ANALYTICA

Case Study

Applying AI / Machine Learning to Regulatory Enforcement

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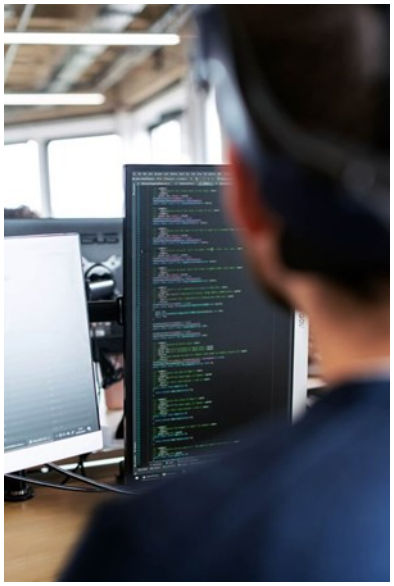
Analytica is supporting the development of complex artificial intelligence and machine learning model development for the Securities and Exchange Commission (SEC) to combat insider trading and financial fraud. Our work applying AI / Machine learning to regulatory enforcement provides the SEC with the ability to reduce costs for regulatory enforcement while providing more accurate, actionable intelligence for enforcement.



The Challenge

The client faced challenges in AI / ML model development due to an insufficient number of positive cases for labeling data needed to train its model to detect anomalies. Additionally, models were being limited to anomaly detection scenarios, and were not factoring in variables such as the financial impacts related to false negatives, recovery outcomes from true positives, and missed opportunities due to false negatives.

Our Approach

Analytica applied AI / Machine learning to regulatory enforcement through evaluating a variety of unsupervised and semi-supervised machine learning modeling techniques and compared these against the SEC's models. To overcome the low label challenge, Analytica applied a semi-supervised model which identifies outliers based on the model trained on normal transactions. Our model development accounted for five groups of semi-supervised models:

1. Linear model (one-class support vector machines),
2. Proximity-based (cluster-based local outlier factor, histogram-based outlier score, and K nearest neighbors),
3. Probabilistic (angle-based outlier detection and stochastic outlier selection),
4. Outlier ensembles (isolation forest and locally selective combination of parallel outlier ensembles),
5. Deep learning (fully connected autoencoder and multiple-objective generative

adversarial active learning).

Analytica incorporated post-modeling conditions and business rules by developing cost functions that factor in the financial impact of models based on the cost of investigation from false negatives, expected financial recovery from true positives, and lost opportunities from false negatives. Bayesian optimization processes simultaneously adjusted hyper-parameters associated with machine learning models, post-processing conditions and business rules, and costs.

Analytica's application of Artificial Intelligence and Machine Learning to regulatory enforcement supported building an AI engine that is modular and comprises multiple machine learning models, which provides the client flexibility to update the models with changing priorities or financial constraints.

The Solution

While ensuring the integrity of our financial system is critical, regulatory enforcement is also costly. Analytica's application of AI / Machine learning to regulatory enforcement helps the SEC optimize its resources with advanced machine learning models and post-modeling business rules to efficiently analyze large datasets to identify potential enforcement actions with a higher return on investment.

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