SEABRIDGE FINTECH

SEABRIDGE AI METHODOLOGY

WHITEPAPER

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机器学习-大数据最优解

Seabridge AI 如何利用机器学习进行更好的投资

技术分析、价值投资、因子模型、均值回归、趋势跟踪、统计套利等，许多流派和技术被用在金融市场。但由于市场的动态变化、非平稳以及混沌状态导致现代投资和资产管理在市场的竞争中保持领先变得越来越具有挑战性。

近年来，随着大数据的出现和新算法的进步，探索数据集之间复杂、细微、动态非线性的关系变得更加容易。这个问题的复杂性和变化性超出了传统的统计分析的解决范畴，但新的解决思路已经在计算机算力大幅提升和大数据人工智能的时代背景下蓬勃发展。新人工智能在这个时代背景下的惊人成就为我们带来了投机和投资组合管理的新视角。

Seabridge FIntech 的创始团队成员曾就职于加拿大某投资机构工作，设计并构建了关键任务机器学习系统，其处理数亿个数据点并以生成最佳结果以达成核心分析预测和排名。系统通过最先进的 AI 和机器学习方法吸收大量复杂数据以生成捕获金融市场中动态和非线性模式的 alpha 信号，结合技术和动量分析从而创造了核心性优势。

我们称之为大数据最优解投资法：具有自适应算法的数据为投资提供了一种新的解决方案来帮助广大的投资者。

虽然金融市场每时每刻都在变化，所记录和观察到的数据也是如此。但与传统的统计或定量模型不同的是我们的算法系统设计用于处理这种不断变化发展的数据集。大家都知道线性模型的局限性，尤其是在做出决定之前需要考虑和权衡成百上千的因数。但机器学习，尤其是深度学习便可以通过在不同的数据集中学习数据特征，并发现极其复杂的非线性模式来完成这种任务。这也便是例如谷歌、Facebook 和亚马逊能够在如此短的时间内成倍地扩展业务并颠覆传统巨头的核心秘密。

一些人可能会问，像 AlphaGo 或自动驾驶汽车，大数据最优解投资会打败还是取代当下的人类专家以及散户投资人？ 对于这个问题，我们倾向于采取更加混合的观点：机器算法更像是副驾驶、投资顾问或者经理，而人类投资者仍处于主导地位。 为了阐述我们的观点，我们从构建 Seabridge AI 核心算法的经验中学到的以下三条原则将有所帮助：

1，投资交易是这个过程的核心，而不是机器，人类起着至关重要的作用；
2，算法投资只有在数据表达正确和人类洞察力指导编码后内才能变成所谓的“ 高级智慧 ”，而其“ 智慧 ”便是建立在大数据的支持和计算机的算力上；
3，在正确的应用环境中时千万不要低估高级人工智能算法的优势。

Seabridge AI 方法论

由于近年来许多定量因子模型的盈利能力下降，市场从业者正在寻找动态和因子时序模型进行选股。很少有人在传统的定量方法中取得成功， 线性回归模型很难捕捉预测变量和股票收益之间的动态关系。
与当下流行的计量不同的是，Seabridge AI 是机器学习和交易系统驱动的股票选择，预测模型。简单来说是价格行为与机器学习，深度学习的完美配合。

Seabridge AI 利用大数据和强大的学习算法结合配合着许多价格行为分析方法来寻找最佳信号。例如多因子选股，图形识别，主成分回归、弹性网络回归、随机森林、梯度提升树和神经网络模型等。将许多弱信息源组合成一个强复合信号来识别隐藏的非线性关系。 并采用的这种集成方法在这种嘈杂金融数据的低信噪比环境中取得惊人的成功。

为了在数据中找到不仅在过去有效而且从样本中泛化的模式，我们将核心算法应用于了更多数据源，有些甚至通常被人工分析师视为极弱信息或嘈音，这些无法在人的审查下做出任何的判断，却可以在机器算法分析中取得重要的信号， 其 AI 系统引擎可以在处理大量数据的同时识别出超越传统定量方法的复杂信息。 我们致力于对AI的不断开发，训练和完善，采用先进的投资分析理论，建立完整的风险控制体系和交易系统，利用大数据和算力为用户提升投资交易体验以及获得更高的回报。

