CredTech: Real-Time, Explainable Credit Intelligence

Hackathon Submission — IIT Kanpur

Team: Tech Tribe

The 'Black Box' of Credit Risk

Slow & Stagnant

Traditional credit ratings are updated quarterly or annually, often missing critical, real-time shifts in market dynamics and sentiment.

Opaque & Unclear

Current ratings lack transparency, providing minimal insight into the specific factors driving changes, leading to an information vacuum.

Reactive & Lagging

Predominantly reflecting past performance, these systems fail to anticipate future risks, leaving analysts with a significant decision-making gap.

This collective shortcoming creates an environment of uncertainty for financial analysts and investors.

CredTech: Illuminating Credit Intelligence

CredTech transforms the opaque 'black box' of traditional credit risk into a transparent 'glass box' solution for financial analysts.

- **Daily Issuer-Level Credit Scores:** Generated using a dynamic blend of structured and unstructured data sources.

- **Explainable Insights:** Powered by SHAP (SHapley Additive exPlanations), every score is deconstructed to show feature contributions.

- **Proactive Monitoring:** Scores update instantly with market shifts, news, and macroeconomic indicators.

- **Integrated Design:** A powerful combination of advanced data science, interpretability, and a user-friendly interface.

Adaptive Scoring Engine

At the core of CredTech is an adaptive scoring engine, ensuring daily relevance and precision.

1

Dynamic LightGBM Model

Our LightGBM model is retrained **daily** to assimilate the freshest data, ensuring scores are always current and responsive.

2

Multi-Signal Integration

The model seamlessly blends diverse signals, including market indicators (volatility, momentum), sector proxies (ETFs, indices), and commodity prices.

3

Economic & Sentiment Factors

Incorporates crucial economic indicators (GDP, CPI, US rates from World Bank) and real-time news sentiment for a holistic view.

4

Optimised Performance

LightGBM was selected for its **speed**, **robustness** with tabular data, and efficiency in frequent retraining cycles.
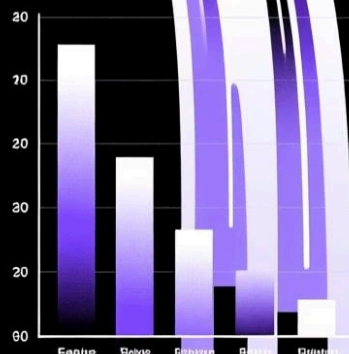
News-Driven Sentiment Analysis

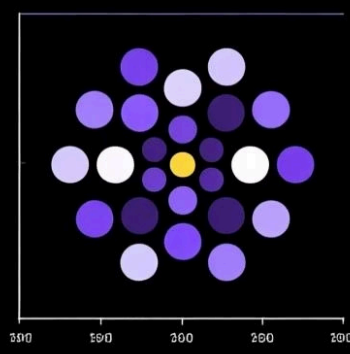CredTech moves beyond quantitative metrics by analysing news headlines to capture event-driven risk in real-time.

NLP Ensemble Blend	FinBERT (0.6)	Finance-specific sentiment
	DistilBERT (0.3)	General sentiment nuances
	VADER (0.1)	Reliable lexicon-based fallback
Fallback Chain	NewsAPI	Primary news source
	yfinance	Secondary data integration
	Sample CSV	Guaranteed data availability

This aggregated sentiment data directly influences the daily credit score, offering an immediate reflection of market perception.

Contributions

Feature Contribution

Global Feature Importance

Explainability with SHAP

Every credit score within CredTech is transparently deconstructed to reveal its underlying drivers, making our system a truly transparent decision tool.

Local Explanations

Utilising waterfall plots, we illustrate how factors like volatility, momentum, and sentiment specifically influenced a score's daily movement.

Global Explanations

Beeswarm plots provide a macro view, highlighting the long-term, overarching drivers of an issuer's creditworthiness.

Plain Language Mapping

Complex SHAP outputs are translated into analyst-friendly statements, e.g., "High volatility reduced score by ~3 points."

System Architecture & Tech Stack

CredTech's robust architecture ensures seamless data flow from ingestion to interactive insights.

01

Data Ingestion

Market data via Yahoo Finance; macroeconomics from World Bank APIs; news headlines from various APIs with resilient fallbacks.

02

Feature Engineering

Creation of technical indicators, momentum, volatility, sector/macro/commodity joins, and crucial sentiment injection.

03

Modeling

LightGBM implementation with built-in retraining safety checks and the use of synthetic score targets for enhanced accuracy.

04

Explainability

SHAP for precise feature attribution, ensuring every score component is fully auditable and understandable.

05

Dashboard & Operations

Interactive Streamlit + Plotly dashboard for insights, complemented by a config-driven, Docker-ready operational framework with clear logging.

CredTech Dashboard: Interactive Insights

The CredTech dashboard provides a single, intuitive interface for real-time monitoring and deep analytical dives into credit intelligence.

