



Fundamentals of Software Engineering

Crypto Trading Analytics & Risk Management App (CryptoAnalyticsPro)

Muhammad Ali Saleem (23L-2638)

Ammar Hassan (23L-2614)

Hamza Mumtaz (23i-2635)

Deliverable # 3

Final Report

Date: 4th May, 2025.

CryptoAnalyticsPro

A Crypto Trading Analytics & Risk Management App

Link to our Github Repository:

<https://github.com/ammarhassan6/CryptoAnalyticsPro>

Introduction

CryptoAnalyticsPro is a Windows-based desktop application designed for cryptocurrency traders to track trade history, assess risk, and analyze profits and losses using real-time market data. Built using C# WinForms and MS Access for data storage, the application provides a user-friendly interface for portfolio management, trade insights, and market trend analysis.

With the volatile nature of the cryptocurrency market, traders need robust tools to make informed decisions. CryptoAnalyticsPro offers essential features such as profit/loss tracking, stop-loss and take-profit calculations, risk assessment dashboards, and multi-currency portfolio valuation. The platform now also includes **AI-powered trade recommendations** to guide users toward high-potential trades based on portfolio data and market conditions, along with **real-time sentiment analysis** that helps traders gauge market mood across news and social media.

This application empowers users to minimize risks and maximize returns through actionable insights, AI-driven decision support, and historical trade analysis. Designed to be lightweight, standalone, and offline-capable, CryptoAnalyticsPro avoids the complexity of cloud-based solutions. Its use of MS Access for local data storage ensures seamless and accessible data management for both beginner and advanced traders.

User Stories and Sub-User Stories

Sprint 3

AI-Powered Trade Recommendations

User Story:

As a crypto trader, I want personalized AI-driven trade suggestions that analyze market trends and my portfolio, so I can discover high-potential opportunities quickly and make more data-driven decisions.

Sub-Stories:

- I can filter trade recommendations by asset, timeframe, and risk level so that I only see suggestions matching my trading strategy.
 - I can view each recommendation with detailed metrics (like predicted ROI or confidence score) and explanation (e.g., key indicators or news triggers) to understand why the AI made that suggestion.
 - I can set my risk tolerance and preferred coins so that the AI tailors future recommendations to my goals and existing portfolio.
-

Sentiment Analysis

User Story:

As a crypto trader, I want to see market sentiment across news and social media, so I can gauge overall market mood and inform my trading strategy.

Sub-Stories:

- I can view visual sentiment scores or gauges for the overall market and for specific cryptocurrencies, giving me a quick snapshot of positive vs. negative mood.

- I can overlay sentiment trends with price charts to spot correlations between sentiment spikes/drops and price movements.
 - I can receive alerts when sentiment for a specific coin becomes extremely positive or negative, so that I'm notified of sudden market mood changes.
-

Multi-Currency Support

User Story:

As an international crypto trader, I want the platform to support multiple fiat and crypto currencies so I can track and analyze my portfolio value across all currencies.

Sub-Stories:

- I can add and manage multiple fiat currency accounts (like USD, EUR) and cryptocurrency wallets, with balances tracked separately and in aggregate.
 - I can select a base currency (e.g., USD or EUR), and the platform automatically converts all asset values into that currency using real-time exchange rates.
 - All charts, reports, and analytics use the selected base currency, so I can view everything in my preferred format.
 - When I execute trades, prices and outputs are shown in both currencies (crypto + base fiat), clearly displaying the conversion rate and resulting balances.
 - I can view a breakdown of my portfolio by currency to understand exposure and diversification.
-

Sprint 2

Functional Portfolio Dashboard

User Story:

As a trader, I want to analyze my portfolio to make informed decisions.

Sub-Stories:

- Display visual indicators of risk metrics (e.g., volatility, profit-loss asset concentration).
 - Show historical performance trends of the portfolio.
 - Categorize assets for clearer organization.
-



Stop-Loss & Take-Profit Calculator

User Story:

As a trader, I want to set stop-loss and take-profit levels to automate my trade exits.

Sub-Stories:

- Allow users to enter current price, stop-loss %, and take-profit %.
 - Calculate and display stop-loss and take-profit target values.
 - Display potential loss and potential profit based on inputs.
 - Allow saving of calculated thresholds for later use.
-



Price Alerts

User Story:

As a trader, I want to receive price alerts when a cryptocurrency reaches a specific value.

