Pisces

Steve

Investor

Meet Steve.

Steve wants to harness the power of AI to make informed investment decisions.

Steve

Investor

…but he struggles with…

Filtering relevant information.

Utilising AI prediction models.

Trusting model performance.

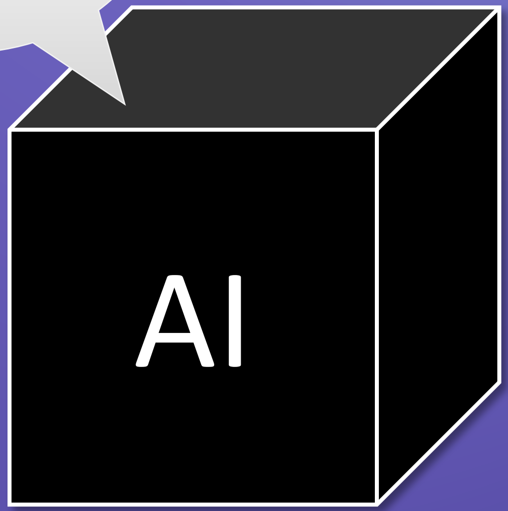
Even when he can, he doesn't understand the results.

How?

Steve

Investor

I just do it! 😬



99%

Model Accuracy

Pisces opens the AI Black-Box for Investors

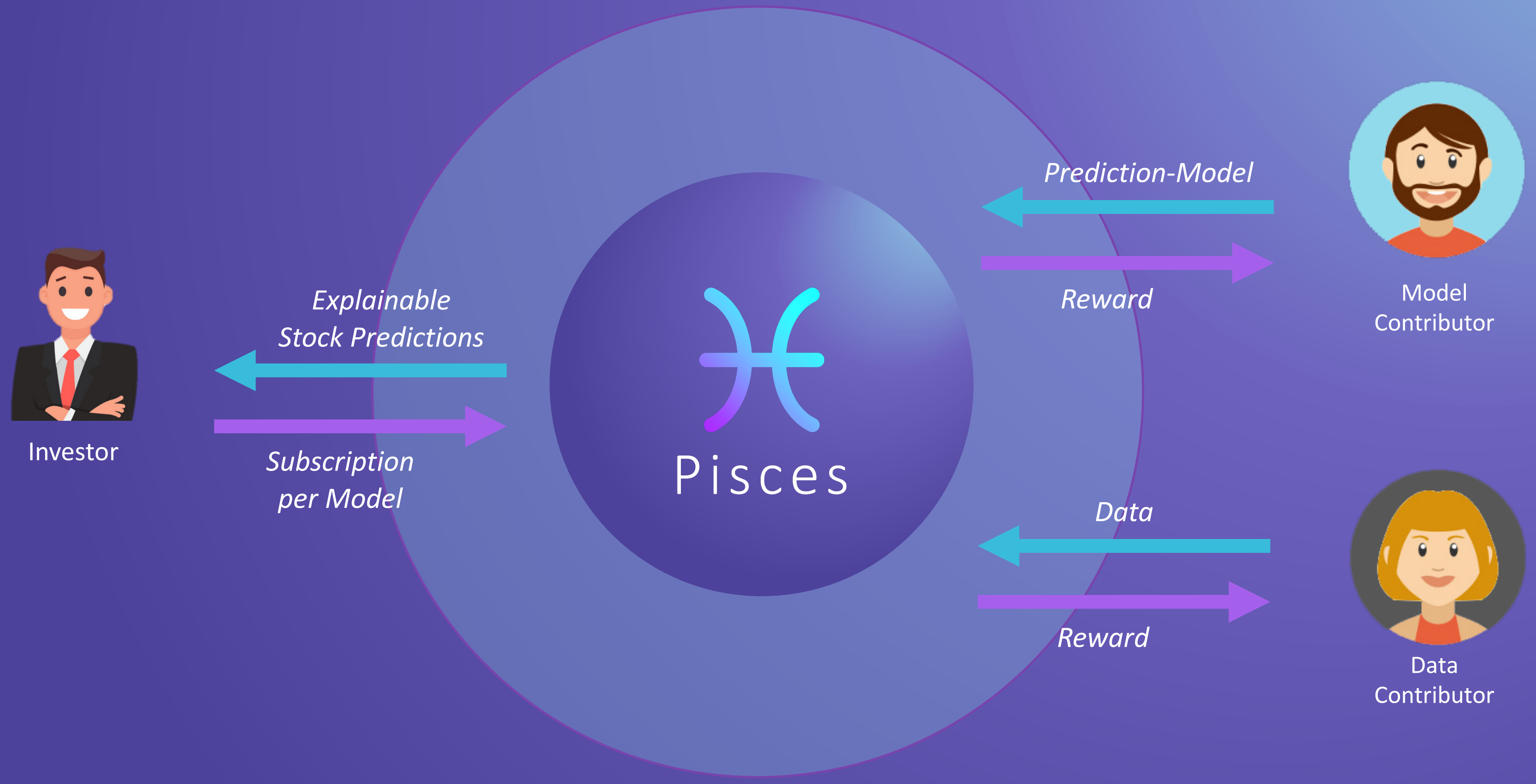
Actionable Investment Insights