- **Overview Tab**

  Visualise score trends against mock agency overlays, alongside key performance indicators (score, volatility, sentiment).
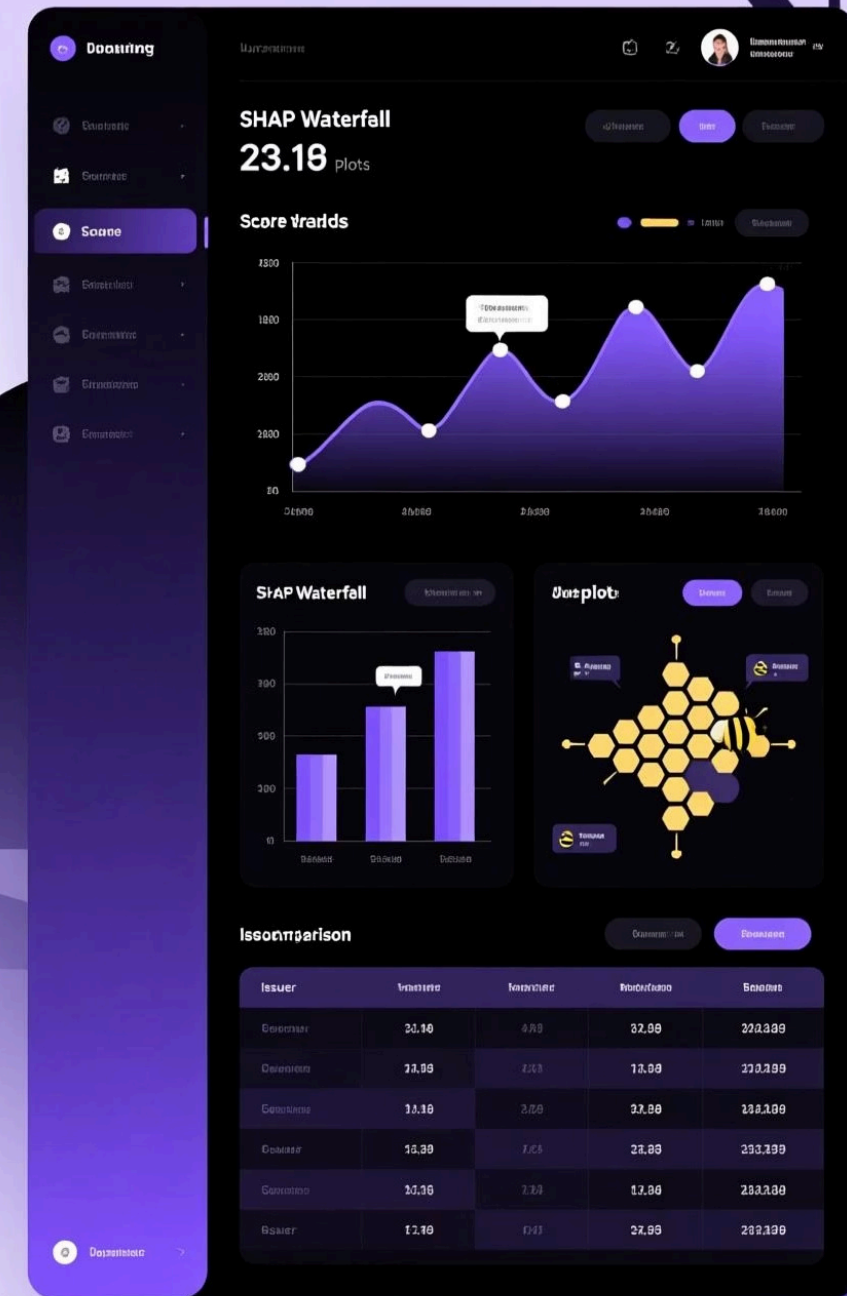
- **Score Deconstruction**

  Direct access to SHAP waterfall and beeswarm plots for unparalleled interpretability of individual scores.

- **Issuer Comparison & Alerts**

  Compare trends, correlations, and rankings across issuers, with automated alerts for sudden score changes.

- **Data Explorer**

  Interact with raw features to gain deeper insights into the underlying data influencing credit scores.

CredTech: A Distinct Competitive Edge

CredTech stands apart by addressing the critical gaps in traditional and even other modern credit analysis tools.

Frequency	Quarterly/Yearly	Daily (prices only)	Daily, multi-source (news + macro)
Explainability	Opaque	Basic/Numeric	Granular SHAP + Plain Language
News Integration	Manual/Lagged	Basic Sentiment	Advanced NLP Ensemble
Adaptability	Static	Static ML	Daily Retraining, Resilient

Reliability & Operational Excellence

CredTech is engineered for stability, repeatability, and production readiness.

Graceful Fallbacks

Multi-tier ingestion ensures news and data feeds remain uninterrupted, guaranteeing continuous operation.

Robust Logging

Comprehensive logging (info, warning, error) makes the entire pipeline transparent and easily debuggable.

Config-Driven Setup

Effortlessly onboard new issuers and tickers, simplifying scalability and management.

Deployment-Ready

Includes a Dockerfile with all dependencies, enabling seamless deployment and scheduling via cron or CI/CD.