Sub-Stories:

- Let users select a cryptocurrency and set a price threshold.
- Store alerts in the database for active monitoring.

- Notify the user when the set price is hit.
 - Allow editing or deleting of alerts.
-

Sprint 1

Login & Signup

User Story:

As a user, I want to securely log in and sign up so that I can access my personalized portfolio data.

Sub-Stories:

- Allow new users to create an account using email and password.
 - Enable existing users to log in with their credentials.
 - Ensure secure authentication practices are followed.
-

Portfolio Dashboard

User Story:

As a trader, I want to view my portfolio summary in different fiat currencies to analyze my holdings.

Sub-Stories:

- Display total asset value in USD, EUR, and other fiat currencies.
 - Show profit/loss metrics for each trade and overall portfolio.
 - Enable users to manually update asset holdings.
-



Trade History Tracker

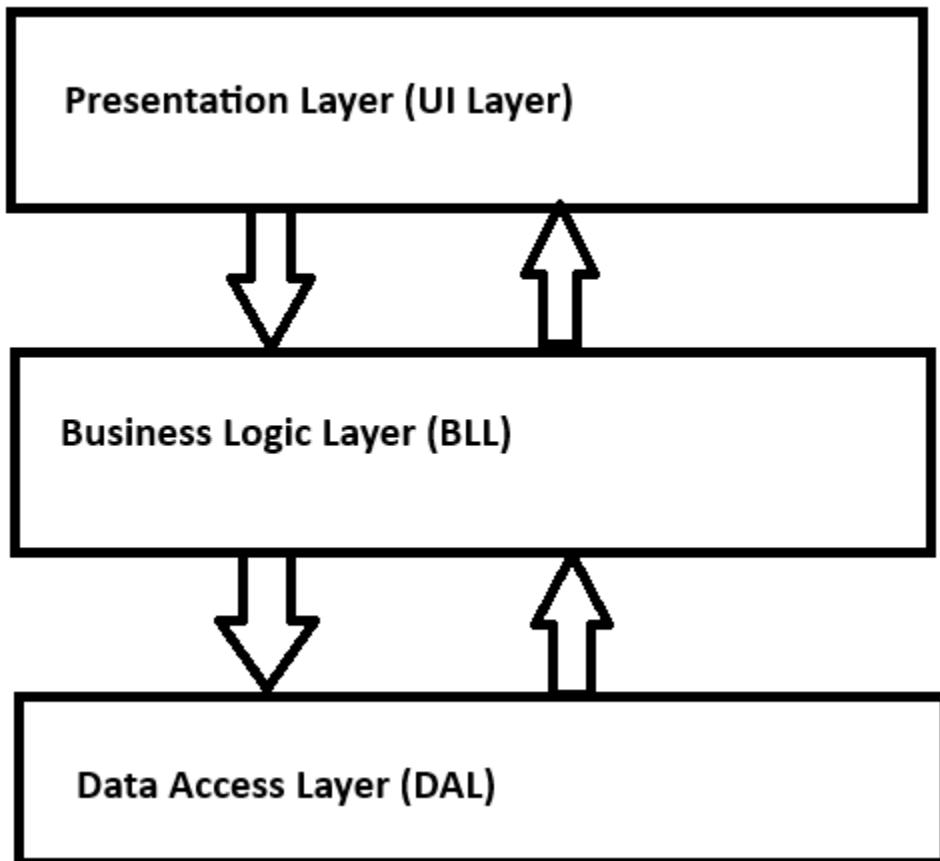
User Story:

As a trader, I want to log and track my trade history so I can review my past trades.

Sub-Stories:

- Allow users to input trade details (buy/sell price, quantity, exchange, date).
- Store trade history in a database for future retrieval.
- Enable filtering of trades based on date and exchange.

Architecture



1. Presentation Layer (UI Layer)

Handles user interactions and displays information.

Contains:

- WinForms UI (MainForm, buttons, ComboBoxes, Labels)
- Event handlers (`btnGetRecommendation_Click`, etc.)
- Displays sentiment, recommendations, and prices

Responsibilities:

- Trigger business logic on user actions
 - Show API results and recommendation output
 - Handle loading states, colors, icons, formatting
-

2. Business Logic Layer (BLL)

Contains all the core logic of the application.

