

EDELWISS HACKATHON



**REAL-TIME OPTION CHAIN DISPLAY WITH
IMPLIED VOLATILITY CALCULATION**

TEAM MEMBERS:

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PROBLEM STATEMENT

		HOME		ABOUT		MARKET DATA			INVEST		LIST		TRADE		REGULATION		LEARN		RESOURCES		COMPLAINTS		
CALLS														PUTS									
	OI	CHNG IN OI	VOLUME	IV	LTP	CHNG	BID QTY	BID	ASK	ASK QTY	STRIKE	BID QTY	BID	ASK	ASK QTY	CHNG	LTP	IV	VOLUME	CHNG IN OI	OI		
	39	-	-	-	=	-	200	2,250.40	2,301.75	250	<u>17,100.00</u>	11,550	1.55	1.60	1,350	-0.35	<u>1.60</u>	68.14	42,959	-439	25,845		
	10	-	-	-	=	-	1,800	2,196.25	2,273.20	1,500	<u>17,150.00</u>	2,200	1.65	1.70	2,200	-0.15	<u>1.65</u>	67.31	16,928	-672	578		
	17	-	-	-	=	-	1,500	2,139.25	2,206.40	200	<u>17,200.00</u>	6,100	1.60	1.65	3,450	-0.40	<u>1.65</u>	65.70	30,103	-395	25,145		
	10	-	-	-	=	-	1,800	2,095.90	2,185.40	1,500	<u>17,250.00</u>	1,300	1.55	1.65	1,850	-0.35	<u>1.60</u>	64.28	13,441	-854	726		
	35	-	-	-	=	-	100	2,050.70	2,113.20	250	<u>17,300.00</u>	4,400	1.70	1.75	8,700	-0.55	<u>1.70</u>	63.23	87,189	239	26,748		
	22	-	-	-	=	-	1,800	1,996.30	2,071.70	1,800	<u>17,350.00</u>	2,200	1.65	1.70	1,250	-0.45	<u>1.70</u>	61.80	15,399	-200	710		
	296	-10	13	55.35	<u>1,987.50</u>	90.50	1,500	1,939.30	2,001.60	250	<u>17,400.00</u>	3,250	1.65	1.70	6,400	-0.60	<u>1.70</u>	60.38	69,388	43	16,403		
	142	123	134	86.91	<u>1,961.75</u>	331.75	1,800	1,894.80	1,940.55	100	<u>17,450.00</u>	2,100	1.60	1.65	2,200	-0.55	<u>1.65</u>	58.61	9,908	-547	1,078		
	401	-7	9	86.04	<u>1,860.00</u>	35.15	600	1,883.10	1,888.75	50	<u>17,500.00</u>	17,400	1.55	1.60	13,950	-0.70	<u>1.55</u>	57.37	2,03,525	-4,454	55,029		
	309	-30	66	-	<u>1,830.55</u>	79.65	150	1,791.10	1,841.30	150	<u>17,550.00</u>	6,150	1.65	1.75	7,700	-0.60	<u>1.75</u>	56.12	13,516	-662	967		
	270	-190	259	-	<u>1,776.00</u>	71.00	200	1,769.25	1,787.65	100	<u>17,600.00</u>	8,350	1.65	1.70	4,950	-0.60	<u>1.70</u>	54.70	59,176	-1,685	13,924		
	206	-	-	-	=	-	1,500	1,691.40	1,756.60	150	<u>17,650.00</u>	5,150	1.65	1.70	8,750	-0.70	<u>1.70</u>	53.28	10,229	141	1,271		
	357	-3	5	66.35	<u>1,672.00</u>	52.85	600	1,662.20	1,686.90	450	<u>17,700.00</u>	10,450	1.70	1.75	13,500	-0.75	<u>1.70</u>	51.86	63,484	96	13,957		
	44	-	-	-	=	-	1,500	1,591.65	1,662.00	150	<u>17,750.00</u>	5,300	1.80	1.90	12,250	-0.80	<u>1.85</u>	50.88	16,438	-1,564	3,097		
	707	-2	4	80.81	<u>1,625.00</u>	93.90	200	1,580.10	1,590.80	250	<u>17,800.00</u>	13,800	1.90	1.95	13,700	-0.75	<u>1.95</u>	49.59	75,062	2,694	35,549		
	82	-	1	75.09	<u>1,568.00</u>	240.45	1,500	1,492.35	1,543.25	200	<u>17,850.00</u>	600	2.00	2.05	7,600	-0.90	<u>2.00</u>	48.55	16,147	-196	4,418		
	337	-7	9	76.85	<u>1,525.35</u>	113.30	200	1,480.90	1,491.85	250	<u>17,900.00</u>	9,900	1.90	1.95	17,350	-0.80	<u>1.95</u>	46.72	86,620	1,258	25,864		
	65	-	1	-	<u>1,380.00</u>	50.90	600	1,424.95	1,443.35	50	<u>17,950.00</u>	9,450	2.10	2.15	50	-0.80	<u>2.15</u>	45.90	34,749	1,201	5,080		
	1,374	-129	616	-	<u>1,378.15</u>	54.65	250	1,387.30	1,389.85	250	<u>18,000.00</u>	47,250	2.20	2.25	13,600	-1.00	<u>2.25</u>	44.68	3,09,388	14,283	1,38,744		
	66	-	-	-	=	-	200	1,324.65	1,346.60	200	<u>18,050.00</u>	10,500	2.35	2.40	7,600	-0.85	<u>2.40</u>	43.55	47,272	2,203	6,559		
	820	-58	78	-	<u>1,285.00</u>	66.25	600	1,285.70	1,289.55	250	<u>18,100.00</u>	5,400	2.35	2.40	28,900	-0.95	<u>2.40</u>	42.08	88,412	428	26,301		
	41	-	2	-	<u>1,231.25</u>	58.25	150	1,230.25	1,241.75	150	<u>18,150.00</u>	8,350	2.45	2.50	8,100	-1.05	<u>2.50</u>	40.81	48,750	199	8,761		