当下所使用的一些分析策略组成部分包括：
财务报表信息，包括销售额，市值，净收入，股息，EPS等，
比率包括资本与长期债务、ROA 和 ROE等，
自主研发的公司基本面及盈利能力分数体系，
机器学习自主优化的技术指标包括 最佳均线，倾斜资金流，成交量，相关性相对强弱等
根据价格行为与成交量化等构建出动量分析系统
价格趋势逻辑，包括图形识别和蜡烛图组合信息
上述因素的时间序列以及与价格相关性
市场和投资者情绪信息来自替代数据的信息，例如 SEC 报告、股民社区、访问流量、电子商务网站的销售额等

据数据统计，股票的价格走势只有30%-40%处于趋势运动，而60%-70%则处于震荡。根据此基本原则可推出交易分析里绝不存在“一招鲜吃遍天”，单一策略掌控全市场行情则显为悖论。所以Seabridge AI的策略设计根据价格趋势原则进行了区分。我们在基础的趋势和震荡之外还额外添加了动量策略。

数据来自多个数据供应商以提高完整性和质量, 在全部基本数据财务报表信息和比率粗筛后获取由2000多只基本数据符合要求的个股组成的第一股池，再通过自主研发的Cashbridge基本面评分体系，过滤出700以内数量的第二股池。Cashbridge结合了动态学习因子与未来回报之间的变化关系针对给定时间范围内的当前影响项去提取预测和分析数千因子，我们的算法将这一长长的信号列表从数千个减少到几十个。我们通过关注具有高信噪比的因子并避免过度拟合（机器学习中最具挑战性的任务之一）来构建具有更符合当下市场动态的评分系统。每只股票的评级在 1 到 9 之间，分配给股票的得分越高 (9) 表示未来几个月表现优异的可能性越大，而得分 (1) 越低表示表现优异的可能性越低。

在第二股池开始以三条主策略运行对其个股进行分析和价格节点计算及回测对比，并配合我们当下所监控统计得到的实盘目标价触发率以搭配合适的风险回报比例（关键）以当下最优解去对个股做出交易决策。（每日运算）

紫色Power Trend策略：以特征识别价格反转所构成的不同规则运动的节点与自生成的多均线系统结合。对股池中提取的公司进行识别聚类后为每个聚类创建随机其森林模型推演，使用最优解对应集群预测，再同理套用在其他自研自生的指标系统进行层叠筛选。同时在自研均线角度和量价的关系排列考虑支撑阻力择优过滤出强势趋势概率最大的股票。

绿色策略：通过使用动量和波动为主要因数，结合紫色power trend, 但去掉对趋势强度的定义。此策略具有4种微调算法(包括Squeeze）来训练最佳策略模型以选出最具有交易价值的个股。