Contains:

- `TradeAnalyzer.cs` → calculates MA50, RSI, generates signals
- `RecommendationEngine.cs` → processes rules and creates final output
- `SentimentHelper.cs` → parses sentiment values and returns interpretation
- Input validation and data formatting

Responsibilities:

- Apply AI logic (e.g., MA50, RSI, decision rules)

- Generate readable recommendations
 - Interpret sentiment data
 - Communicate between UI and data layer
-

3. Data Access Layer (DAL)

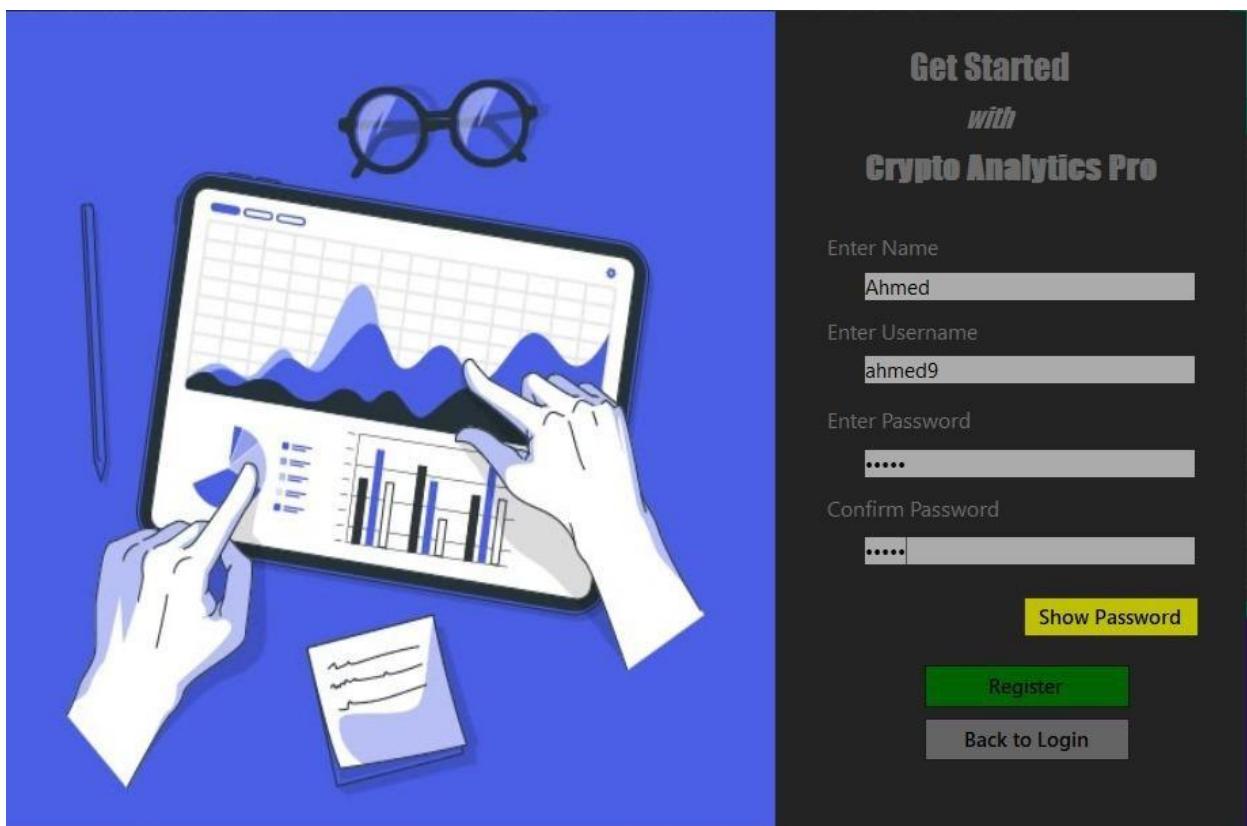
Handles all external data fetching from APIs.