Driverless AI Interpretations

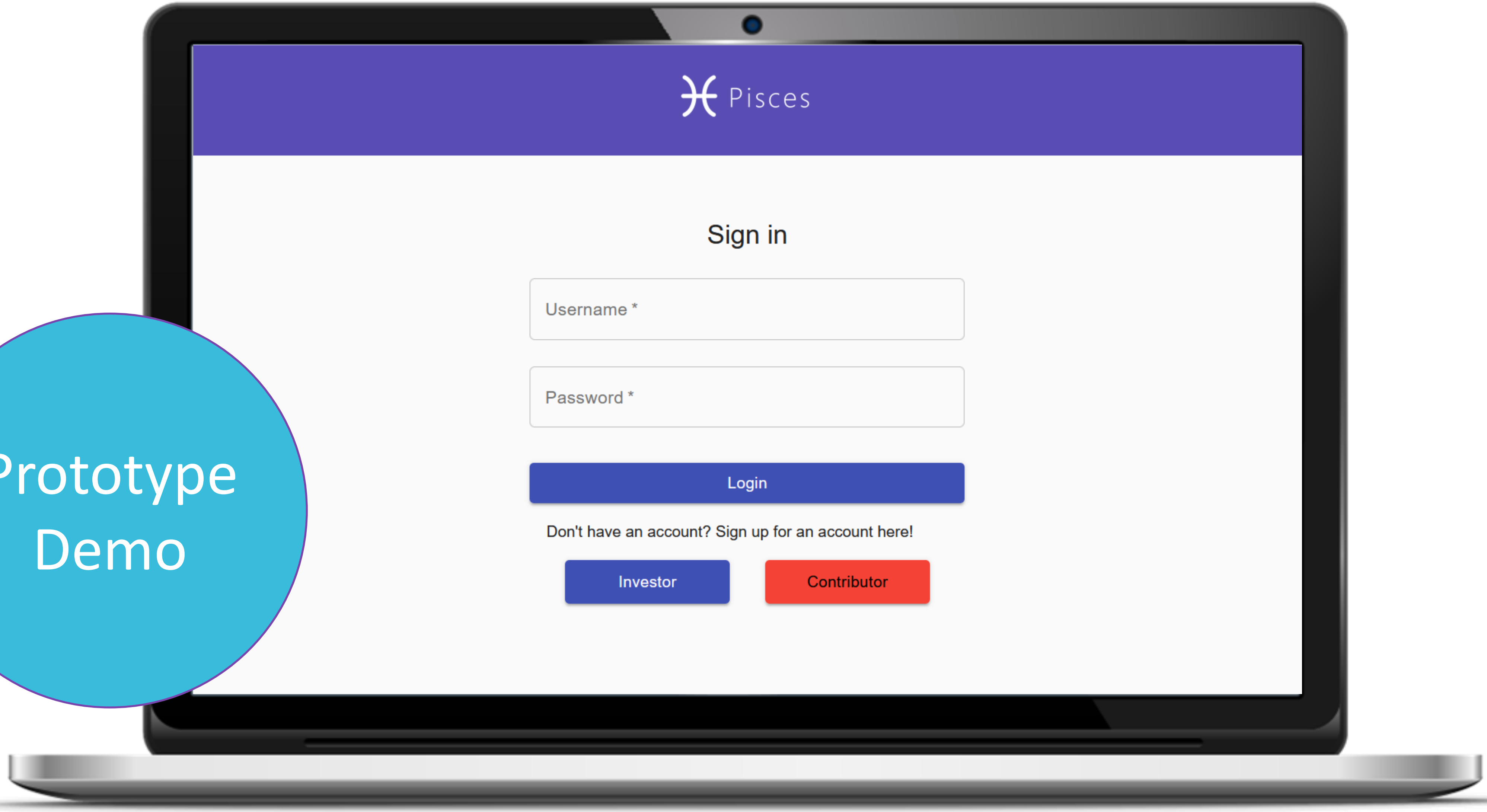
Marketplace for Prediction Models

Blockchain-based Model Performance Tracking

Subscription-based Business Model

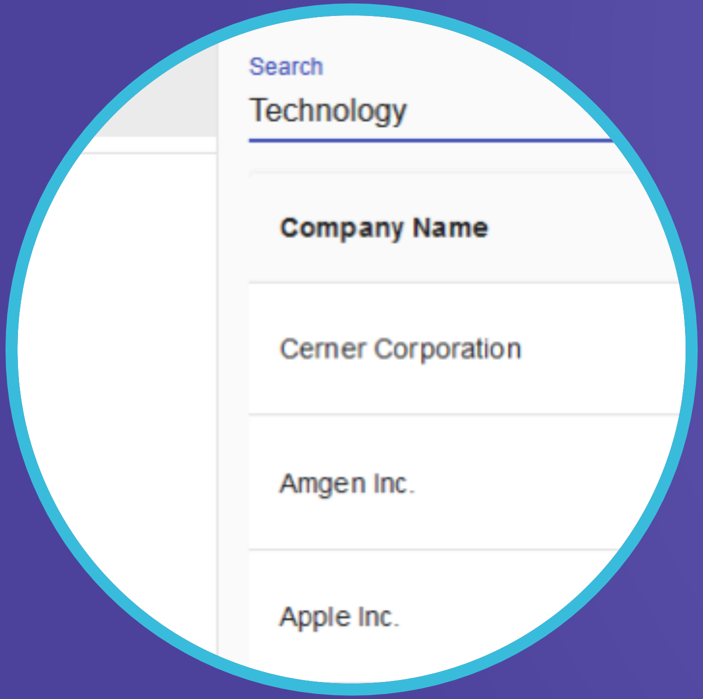


Investor's Experience

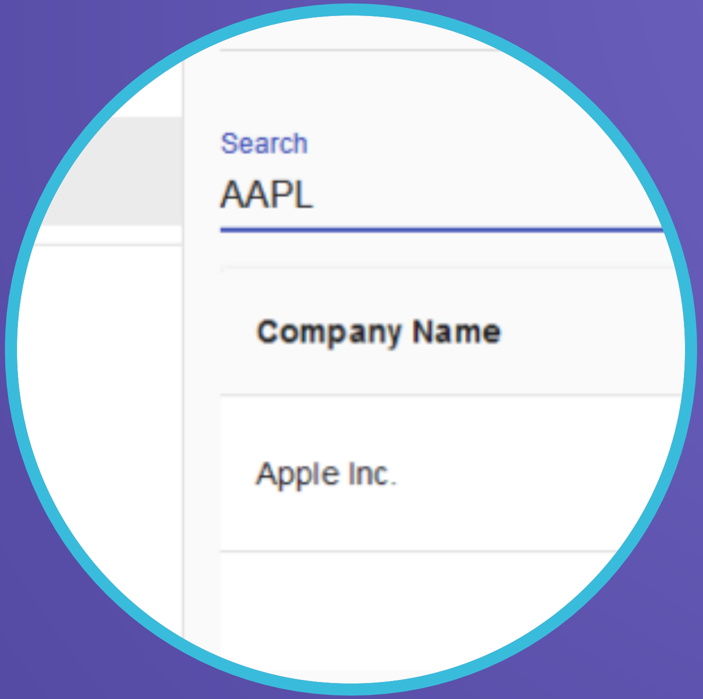


Prototype Demo

Stock Screening



Screen Industries

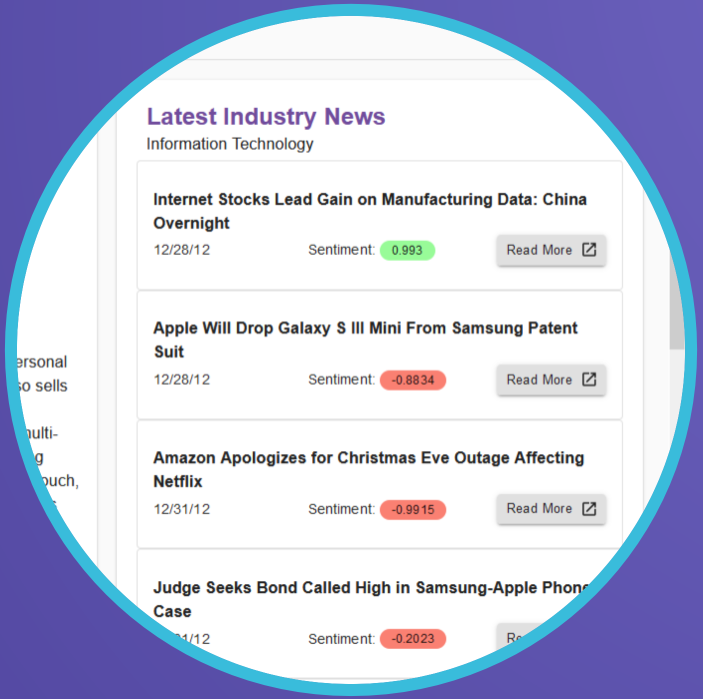


Search Stocks

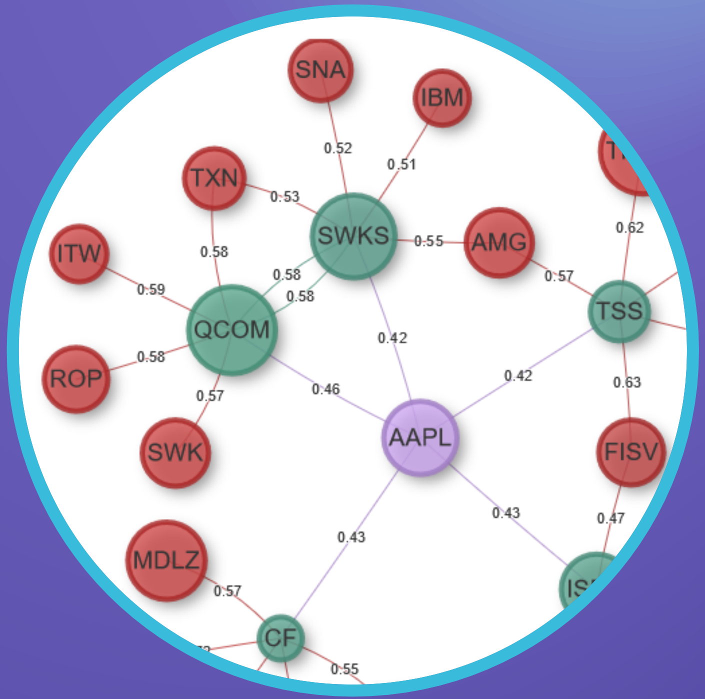
Add to Watchlist

Company Insights

Review Key Statistics