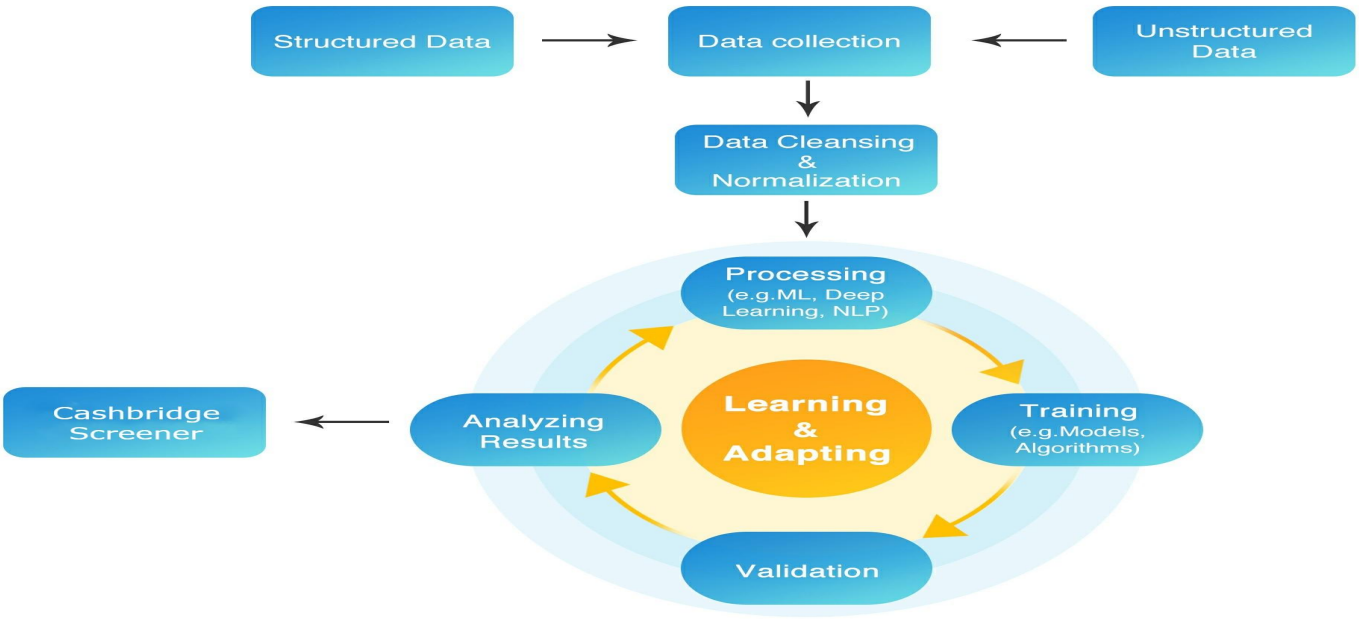
蓝色策略：弱化紫色策略中的趋势性，并且强化了对价格节点的重要性以及支撑阻力的更长时间窗口的参数，结合上下趋势构成的支撑阻力来寻找高概率突破或反弹的价格范围，配合量能的变化找出当下机会。

将三大策略结果与图形机器视觉识别匹配，并过滤出满足其他附加条件的股票。并利用过去10年数据在本个股上回测策略。

在更高层次上，Seabridge AI引擎设定可以从结构化和非结构化数据（如财务比率、内幕交易、分析师意见、筹码、财务报告、新闻和社交媒体等）中获取信号和因子，并利用机器学习算法来提取其定量信号。这高度模拟了人类的思维方式并在打开类人智慧的前提下附加了几乎无限的算力和大数据库的支持。

基本面评分层

Seabridge AI 的其中一大优势在于搭载了我们为Cashbridge长线投资量化策略所开发的纯基本面评分选股器算法，其结合了动态学习因子与未来回报之间的变化关系逻辑。 针对给定时间范围内的当前影响项和预测能力分析数千个因素，我们的算法将这一长长的信号列表从数千个减少到几十个。这种有效减少因素有助于我们通过关注具有高信噪比的因素并避免过度拟合（机器学习中最具挑战性的任务之一）来构建具有更符合当下市场动态的评分系统。
每只股票的评级在 1 到 9 之间，分配给股票的得分越高 (9) 表示未来几个月表现优异的可能性越大，而得分 (1) 越低表示表现优异的可能性越低



K Score Methodology

For the US, China, UK, and Germany markets, we provide a show case of intermediate sub-scores in addition to the K Score for each ticker, based on four well-known factor groups: Value, Quality, Momentum, and Growth.

Much like the K Score, these intermediate sub-scores are rated with value from 1 to 9, where the higher the number indicates the stronger the factor for a particular stock.

Intermediate sub-scores are designed to be used in tandem with the K Score. By using the intermediate sub-scores with the K Score, you can:

- Determine which stocks align with your own factor investing style, while still taking advantage of the predictive analytic power of the K Score
- Buy stocks that receive a high K Score, while aligning your decision with a particular factor or combination of factors
- Mitigate risk by selling stocks with a low K Score, while overlaying them with lowly rated intermediate sub-scores

Each ticker is assigned with a K score ranging from 1 to 9.

Symbol	Date	K Score	Value Score	Momentum Score	Quality Score	Growth Score
AAPL	2018-01-02	4	6	4	8	5

Kai-Vantage

While statistical analysis are used, Kai intelligence platform was built from the ground up using machine learning technologies. It has several advantages over analysis using traditional financial analytics only.

First, our machine learning platform is built to process big, complex and inhomogeneous data.

Statistical models are limited to a few input factors, and are used to find parameters to fit the models over a period of time. Moreover, statistical models require the modeler to understand or hypothesize the relations among variables in advance, such as linear relation between independent and dependent variable.