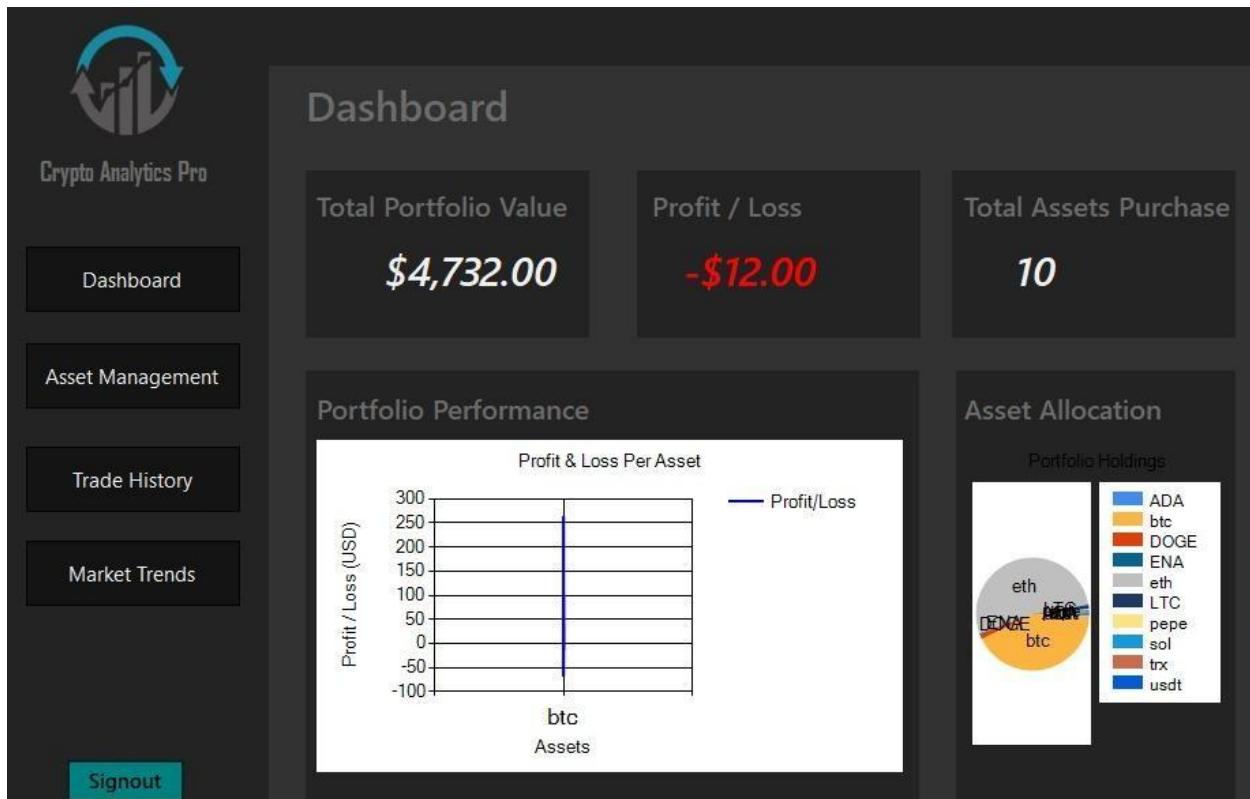
Contains:

- `ApiService.cs` → general HTTP utility functions
- `PriceFetcher.cs` → gets historical and current prices
- `SentimentApi.cs` → fetches Crypto Fear & Greed Index

Responsibilities:

- Make API calls (CoinGecko, Alternative.me)
- Deserialize JSON responses
- Provide clean, reusable methods like `GetPrices(string coin)` or `GetSentiment()`