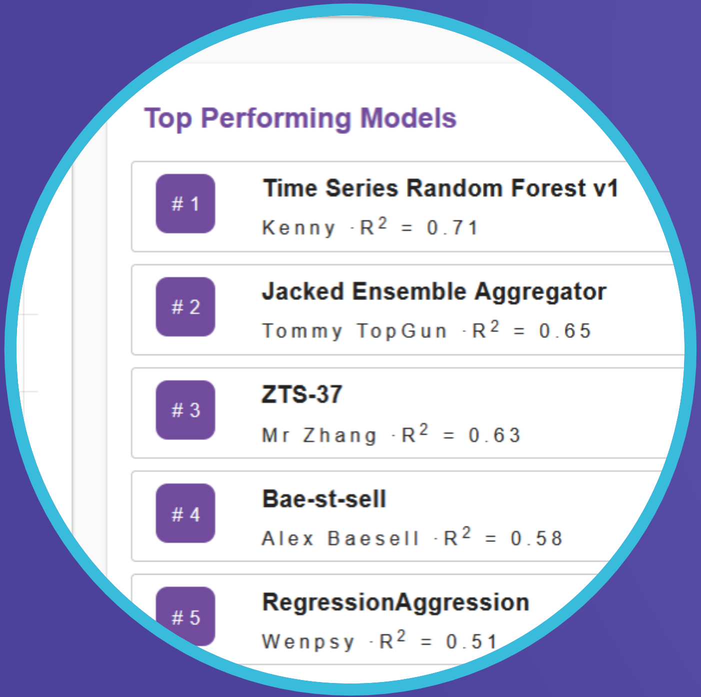


See Market Sentiment



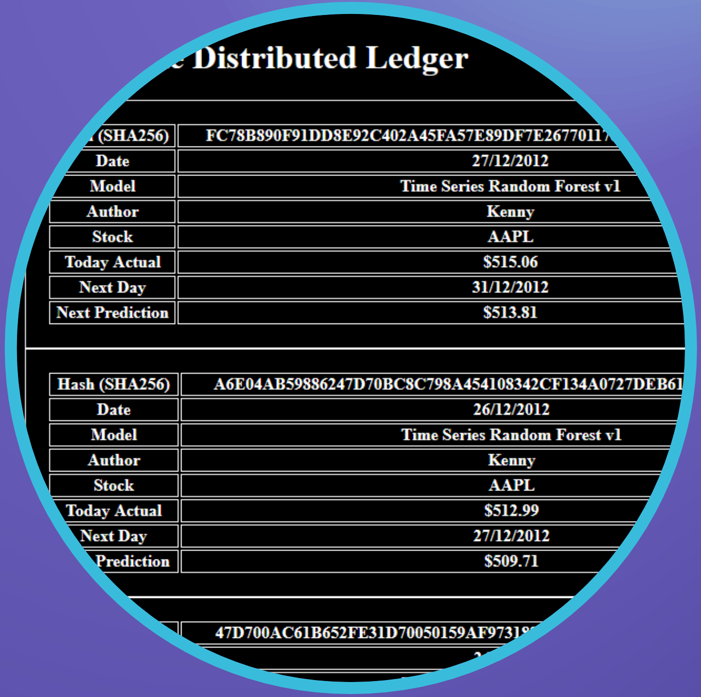
View Company Relations

Prediction Models



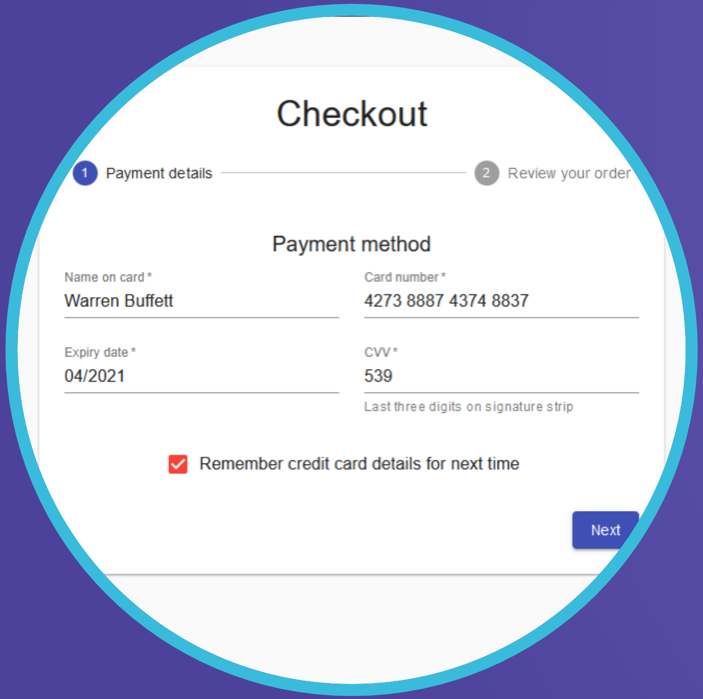
Select a Model

View Performance

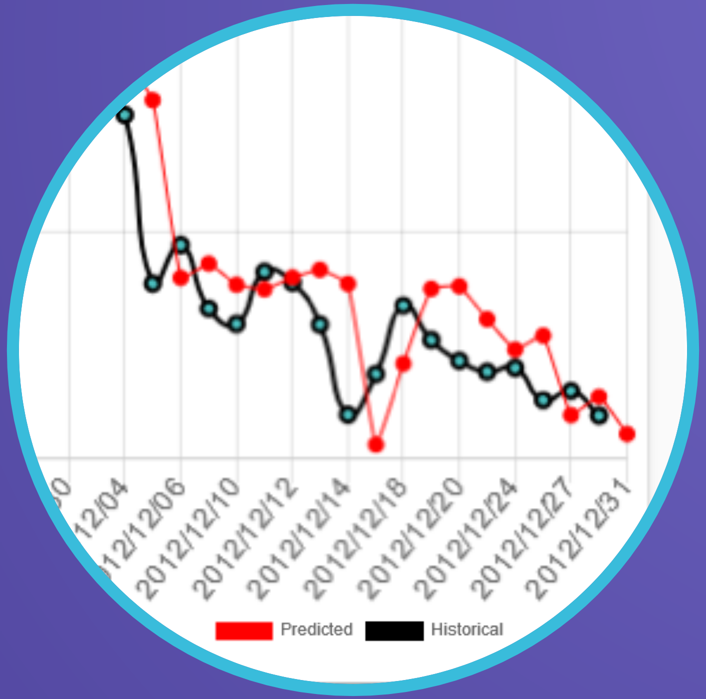


Verify in Blockchain

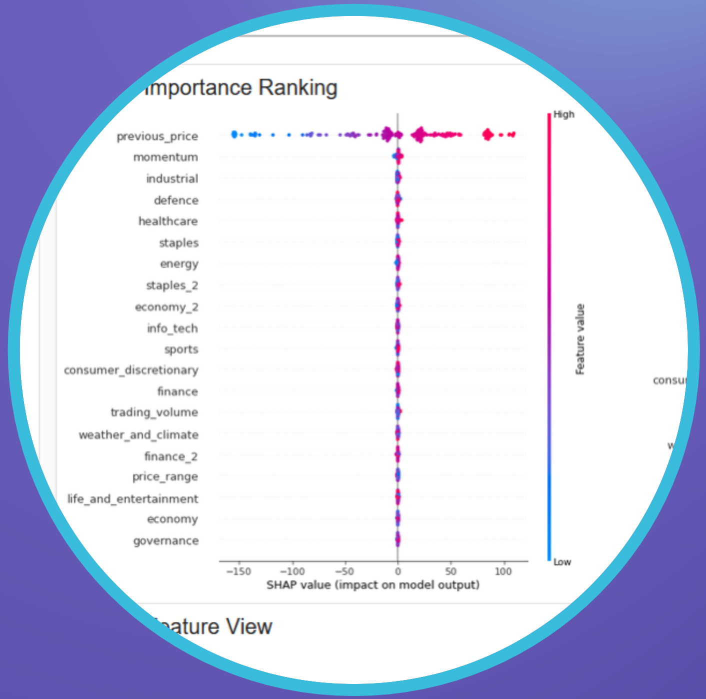
Stock Prediction and Interpretation



Subscribe Model

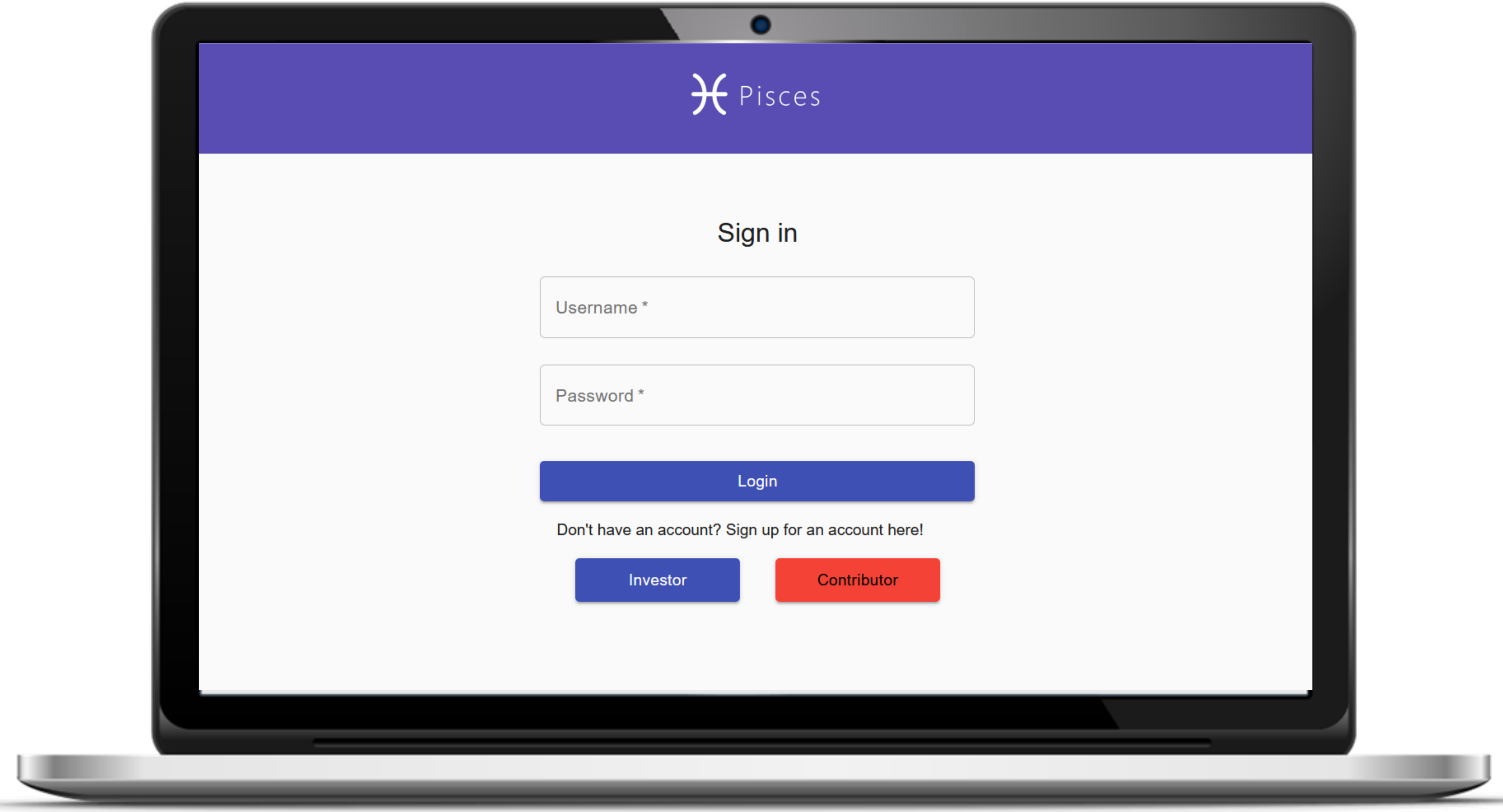


View Prediction

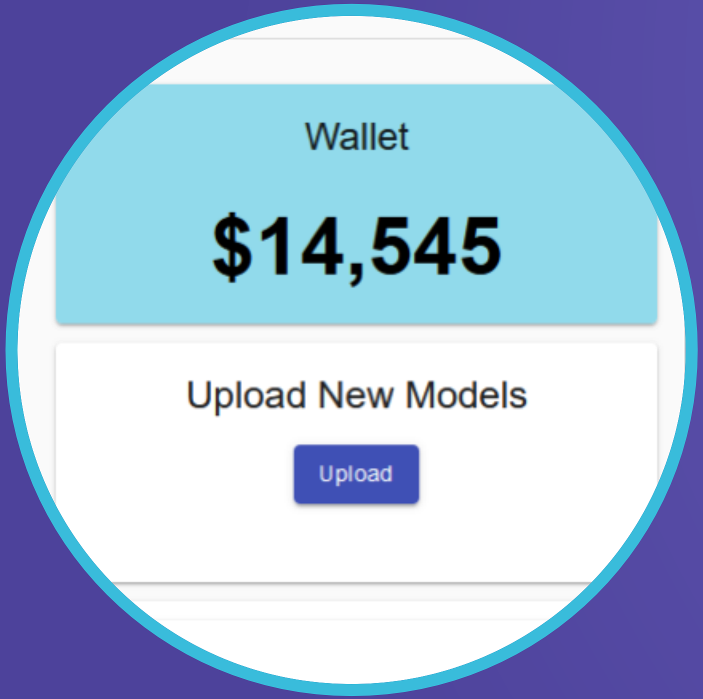


Interpret Model