DEVELOPING A REAL-TIME OPTIONS CHAIN DISPLAY WEB APPLICATION THAT PROCESSES A MARKET DATA STREAM OVER TCP/IP AND CALCULATING IMPLIED VOLATILITY (IV) TO PROVIDE OPTIONS TRADERS WITH AN INTERACTIVE AND DYNAMIC VIEW OF THE MARKET.

Features to be included

1 IN THE MONEY / OUT OF MONEY

Different highlights for in the money options and out of money options.

2 EXPIRY SELECTION

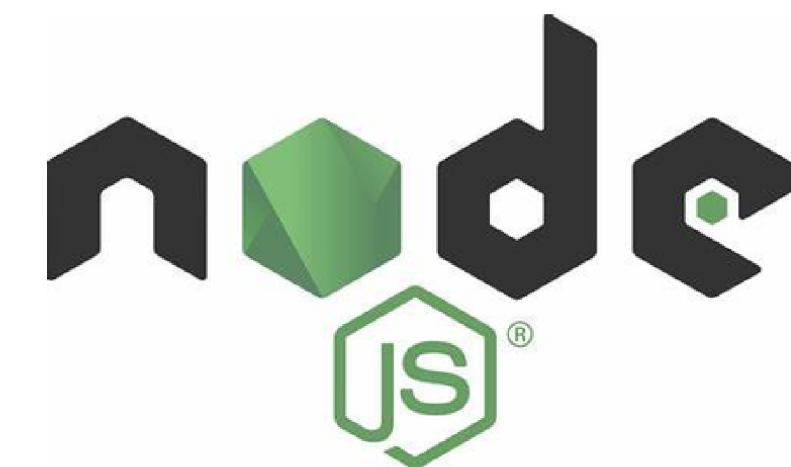
Selection of underlying and different expiries.

3 REAL TIME - AUTO REFRESH

As the market data changes, the fields should be recalculated and refreshed on screen without having to reload on the browser.

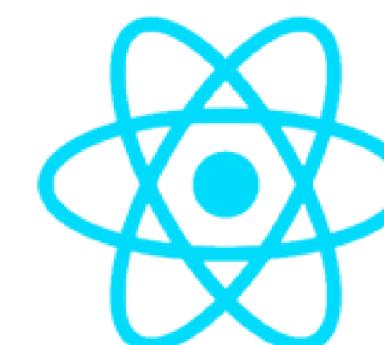
TECH STACK USED

NodeJS for Backend and socket-connection



React for frontend

Java file for sending tcp/ip stream



ATTEMPTED TO CONSTRUCT

- **Implied Volatility** : to calculate IV using Black Scholes formula, which uses options price as parameter.

implied volatility (IV) of an option contract is that value of the volatility of the underlying instrument which, when input in an option pricing model, will return a theoretical value equal to the current market price of said option.