Crypto Analytics Pro

Dashboard

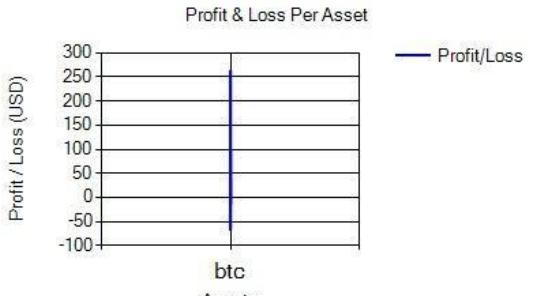
Total Portfolio Value **\$4,732.00**

Profit / Loss **-\$12.00**

Total Assets Purchase **10**

Portfolio Performance

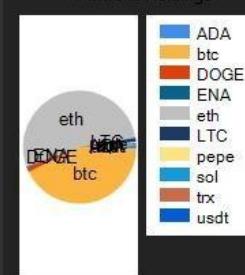
Profit & Loss Per Asset



Assets	Profit/Loss (USD)
btc	-100

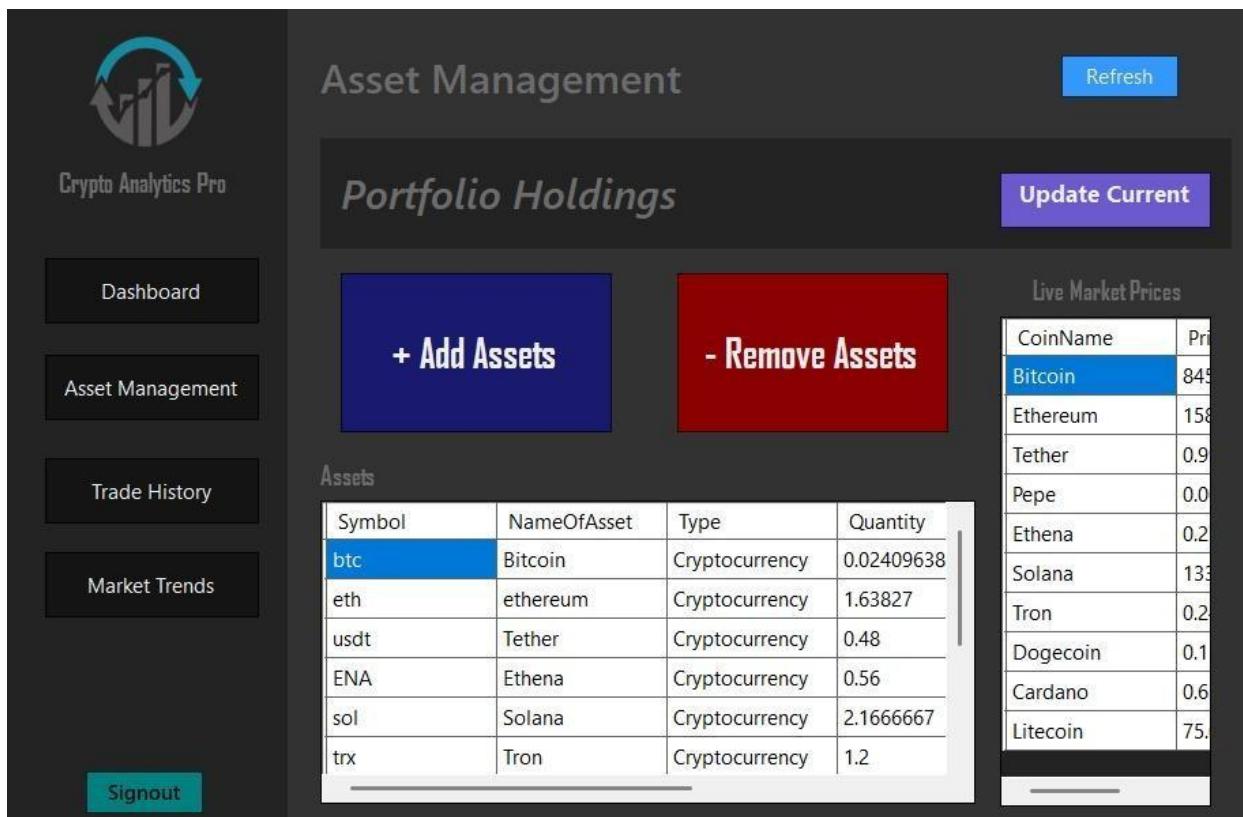
Asset Allocation

Portfolio Holdings



Coin	Percentage
eth	~45%
DOGE	~15%
ADA	~10%
ENA	~10%
LTC	~5%
pepe	~5%
sol	~5%
trx	~5%
usdt	~5%

Signout



Crypto Analytics Pro

Asset Management

Portfolio Holdings

+ Add Assets - Remove Assets

Assets

Symbol	NameOfAsset	Type	Quantity
btc	Bitcoin	Cryptocurrency	0.02409638
eth	Ethereum	Cryptocurrency	1.63827
usdt	Tether	Cryptocurrency	0.48
ENA	Ethena	Cryptocurrency	0.56
sol	Solana	Cryptocurrency	2.1666667
trx	Tron	Cryptocurrency	1.2

Live Market Prices

CoinName	Price
Bitcoin	845
Ethereum	158
Tether	0.9
Pepe	0.0
Ethena	0.2
Solana	133
Tron	0.2
Dogecoin	0.1
Cardano	0.6
Litecoin	75.

Signout



Add Assets

Symbol: btc

Asset Name: Bitcoin

Asset Type: crypto

Invested Amount (in usd): 25

Purchase Price: 15

Purchase Date: 2025-12-12

[Cancel](#) [+ Add Asset](#)

[Refresh](#)

[Update Current](#)

CoinName	Price
Bitcoin	845
Ethereum	158
Tether	0.9
Pepe	0.0
Ethena	0.2
Solana	133
Tron	0.2
Dogecoin	0.1
Cardano	0.6
Litecoin	75.