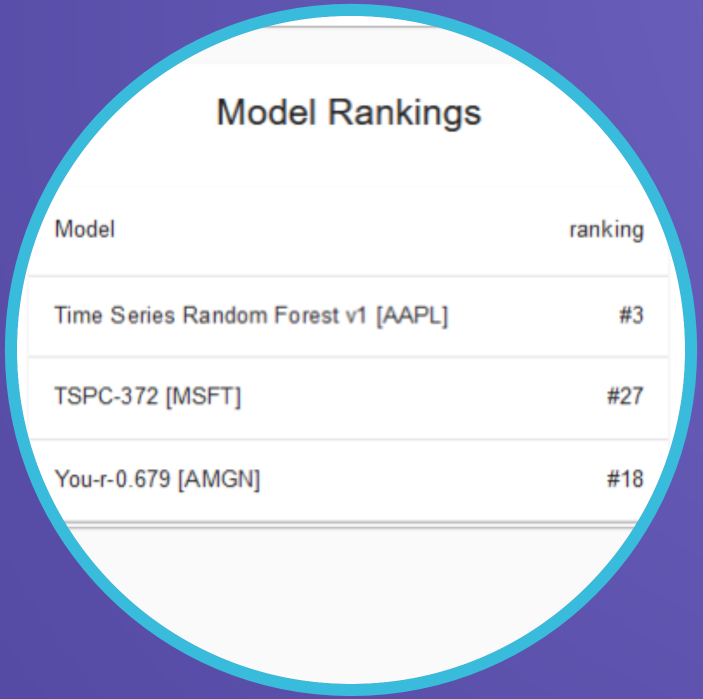
Contributor’s Experience



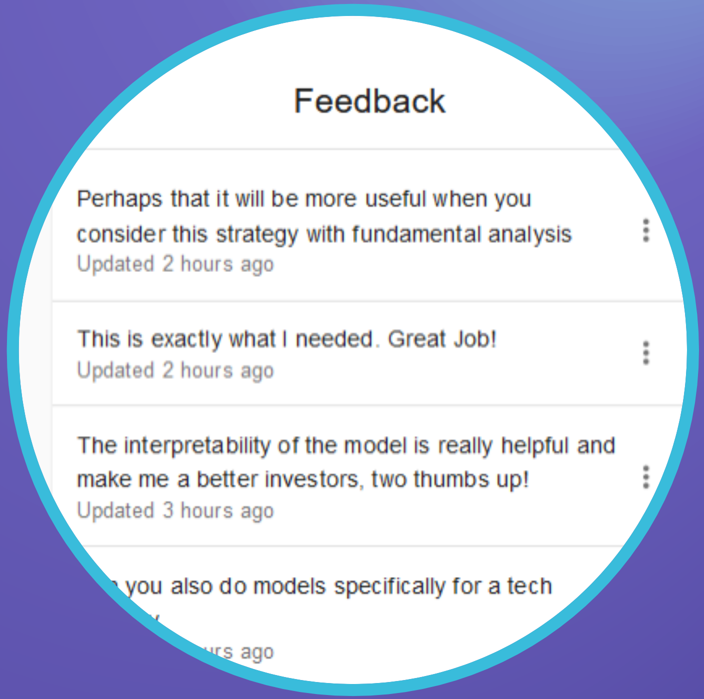
Contributor’s Features



Upload Model

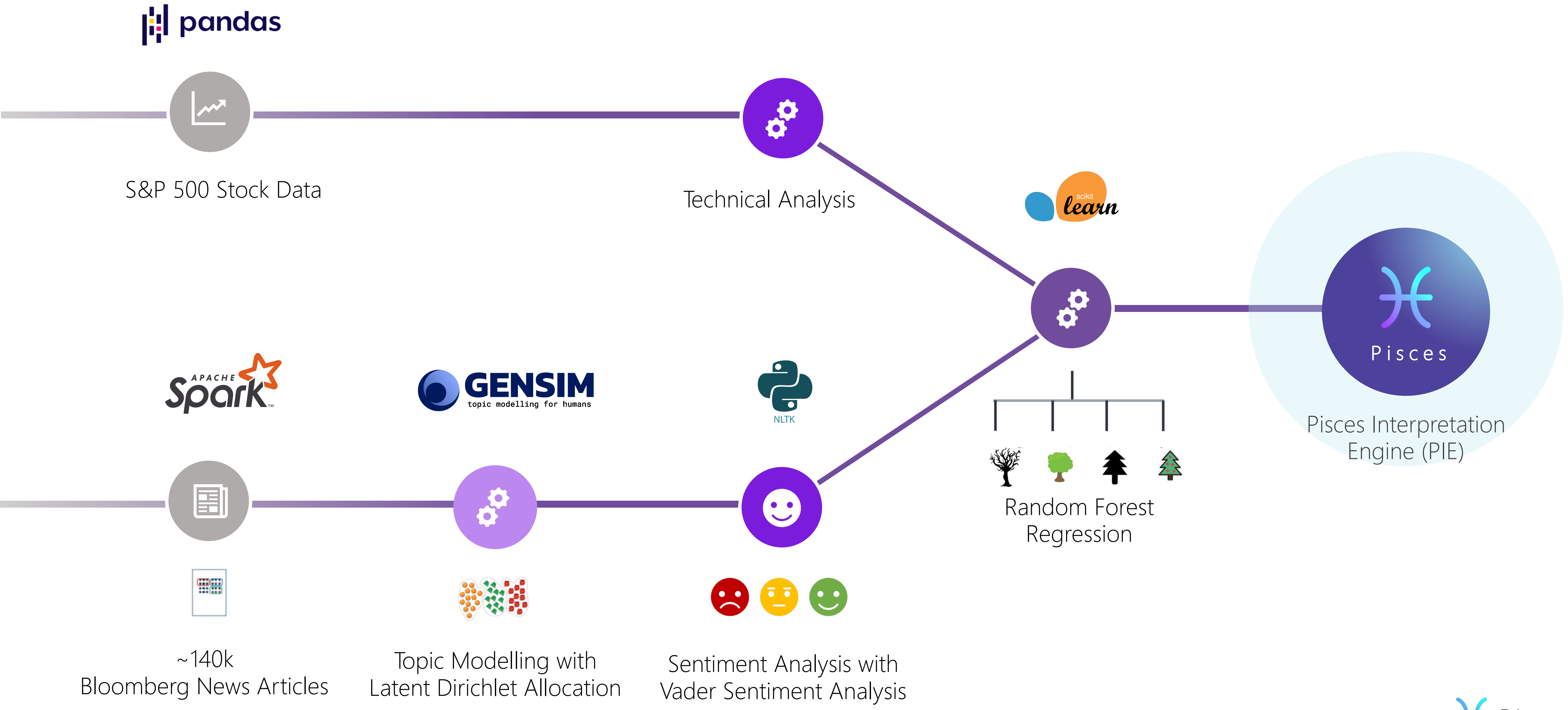


View Model Rank



Read Feedback

Prediction Model Process Overview



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stock data

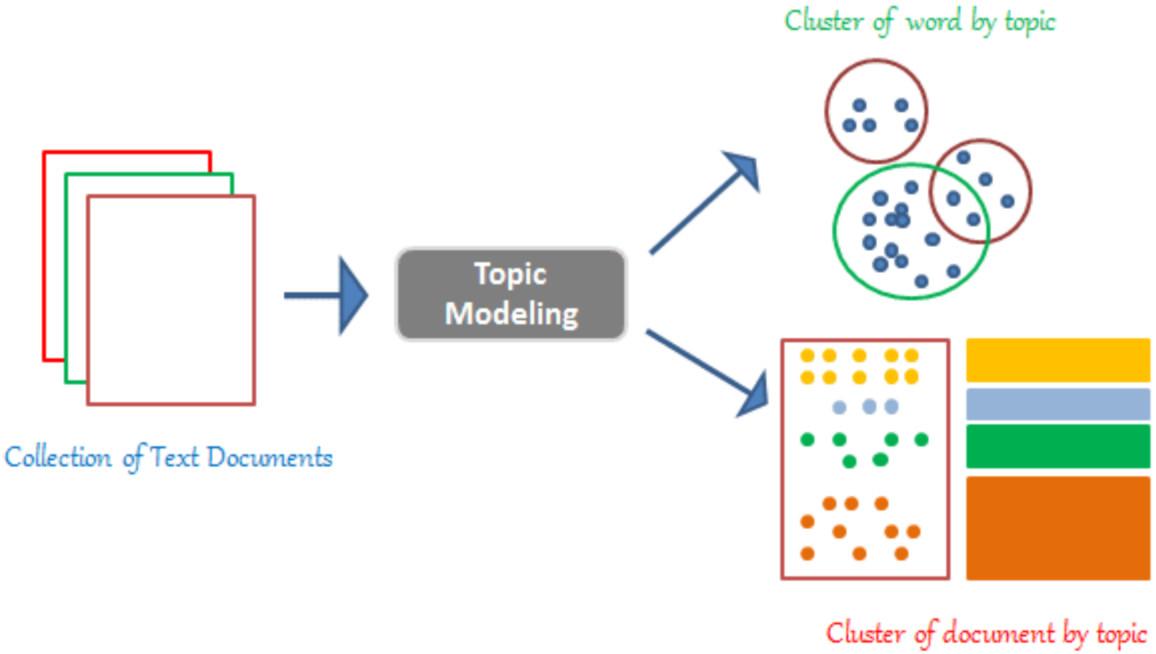
Technical Analysis

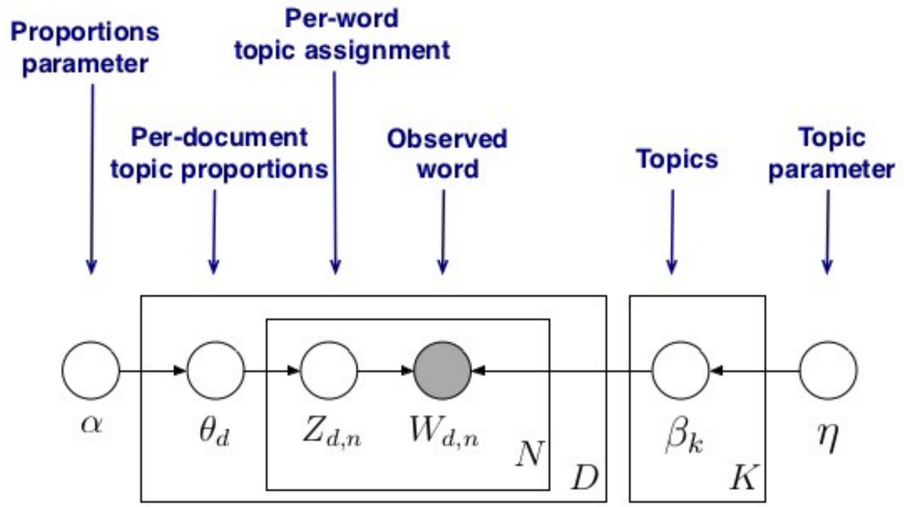
Daily Price Range	Market Volatility
Trading Volume / Market Cap	Stock Market Disagreement