IV is a metric used by investors to estimate future fluctuations (volatility) of a security's price based on certain predictive factors.

```
const expiryTimestamp = new Date(expiryDate);
const currentTimestamp = new Date().getTime();
const timeToMaturity = (expiryTimestamp - currentTimestamp) / ( 24 * 60 * 60 * 1000);      You, 9 minutes ago • Uncommitted changes
```

```
const impliedVolatility = bs.blackScholes(parseFloat(marketData.lastTradedPrice)/100, parseFloat(strikePrice/100), timeToMaturity, 0.0002, r, OptionType === 'Calls' ? 'call' : 'put');// paise to
const change = ((marketData.lastTradedPrice - marketData.previousClosePrice)/100).toFixed(2);
const coi = ((marketData.bidPrice - marketData.askPrice)).toFixed(2);
```

ATTEMPTED TO CONSTRUCT

- **Real time option change** - provide up-to-date information on the available options contracts.

After an initial request has been received from the server, the server responds with the latest snapshot data for all the symbols stored in it over the same TCP/IP connection.

```
26 |     console.log('Client connected');
27 |
28 |     const tcpSocket = new net.Socket();
29 |
30 |     // Connect to the TCP server
31 |     tcpSocket.connect(serverPort, serverIP, () => {
32 |         console.log('Connected to TCP server');
33 |         // Send initial request packet
34 |         const request = Buffer.alloc(1, 1);
35 |         tcpSocket.write(request);
36 |     });
37 |
38 |     let batchedData = [];
39 |
40 |     // Function to send batched data to the WebSocket client
41 |     const sendBatchedData = () => {
42 |         if (batchedData.length > 0) {
43 |             ws.send(JSON.stringify(batchedData));
44 |             batchedData = []; // Clear the batchedData array after sending
45 |         }
46 |     };
47 | }
```

ATTEMPTED TO CONSTRUCT

- **Calls and puts** : Different tables for call options and puts options is displayed.

A **call** option gives the holder the right to buy a stock and a **put** option gives the holder the right to sell a stock. Both the call option and the put options are rights without the obligation which is what makes them an asymmetrical option. The call option has a buyer and a seller just as a put option also has a buyer and a seller.

Puts Table											Calls Table										
OI	Volume	Last Traded Price	Bid Quantity	Bid Price	Ask Price	Ask Quantity	Change OI	Change	Implied Volatility	Strike Price	OI	Volume	Last Traded Price	Bid Quantity	Bid Price	Ask Price	Ask Quantity	Change OI	Change		
00	0	2.00	0	2.00	2.00	0.00	0.00	-0.33	37.86	13500.00	0.00	0	4167.00	0	4167.00	4167.00	0.00	0.00	41.1		
00	0	3.05	0	3.05	3.05	0.00	0.00	-0.19	39.17	14500.00	21.75	0	4080.40	0	4080.40	4080.40	0.00	0.00	40.7		
50	0	1.80	600	0.90	2.00	500.00	-1.10	-1.17	39.51	15800.00	0.00	0	2490.00	500	2770.75	2881.20	250.00	-110.45	24.3		
30	0	3.15	600	1.05	2.80	100.00	-1.75	-0.35	40.15	16200.00	15.00	0	2435.65	200	2382.55	2422.35	250.00	-39.80	23.8		
30	0	2.50	0	2.50	2.50	0.00	0.00	-1.11	44.44	16850.00	0.00	0	1574.70	1500	1606.15	1865.75	1500.00	-259.60	15.1		
30	0	5.55	0	5.55	5.55	0.00	0.00	-1.72	51.33	16950.00	13.50	0	1614.05	1500	1503.80	1731.05	1500.00	-227.25	15.5		
30	0	3.10	2900	3.10	0.00	0.00	3.10	-1.09	52.01	17600.00	899.00	0	1039.84	150	1022.90	1035.00	50.00	-12.10	9.7		
30	0	3.35	0	3.35	3.35	0.00	0.00	-2.43	52.83	17750.00	0.00	0	897.00	200	879.40	890.95	50.00	-11.55	8.2		
50	0	6.05	1100	6.15	6.35	250.00	-0.20	-2.71	54.62	17950.00	306.50	50	700.00	150	695.35	705.25	400.00	-9.90	6.2		
30	2300	6.95	2000	6.90	7.05	100.00	-0.15	-2.33	55.43	18450.00	895.00	1850	291.00	50	293.70	295.00	1000.00	-1.30	-1.0		
50	850	28.35	150	28.00	28.25	150.00	-0.25	-4.33	58.51	18500.00	22580.00	16800	260.00	250	260.20	260.80	100.00	-0.60	-15.3		
0	10750	31.70	1750	31.50	31.70	950.00	-0.20	-7.91	58.64	18550.00	1560.00	4100	228.90	300	229.00	229.75	750.00	-0.75	-11.1		

ATTEMPTED TO CONSTRUCT

- **Expiry date and symbol filter** : provides the facility of navigating through options on the basis of expiry date and/or symbol.