Market Trends

SL/TP Calculator

Entry Price: 1625

Stop Loss (%): 3

Take Profit (%): 5

Investment: 2000

Coin Name: Ethereum

[Suggest SL/TP](#)

Current Price: \$1845.68

Stop-Loss Price: \$1576.25

Take-Profit Price: \$1706.25

Potential Loss: \$60.00

Potential Profit: \$100.00

Risk/Reward Ratio: 1.67 : 1

Alerts

Enter Coin: Target Price: Condition:

[Set Alert](#)



Trade History

	Symbol	NameOfAsset	Type	Quantity	PurchaseP
▶	eth	ethereum	Cryptocurrency	1.63827	1526
	usdt	Tether	Cryptocurrency	0.48	25
	ENA	Ethena	Cryptocurrency	0.56	25
	sol	Solana	Cryptocurrency	2.1666667	12
	trx	Tron	Cryptocurrency	1.2	15
	DOGE	Dogecoin	Cryptocurrency	5.6666665	12
	ADA	Cardano	Cryptocurrency	0.30769232	78
	LTC	Litecoin	Cryptocurrency	1.2888889	45
	pepe	Pepe	Cryptocurrency	0.48	25



Market Trends

SL/TP Calculator

Entry Price: 25

Stop Loss: 24.50

Take Profit: 28.00

Investment: 10

Coin Name: BTC

Current Price: \$84535.00

Price Alert

⚠ Alert!

BITCOIN is Above your target of Rs82,000.00.

Current Price: Rs85,310.00

OK

Alerts

Enter Coin: Bitcoin

Target Price: 82000

Condition: Above

Set Alert



Crypto Analytics Pro

Dashboard

Asset Management

Trade History

Market Trends

Recommend Trade

Sentiment Indicator

Signout

Trade Recommendations

Select Coin: ▼

Get Recommendations

SOLANA:
Price: \$145.33
MA50: \$147.86
RSI: 28.56

→ **Sell**

The system analyzes real-time price data using two key indicators:
- MA50 (Moving Average): Shows the average price over the last 50 hours to spot trends.
- RSI (Relative Strength Index): Measures momentum to detect if a coin is overbought or oversold.

These indicators are combined into a score that helps us suggest whether to Buy, Hold, or Sell the selected coin.



Crypto Analytics Pro

Dashboard

Asset Management

Trade History

Market Trends

Recommend Trade

Sentiment Indicator

Signout

Sentiment Indicator

📊 **Sentiment: Greed (64/100)**

🕒 **Last Updated: 5/4/2025 12:00:00 AM**

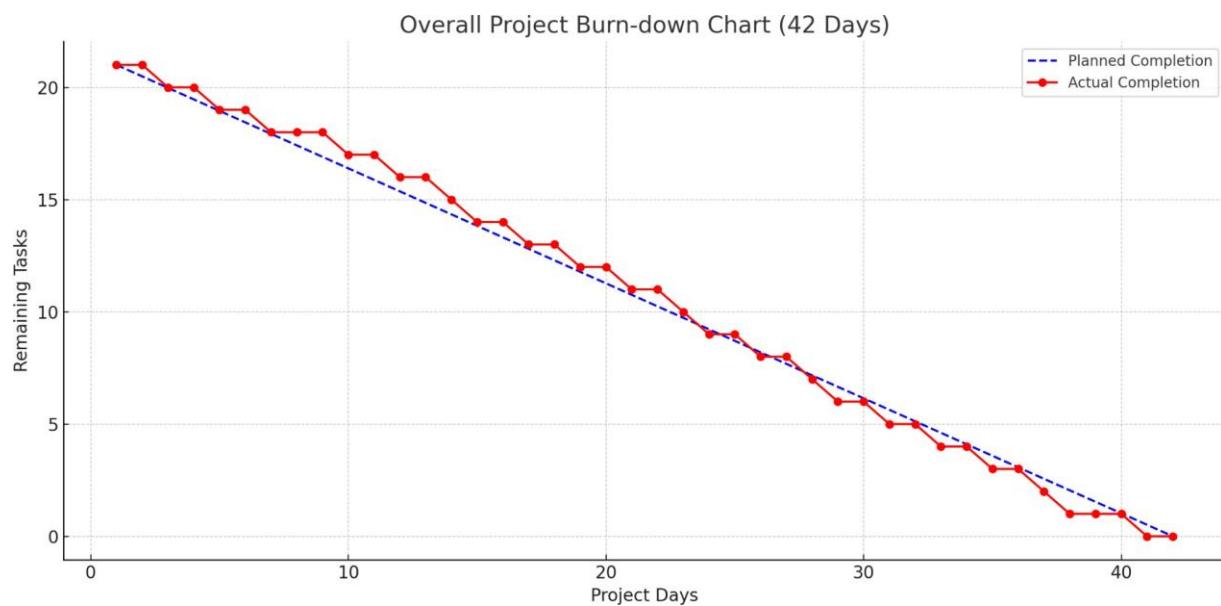
💡 **Insight: Market shows greed. Be cautious of bubbles.**