Stochastic Oscillator	Price Momentum, Overbought, Oversold Signal
MACD, Signal Line, Crossovers	Possible Bullish, Bearish trend

Pisces

News articles

Latent Dirichlet Allocation Topic Modelling





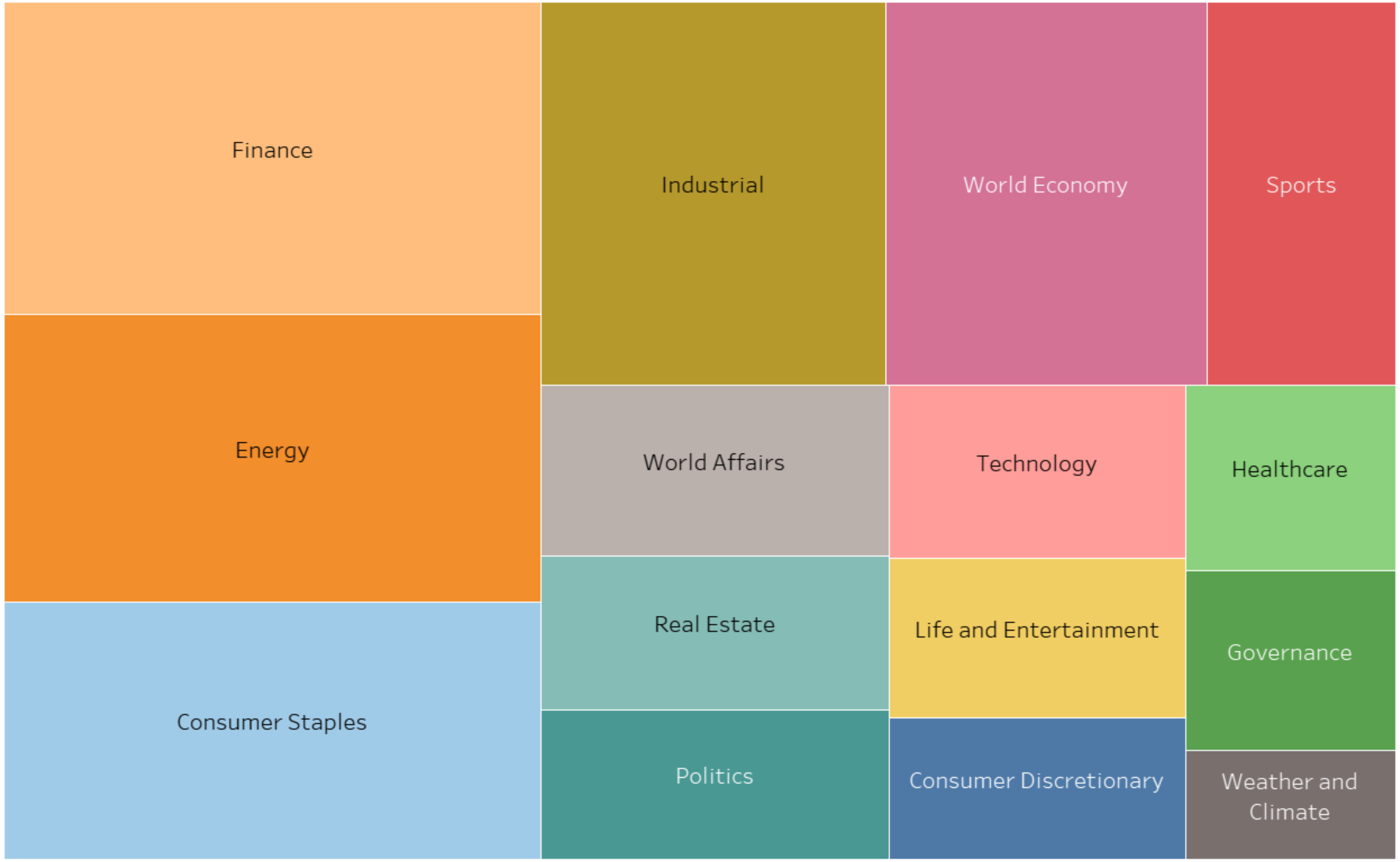
$$\prod_{i=1}^{K} p(\beta_i \mid \eta) \prod_{d=1}^{D} p(\theta_d \mid \alpha) \left(\prod_{n=1}^{N} p(z_{d,n} \mid \theta_d) p(w_{d,n} \mid \beta_{1:K}, z_{d,n}) \right)$$

A probability distribution model that assumes similar words make up similar topics, and several topics make up a document.