Expiry date is the date, as the name suggests, on which a particular contract (usually a derivative contract) expires. Every derivative contract, which is based on an underlying security such as a stock, commodity, or a currency, has an expiry date. On the expiry date, the derivative contract is finally settled between the buyer and seller.

Symbol Name	Expiry Date	Calls			
Change OI	Change	Implied Volatility	Volume	Last Traded Price	Bid Quantity
	13JUL23		0	1180.00	3250
	04JUL23		0	1203.70	1500
	05JUL23		0	1111.20	150
	06JUL23		0	1045.05	400
	11JUL23		0	963.00	200
	13JUL23		0	858.15	200
	18JUL23		0	741.05	200
	20JUL23		0	750.00	600
	25JUL23		0	717.00	400
	26JUL23		0	665.85	150
	27JUL23		0	601.85	400
	03AUG23		0	585.65	50
	29AUG23				
	31AUG23				
	26SEP23				
	28SEP23				
	26OCT23				
	28DEC23				
	28MAR24				
	27JUN24				
	26DEC24				
	26JUN25				
	25DEC25				

ATTEMPTED TO CONSTRUCT

- **Differentiate in the money and out of money options :** in the money and out of money options are differentiated by using highlighting.

Calls are **in the money** when the security's price is above the strike price, and **out of the money** when the security's price is below the strike price.

Symbol Name	Expiry Date	Ask Quantity	Change OI	Change	Implied Volatility	Strike Price	OI	Volume	Last Traded Price
	27JUL23	0.00	0.00	-0.33	37.86	13500.00	0.00	0	4167.0
		0.00	0.00	-0.19	39.17	14500.00	21.75	0	4080.4
		500.00	-1.10	-1.17	39.51	15800.00	0.00	0	2490.0
		100.00	-1.75	-0.35	40.15	16200.00	15.00	0	2435.6
		0.00	0.00	-1.11	44.44	16850.00	0.00	0	1574.7
		0.00	0.00	-1.72	51.33	16950.00	13.50	0	1614.0
		0.00	3.10	-1.09	52.01	17600.00	899.00	0	1039.8
		0.00	0.00	-2.43	52.83	17750.00	0.00	0	897.00
		250.00	-0.20	-2.71	54.62	17950.00	306.50	50	700.00
		100.00	-0.15	-2.33	55.43	18450.00	895.00	1850	291.00
		150.00	-0.25	-4.33	58.51	18500.00	22580.00	16800	260.00
		950.00	-0.20	-7.91	58.64	18550.00	1560.00	4100	228.90

ATTEMPTED TO CONSTRUCT

- **Change in OI and Change :** decrease in OI is displayed with red font and increase in OI is displayed with green font.

Increasing open interest represents new or additional money coming into the market, while decreasing open interest indicates money flowing out of the market.

Symbol Name	Expiry Date	Ask Quantity	Change OI	Change	Implied Volatility	Strike Price	OI	Volume	Last Traded Price
	27JUL23	0.00	0.00	-0.33	37.86	13500.00	0.00	0	4167.0
		0.00	0.00	-0.19	39.17	14500.00	21.75	0	4080.4
		500.00	-1.10	-1.17	39.51	15800.00	0.00	0	2490.0
		100.00	-1.75	-0.35	40.15	16200.00	15.00	0	2435.6
		0.00	0.00	-1.11	44.44	16850.00	0.00	0	1574.7
		0.00	0.00	-1.72	51.33	16950.00	13.50	0	1614.0
		0.00	3.10	-1.09	52.01	17600.00	899.00	0	1039.8
		0.00	0.00	-2.43	52.83	17750.00	0.00	0	897.00
		250.00	-0.20	-2.71	54.62	17950.00	306.50	50	700.00
		100.00	-0.15	-2.33	55.43	18450.00	895.00	1850	291.00
		150.00	-0.25	-4.33	58.51	18500.00	22580.00	16800	260.00
		950.00	-0.20	-7.91	58.64	18550.00	1560.00	4100	228.90

REASONS TO CONSIDER OUR APPLICATION FOR THE FINAL ROUND

1

ENHANCED USER EXPERIENCE:

Our application provides user with user friendly UI with features like visual differentiation and filters.

2

TECHNICAL EXPERTISE

We possess the necessary technical expertise to process market data streams over TCP/IP and calculate important metrics such as implied volatility (IV) accurately. Our team has a solid understanding of options pricing models and the ability to implement real-time calculations.

3

INOVATION AND UNIQUENESS

Our application provides user with user friendly UI with features like visual differentiation and filters.