,775
13	-1	8	-	1,801.45	-123.55	25
20	-	-	-	1,886.55	-	1,775
8,843	-922	2,094	-	1,704.40	-163.75	25
4	-	2	-	1,624.05	-150.05	100
15	-10	13	-	1,607.35	-199.65	75
3	2	4	-	1,544.10	53.15	75
40	-10	48	-	1,510.00	-182.55	50
1	-	-	-	1,297.40	-	1,775
46	-4	41	-	1,405.10	-274.90	50

And finally paste this cookie here in the code (return 'cookie') NIFTY part :

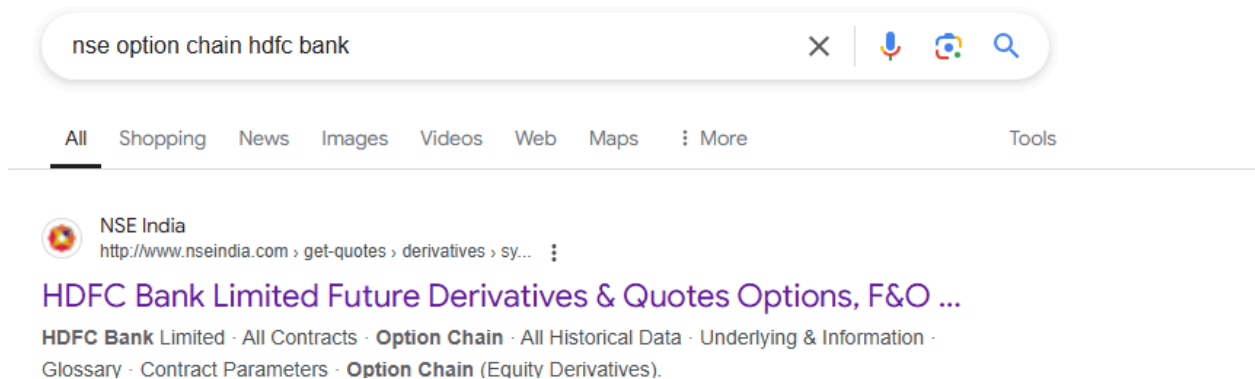
Subtask 1

```
# Getting cookie for the symbol
def get_cookie(sym):
    if sym == "NIFTY":
        return '_ga=GA1.1.2094515518.1729886084; defaultLang=en; nseQuot
    elif sym == "HDFCBANK":
        return '_ga=GA1.1.2094515518.1729886084; defaultLang=en; nseQuot
    else:
        return ''
```

For HDFCBANK part cookie mentioned below , after getting cookie you can paste here in sym = HDFCBANK

Same for getting HDFCBANK , i will show you some steps :

Go to google and search ;



The page :

Option Chain

Listings

IPO

Circulars

Daily Reports

Holidays

Press Releases

Contact Us

NSE

Search by company name, symbol or keyword

English

Nifty50

24,205.35

-135.50 (-0.56%)

31-Oct-2024 15:30

USDINR Futures

31-Oct-2024 | ₹1.3050

31-Oct-2024 17:00

HOME

ABOUT

MARKET DATA

INVEST

LIST

TRADE

REGULATION

LEARN

RESOURCES

COMPLAINTS

RESEARCH

HDFCBANK

HDFC BANK LIMITED

EQUITY

DERIVATIVES

SLB

BONDS

As on 31-Oct-2024 15:30:02 IST (All price values in ₹)

All Contracts

Option Chain

All Historical Data

Underlying & Information

Glossary

HDFCBANK

Active Contrac

Expiry Date

Option Type

Strike Price

Refresh

Clear

	INSTRUMENT TYPE	EXPIRY DATE	OPTION	STRIKE	OPEN	HIGH	LOW	CLOSE	PREV. CLOSE	LAST	CHNG	%CHNG	VOLUME (Contracts)	VALUE (₹ Lakhs)
+	Stock Futures	28-Nov-2024	-	-	1,740.85	1,751.35	1,730.25	1,747.80	1,745.50	1,747.95	2.45	0.14	54,981	5,26,775.98
+	Stock Futures	31-Oct-2024	-	-	1,731.10	1,740.90	1,720.60	1,737.00	1,735.40	1,736.00	0.60	0.03	29,395	2,79,880.97
+	Stock Options	31-Oct-2024	Call	1,750.00	1.00	1.20	0.05	0.05	1.80	0.05	-1.75	-97.22	8,252	7.26
+	Stock Options	28-Nov-2024	Call	1,800.00	17.85	19.50	13.65	17.85	18.80	17.50	-1.30	-6.91	7,195	654.53

After going to developer tool , click on option chain side to All Contracts :

Option Chain

Listings

IPO

Circulars

Daily Reports

Holidays

Press Releases

Contact Us

NSE

Search by company ...

English

24,205.35

-135.50 (-0.56%)

31-Oct-2024 15:30

USDINR Futures

31-Oct-2024 | ₹1.3050

31-Oct-2024 17:00

Menu

HDFCBANK

HDFC BANK LIMITED

EQUITY

DERIVATIVES

SLB

BONDS

As on 31-Oct-2024 15:30:02 IST (All price values in ₹)

All Contracts

Option Chain

All Historical Data

Underlying & Information

HDFCBANK

Active Contracts

Filter

Invert

More filters

All

Fetch/XHR

Doc

CSS

JS

Font

Img

Media

Manifest

WS

Wasm

Other

1000 ms

2000 ms

3000 ms

4000 ms

5000 ms

6000 ms

7000 ms

8000 ms

9000 ms

Name	Status	Type	Initiator
marketStatus	200	xhr	blinkuijs434

Then go to option-chain-equities?symbol=HDFCBANK and fetch cookie as we told for NIFTY :

Option Chain

Listings

IFD

Circulars

Daily Reports

Holidays

Press Releases

Contact Us

NSE

Search by company ...

English

24,205.35

+145.50 (+0.56%)

31-Oct-2024 15:30

Nifty Futures 28-Nov-2024

24,313.90 +80.00 (+0.33%)

31-Oct-2024 20:45

Menu

HDFCBANK

HDFC BANK LIMITED

EQUITY

DERIVATIVES

SLB

BONDS

As on 31-Oct-2024 15:30:02 IST (All price values in Rs)

All Contracts

Option Chain

All Historical Data

Underlying & Information

Option Chain (Equity Derivatives)

Underlying : HDFCBANK 1,734.30

As on 31-Oct-2024 15:30:00 IST

Date

31-Oct-2024

OR

Filter

Invert

More filters

All

Fetch/XHR

Doc

CSS

JS

Font

Img

Media

Manifest

WS

Wasm

Other

10000 ms

20000 ms

30000 ms

40000 ms

50000 ms

60000 ms

70000 ms

80000 ms

Name

X

Headers

Payload

Preview

Response

Initiator

Timing

Cookies

marketStatus

marketStatus

marketStatus

marketStatus

option-chain.json

option-chain-equities?symbol=HDFCBANK

marketStatus

General

Request URL:

Request Method:

Status Code:

Remote Address:

Referrer Policy:

Response Headers

Access-Control-Allow-Headers:

Access-Control-Allow-Methods:

Access-Control-Allow-Origin:

Access-Control-Allow-Origin:

Content-Encoding:

Content-Length:

Content-Security-Policy:

https://www.nseindia.com/api/option-chain-equities?symbol=HDFCBANK

GET

200 OK

23.15.33.57:443

strict-origin-when-cross-origin

Content-Type

GET,POST

beta.nseindia.com

nseindia.com

br

14985

frame-ancestors self