Pisces

Topic Modelling Results

News articles



Distribution of Bloomberg News Articles by Topic in 2012

Pisces

News articles

Sentiment Analysis with Vader

News articles

Sentiment Analysis with Vader

- Sentiment analysis applied to Bloomberg news articles
- Valence-aware lexicon-based approach using a curated dictionary of word to sentiment scores
- Takes into account:
  - Punctuation
  - Capitalization
  - Degree modifiers

For Example:

*"Swiss Exchange Trading Open **Delayed** Due to Unspecified Technical **Problems**"*

Delayed: -0.4019; Problems: -0.2263

[Overall Score: -0.6452]

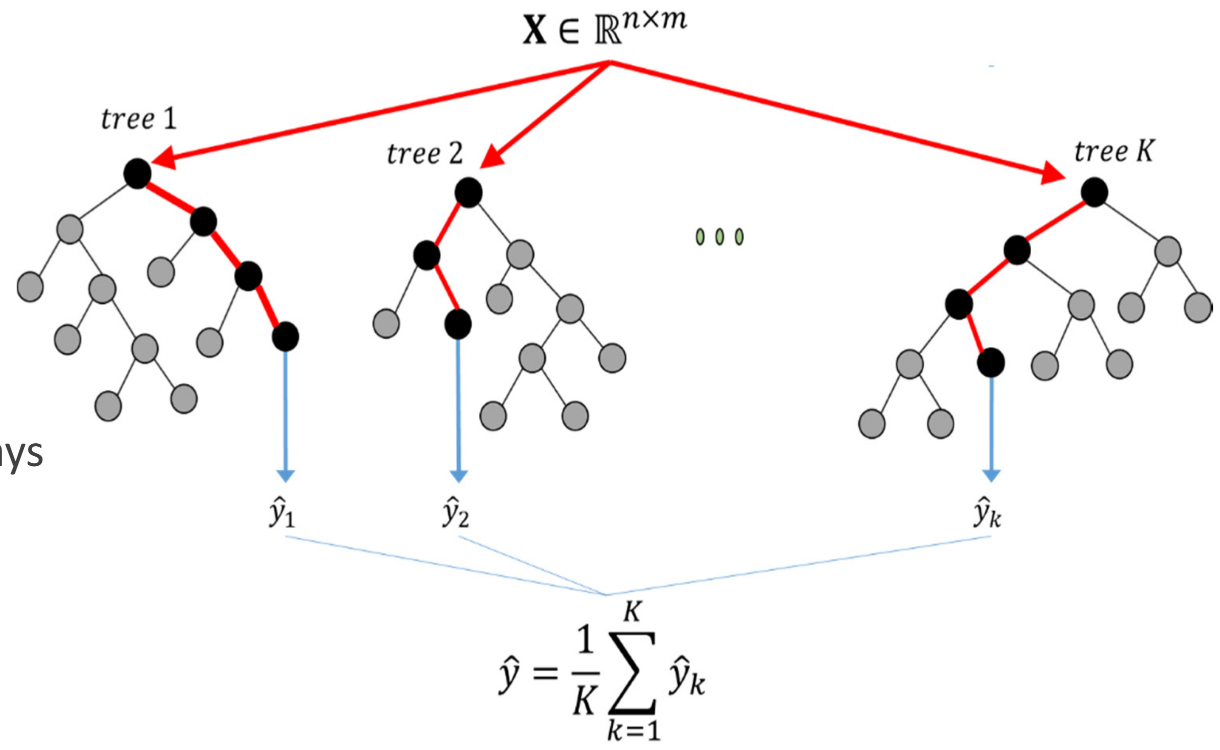
*"Swiss Exchange Trading Open **SEVERELY DELAYED** Due to Unspecified Technical **Problems!!!**"*

SEVERELY DELAYED: multiplier * -0.4019; Problems!!!: multiplier * -0.2263

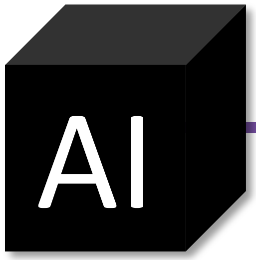
[Overall Score: -0.8733]

Random Forest Regression

1. Relies on the **"wisdom of crowds"** approach to find an average prediction
2. Performs **bootstrap aggregation** on features and observations
3. Features Used:
   - **Technical Analysis Features** in the preceding 3 days
   - Averaged **Sentiment Scores** Across Topics in the preceding 3 days
   - **Stock price** in the preceding 3 days



Pisces' Model Interpretation



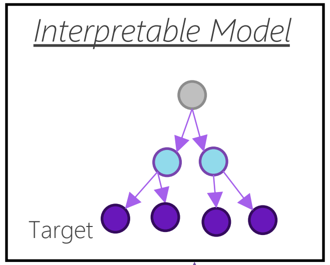
Model Blackbox

Pisces

Pisces Interpretation Engine (PIE)

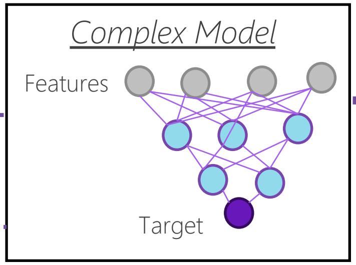
Interpretable Models

- Linear Regression
- Logistic Regression
- Decision Tree
- Decision Rules

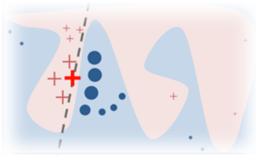


Model-Agnostic Methods

- Surrogate Model
  - Global Surrogate
  - Local Surrogate (LIME)



- Partial Dependence Plot (PDP)



$$\hat{f}_{x_S}(x_S) = \frac{1}{n}\sum_{i=1}^{n} \hat{f}(x_S, x_C^{(i)})$$

- Permutation Feature Importance, ALE, ICE, etc …
- Shapley Values → Shapley Additive exPlanations (SHAP)

$$\phi_j(val) = \sum_{S \subseteq \{x_1,\ldots,x_p\} \setminus \{x_j\}} \frac{|S|!\,(p-|S|-1)!}{p!}\left(val\left(S \cup \{x_j\}\right) - val(S)\right)$$

How Do Price Influencers Contribute Differently In General?

General Feature Ranking View

SHAP

Bar Plot

- Horizontal axis: **Population Average SHAP Value**
- Vertical axis: **Feature Ranking**
- **Compares the total feature impact on predicted day 0, day 1 and day 2 price**

Decision Plot

- Horizontal axis: **Price**
- Vertical axis: **Feature Ranking**
- **Shows how model accumulates features' impact and arrives at prediction step by step**