Check Market Sentiments

This tool measures the overall mood of the crypto market using real-time data.
It ranges from 0 (Extreme Fear) to 100 (Extreme Greed):
- Fear means investors are worried — could signal a buying opportunity.
- Greed means high confidence or hype — be cautious of overbought conditions.

Our sentiment reading helps you understand how the crowd feels — so you can trade smarter.

Product Burn down chart



This burn-down chart visualizes the overall progress of the project over the 42-day sprint. The blue dashed line represents the planned ideal completion rate assuming a consistent pace, while the red line shows the actual task completion. This helps identify if the team is ahead, on track, or behind schedule, providing valuable insight into project performance and sprint velocity.

Scrum Board

Link to our Scrum Board: <https://trello.com/b/5IGpCPuB/cryptoanalyticspro-iv>

At Start:

The screenshot shows a Trello board titled "CryptoAnalyticsPRO (IV)". The board has four columns: "Sprint1Backlog", "TO DO", "Market Sentiment Analysis (Fear & Greed Index)", and "Multi-Currency Support".

- Sprint1Backlog:** Contains one card: "Multi-Currency Support".
- TO DO:** Contains two cards:
 - "AI-Powered Trade Recommendations":
 - Description: "Allow users to select a coin from a dropdown list (e.g., BTC, ETH, etc.)."
 - Description: "Fetch historical price data for the selected coin using a crypto API."
 - Description: "Calculate key indicators such as: MA50 (50-period Moving Average) RSI (Relative Strength Index)"
 - Description: "Analyze indicators using predefined logic to generate a trade recommendation (Buy / Hold / Sell)."
 - Description: "Display the recommendation along with RSI, MA50, and current price."
 - "Sentiment Analysis":
 - Description: "+ Add a card"
- Market Sentiment Analysis (Fear & Greed Index):** Contains one card:
 - Description: "Fetch the latest crypto market sentiment."
 - Description: "Use the Alternative.me API to retrieve the Fear & Greed Index."
 - Description: "Parse and display: Sentiment score (0-100) Classification (e.g., Fear, Greed, Extreme Fear) Insight message based on sentiment level Last updated timestamp (formatted)"
 - Description: "Handle errors gracefully if the API call fails or times out."
 - Description: "+ Add a card"
- Multi-Currency Support:** Contains one card:
 - Description: "Verify correct currency conversion for portfolio valuation."
 - Description: "Research API for real-time exchange rates."
 - Description: "Implement API integration for fetching exchange rates."
 - Description: "Check accuracy of currency conversion calculations."
 - Description: "Display converted portfolio value in different fiat currencies."
 - Description: "+ Add a card"

The screenshot shows a Trello board titled "CryptoAnalyticsPRO (IV)". The board has a dark purple background. On the left, there is a vertical column of five dark cards, each with a small icon at the bottom right. To the right of this column are four main columns:

- Sprint1Backlog**: Contains one card: "Multi-Currency Support". Below it is a button "+ Add a card".
- TO DO**: Contains three cards: "AI-Powered Trade Recommendations", "Sentiment Analysis", and "Multi-Currency Support". The first two have green checkmarks. Below them is a button "+ Add a card".
- AI-Powered Trade Recommendations**: Contains six items with green checkmarks:
 - Fetch historical price data for the selected coin using a crypto API.
 - Calculate key indicators such as: MA50 (50-period Moving Average) RSI (Relative Strength Index)
 - Analyze indicators using predefined logic to generate a trade recommendation (Buy / Hold / Sell).
 - Display the recommendation along with RSI, MA50, and current price.
 - Handle network/API errors gracefully and inform the user if data fetch fails.
- Market Sentiment Analysis (Fear & Greed Index)**: Contains five items with green checkmarks:
 - Fetch the latest crypto market sentiment.
 - Use the Alternative.me API to retrieve the Fear & Greed Index.
 - Parse and display: Sentiment score (0-100) Classification (e.g., Fear, Greed, Extreme Fear) Insight message based on sentiment level Last updated timestamp (formatted)
 - Handle errors gracefully if the API call fails or times out.
- Multi-Currency Support**: Contains five items with green checkmarks:
 - Verify correct currency conversion for portfolio valuation.
 - Research API for real-time exchange rates.
 - Implement API integration for fetching exchange rates.
 - Check accuracy of currency conversion calculations.
 - Display converted portfolio value in different fiat currencies.

