

Case Study: AI-Driven Credit Rating Platform

Overview

Trident-AI LTD (R&D) partnered with SmartGreenInvest LTD (commercialization & ESG integration) to build an **AI-driven credit rating platform** that predicts corporate credit risk using advanced machine learning and macro-financial intelligence.

The goal was to replace traditional, slow, subjective credit analysis with a **fast, scalable, unbiased, and transparent automated credit rating engine**.

Business Problem

Traditional credit rating processes are:

- **Time-consuming** (manual data analysis for hundreds of companies)
- **Opaque** and prone to **human bias**
- **Expensive** for SMEs and investors
- **Difficult to scale** across thousands of firms

The challenge: build a fully automated AI platform that can reliably estimate **probability of default (PD)** for over 10,000 companies using finance + macro + sentiment data.

Data & Sources

Collected, cleaned, and unified multi-source financial and macroeconomic datasets:

Financial Data (company-level)

- Income statements
- Balance sheets
- Cash flow statements
- Market/price data
- Sector classification

Macroeconomic Data

- GDP growth
- Unemployment rates
- Oil & commodity prices
- Inflation
- Region-specific indicators

Sources

- World Bank API
- Yahoo Finance API
- Internal proprietary datasets
- Custom scrapers + databases

Dataset size: **10,000+ companies over multiple years**

Feature Engineering

Built a strong set of financial & economic indicators:

Financial Ratios

- Liquidity, solvency, leverage, profitability
- Time-series trends
- Stability & volatility metrics

Text & Sentiment

- News sentiment
- ESG-related signals (via SmartGreenInvest)

Macro-Financial Dynamics

- Market cycle alignment
 - Country-level risk factors
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Modeling Approach

Tested several ML and deep learning architectures, including:

- XGBoost (best performing)
- Random Forest
- Logistic Regression
- ANN (shallow & deep networks)
- Ensemble stacking

Top Model Performance

- **Accuracy:** 0.95
- **ROC-AUC:** 0.80
- Output: **Probability of Default (PD)** and confidence intervals

XGBoost was selected for its interpretability, performance, and robustness across financial time-series.

Cloud Architecture & Deployment

The platform infrastructure evolved from AWS to GCP:

AWS Stack

- **SageMaker** → model training & tuning
- **EC2** → computation & API backend
- **S3** → data lake for financial & macro data
- **RDS** → structured relational datasets

GCP Stack

- **Vertex AI** → model deployment & monitoring
- **Cloud Storage** → data storage
- **Cloud Run / API Gateways** → real-time inference APIs

Outputs

- Real-time **Probability of Default (PD)** score
 - Company-level report with feature importance
 - API endpoint for integration with fintech platforms or investment systems
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Business Impact

The AI Credit Rating Platform delivered significant value:

✓ Speed

- Reduced credit analysis time from **weeks to seconds**

✓ Accuracy & Consistency

- Objective, data-driven ratings
- Removes human bias and opaque manual interventions

✓ Cost Efficiency

- Provides credit insights at a fraction of traditional rating agency costs

✓ Scalability

- Supports **10,000+ companies** with automated updates
 - Cloud-native design ensures global expansion
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Role (Data Scientist Lead)

- Designed the full data pipeline (collection → cleaning → feature engineering)
- Selected and tuned ML models, achieving **0.95 accuracy / 0.8 ROC-AUC**
- Built sentiment analysis + macro-financial integration
- Architected and deployed the platform on **AWS** and later **GCP**
- Developed the prediction API for real-time scoring
- Coordinated with SmartGreenInvest to integrate ESG metrics
- Delivered end-to-end prototype to production-level infrastructure