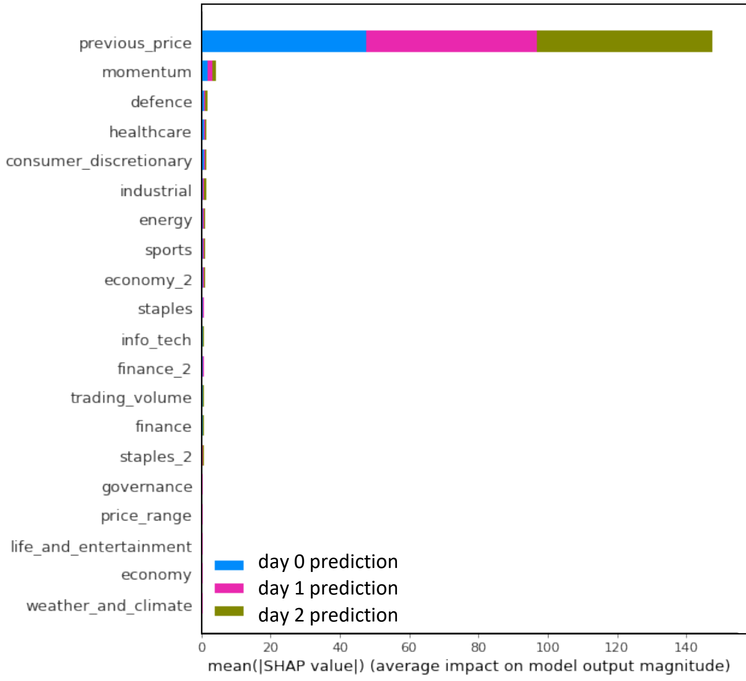
Beeswarm Plot

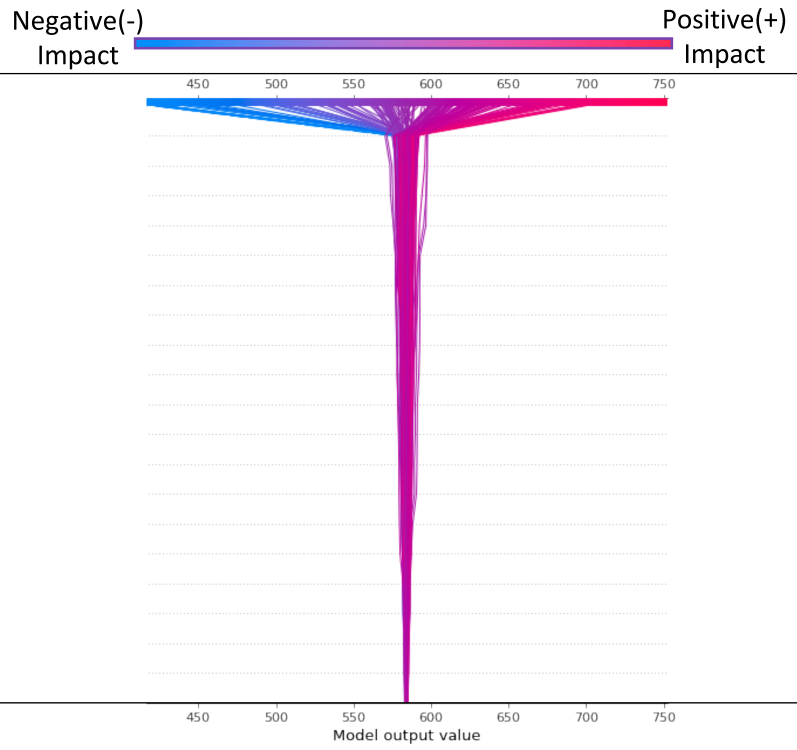
- Horizontal axis: **SHAP Value**
- Vertical axis: **Feature Ranking**
- **Shows how the relative impact of each feature is distributed across observations**

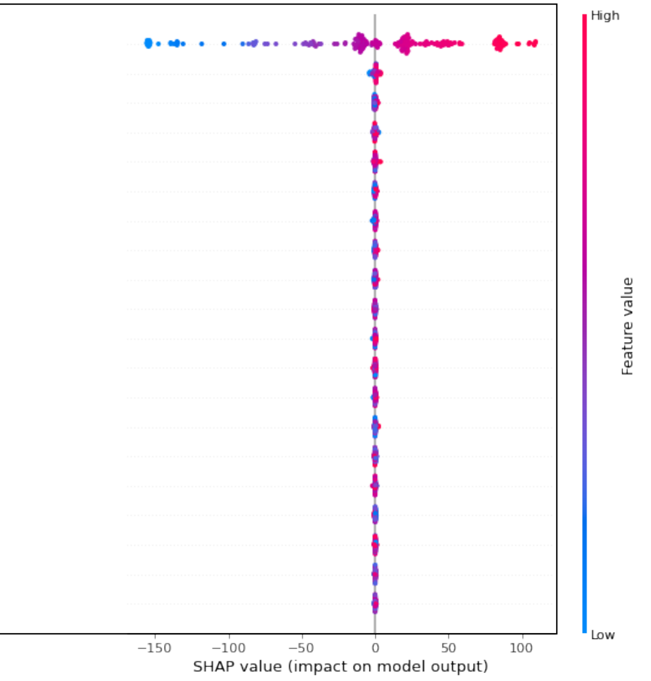
High Impact

Low Impact

Top price influencers are ranked by importance.





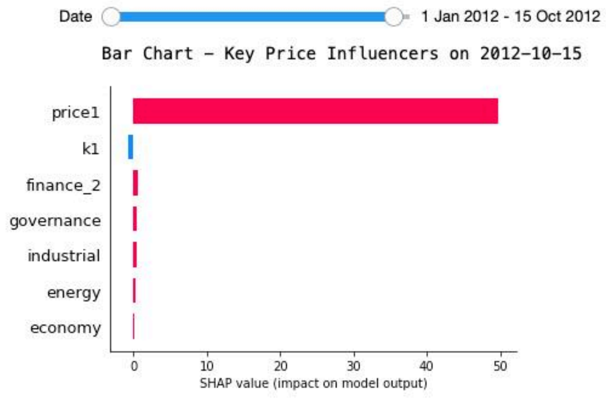


How Do Features Impact Price For a Given Day?

Specific Day View

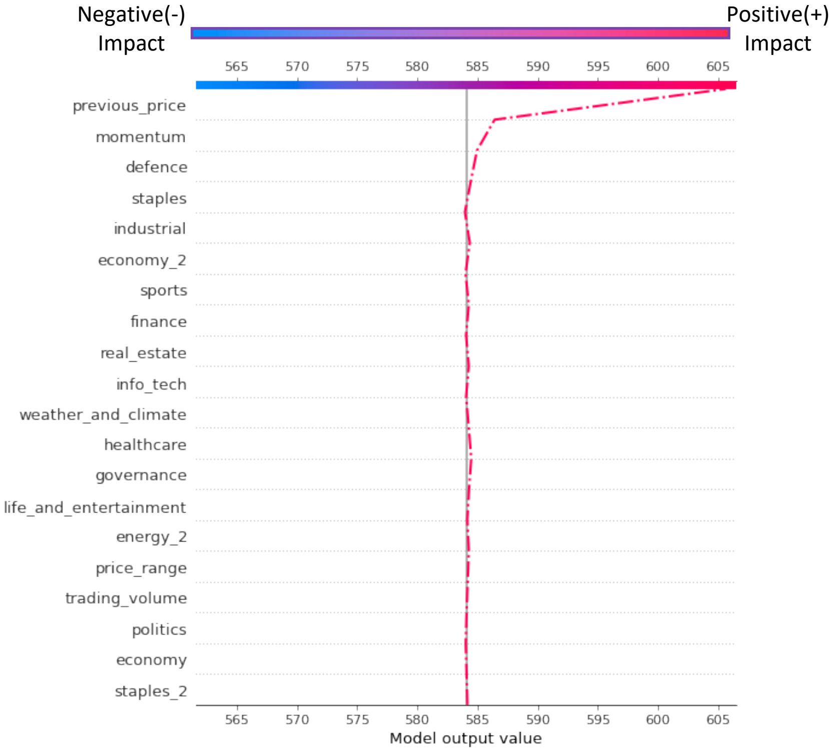
Bar Plot Slider

- Horizontal axis: **SHAP Value**
- Vertical axis: **Key Feature Ranking**
- **Compares relative feature impact on a date chosen by user**



Decision Plot

- Horizontal axis: **Price**
- Vertical axis: **Feature Ranking**
- **Shows how model accumulates features' impact and arrives at prediction step by step**

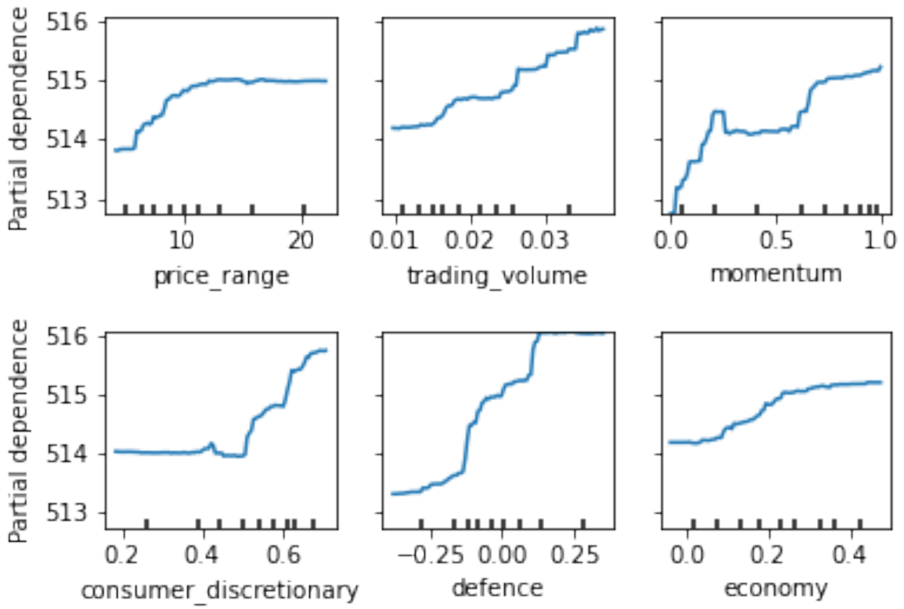


How Does Price Respond To A Specific Feature?