At the bottom right of the board, there is a button "+ Add a card".

At End:

This screenshot shows the same Trello board after the tasks have been completed. The "TO DO" column now contains five cards, all of which have green checkmarks next to their names:

- AI-Powered Trade Recommendations
- Sentiment Analysis
- Multi-Currency Support
- Market Sentiment Analysis (Fear & Greed Index)
- Multi-Currency Support

The other sections of the board remain the same, with their respective cards also having green checkmarks indicating they are complete.

Boundary value analysis testing

Sign Up Interface (BVA – Username & Password)

Username Field (Min: 3, Max: 20)

Test Case	Field	Input Length	Test Value Description	Expected Result
1	Username	3	Minimum	Valid
2	Username	4	Minimum + 1	Valid
3	Username	11	Nominal	Valid
4	Username	20	Maximum	Valid
5	Username	21	Maximum + 1	Invalid

Password Field (Min: 8, Max: 20)

Test Case	Field	Input Length	Test Value Description	Expected Result
6	Password	8	Minimum	Valid
7	Password	9	Minimum + 1	Valid
8	Password	14	Nominal	Valid
9	Password	20	Maximum	Valid
10	Password	21	Maximum + 1	Invalid

Login Interface (BVA – Username & Password)

Username Field (Min: 3, Max: 20)

Test Case	Field	Input Length	Test Value Description	Expected Result
11	Username	3	Minimum	Valid
12	Username	4	Minimum + 1	Valid
13	Username	11	Nominal	Valid
14	Username	20	Maximum	Valid
15	Username	21	Maximum + 1	Valid

Password Field (Min: 8, Max: 20)

Test Case ID	Field	Input Length	Test Value Description	Expected Result
16	Password	8	Minimum	Valid
17	Password	9	Minimum + 1	Valid
18	Password	14	Nominal	Valid
19	Password	20	Maximum	Valid
20	Password	21	Maximum + 1	Invalid

Work Division

Ammar Hassan – Dashboard & Recommendation System Lead

Responsibilities:

- Design and implement the main dashboard UI (coin selector, buttons, display areas).
 - Handle the Get Recommendation feature flow from UI to backend.
 - Display AI-based trade recommendations with MA50, RSI, and signal summary.
 - Style the interface with clear labels, icons, and conditional coloring.
 - Connect button events to data and logic layers.
-

Muhammad Ali Saleem – API Integration & Sentiment Engine

Responsibilities:

- Fetch historical price data (e.g., 50-hour price history) from CoinGecko API.
 - Connect to Alternative.me Crypto Fear & Greed Index for market sentiment.
 - Parse and return clean, usable data for analysis.
 - Add error handling for API timeouts, failures, or bad data.
 - Provide data-fetching functions to be used by the logic and UI teams.
-

Hamza Mumtaz – AI Logic & Trade Signal Analysis

Responsibilities:

- Implement core logic for MA50 and RSI calculation using fetched data.
 - Develop rule-based recommendation engine (Buy/Hold/Sell) using indicators.
 - Add explanation and optional confidence score to recommendation output.
 - Optimize and test indicator logic with mock or real data.
 - Assist with refining indicator thresholds and behavior.
-

Lesson learnt

One thing we learned throughout this project is that staying consistent with our progress makes a huge difference. At times, we underestimated how even small delays in the early stages could start stacking up and impact the later phases. We had a solid plan in place, but we realized that sticking to the plan isn't enough if we're not regularly checking where we stand. What really would've helped was having more frequent check-ins, reassessing our progress, and being flexible enough to adjust the workload when needed. It's easy to get caught up in day-to-day tasks, but stepping back to look at the bigger picture is what keeps everything aligned. This experience showed us that adapting as we go is just as important as having a well-defined roadmap from the start.