Specific Feature View

Partial Dependence Plot

- Horizontal axis: **Feature Value**
- Vertical axis: **Price**
- **Shows how price responds to individual feature in absolute correlations**

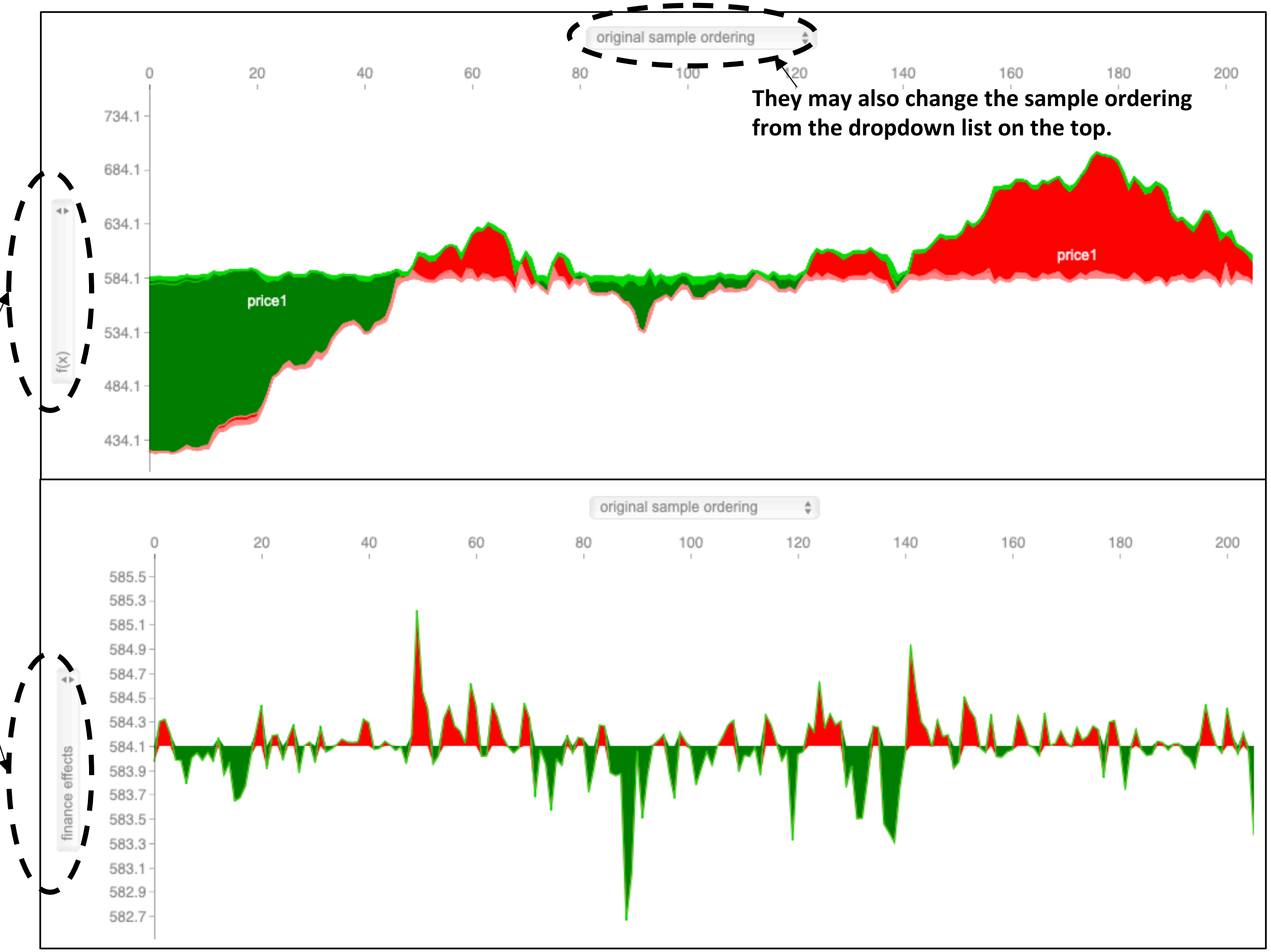


How Do Features' Contribution Change With Time?

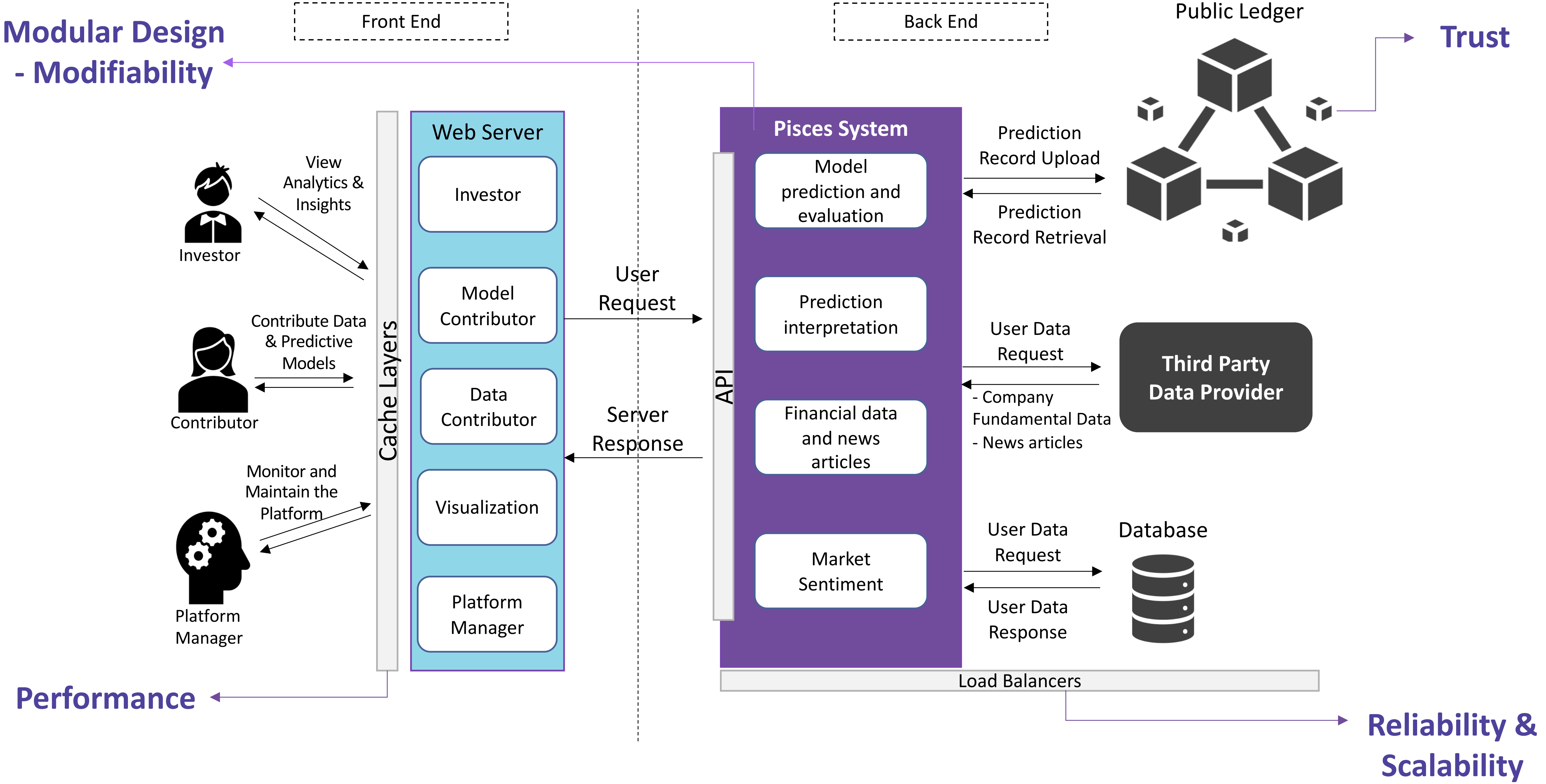
Price Movement with Time Interactive View

- Horizontal axis: **Observation Count, i.e. Date**
- Vertical axis: **Feature Ranking**
- **Allows users to view how relative contribution of price influencers on price change across days**

- **Users can use the dropdown list on the left to choose which feature they want to investigate.**



System Architecture



Win – Win - Win

Investor

Access to a range of models with **explainable** predictions

Trusted model performance through blockchain proof

Pay per **model subscription**

Pisces

Margin on model subscription enables **sustainable revenue**

Low risk business model

Contributor

Monetisation of data and prediction models

Transparent evidence of model performance

Immutable proof of data and model ownership

Pisces

Drive ML adoption for financial industry

Enable collaboration through capitalisation

Protect originality and build trust via Blockchain ledger

Thank you!

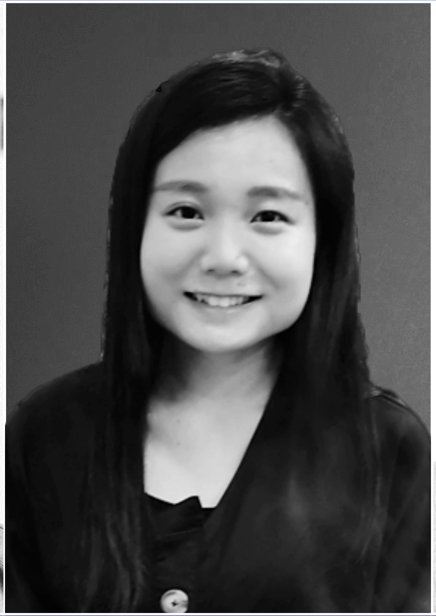
Pisces

Alexander
Baesell

Liow
Jia Chen

Ken
Cheah

Tommy
Kangdra



Yu
Wenxi

Zhang
Tongsen