Machine learning approach is fundamentally different in that it's not limited on the number of factors or features. Our Kai platform can assimilate data types that are wide (high number of attributes) and deep (high number of observations), that are greater than traditional structured core financial data and quantitative analyses.

This high dimensional approach takes in a large amount of data sets, looks at signals from different places including non-linear patterns, learns, and tries to find relationships and patterns hidden in the data, and makes predictions not conceivable with statistical models.

As a result, the models we built are most advantageous when it comes to processing voluminous and complex signals at scale in today's capital market, and creating new capabilities that no human investor could match, both in terms of data integration and processing speed.

Second, Kavout's advanced models are built for the purpose of predictive analytics for outperformance in the future.

These sophisticated predictive models and techniques for analyzing stocks are built into our modern automated adaptive stock ranking system. As the Kai engine continues to process new and additional data, it progressively improves its predictive ability by constantly learning from its performance, incorporating new data and dynamically adapting to the market.

Some of the techniques incorporated include

- Deep learning to capture nonlinear insights and correlations among massive data sources
- Reinforcement Learning (RL) to develop goal-oriented algorithms that dynamically drive the optimal behavior towards the objectives. A key advantage of RL is that over time it automatically incorporates new data, and self-evaluates past actions, and optimizes decisions.

Grounded in fundamental research, the advantage of Kavout's approach is the breadth of the data coverage - historic and current, predictive analytics, and the speed of which it processes daily market data for next day trading.

How to Use a K Score

A higher K Score assigned to a stock indicates a higher probability of outperformance over the next month, whereas a lower K Score indicates a lower probability of outperformance. K Scores can be used as a buy/sell signal incorporated into your investment process. Buy stocks with high K Scores (7-9), and short stocks with low K Scores (1-3).

Most K Scores do not fluctuate dramatically on a daily basis. For portfolios that are rebalanced less frequently, it is more useful to track K Score's month over month change.

However, financial information such as earnings announcement are not always released on the first day of the month. Additionally, pricing and technical trading signals are fluid, which can cause a meaningful change that impact the rating of the stock. Clients who want a greater control may want to opt in for daily delivery, which allow them to adapt to market change quicker.

K Score reflects the quality of stocks over time. If the K score for a stock is trending downward, then the stock is likely to have a relatively weaker performance ahead, compared to the period with a higher K score. The opposite is true when the K score shows an upward trend. If the stock's K score changes rapidly, that may be a reflection of significant changes in the fundamentals, price movements, and technical signals.

Back Test and Portfolio Showcase

Here is a portfolio showcase constructed using K Scores for the Unites States market. To demonstrate back testing results we created two portfolios, called Top Picks and Bottom Picks.

Selection Procedure

K Score US Top Picks portfolio comprises of stocks that are assigned with a K Score 9 from the largest 500 by market cap US stocks. Bottom Picks portfolios comprises of stocks that are assigned with a K Score 1 from the same pool.

Benchmark

SPY

Weighting Scheme

The strategy is to apply equal-weights to all chosen stocks within each of the two portfolios.

Rebalancing Frequency

Stocks were purchased at the closing price on the first trading day of each month and sold at the closing price on the last trading day of the same month.

Transaction cost

Transaction cost was tested with various assumptions. The difference was insignificant since only highly liquid stocks were selected for the portfolios. To simplify this for illustration purpose, transaction cost in the two portfolios are set to zero, which is a reasonable assumption.

Kai Top Picks Portfolio

As we can see in Figure 1, the Top Picks portfolio, which consists of 9 K Scores, has generated a cumulative return of 223.77%.

The returns statistics are reported in Table 2. The compound annual growth rate (CAGR), which is the average annual growth rate of an investment, for the Top Picks portfolio is 14.82%, which is significantly higher than the 11.20% CAGR of the benchmark . Adjusted for volatility, the Top Picks portfolio also has a higher Sharpe ratio of 0.89 than the benchmark's 0.90.

Looking closer at the returns in Figure 3, the Top Picks portfolio generates stable positive returns 79.41% of the time. The best quarterly return is 35.09% while the worst quarterly performance is -28.83%.

Back Test and Portfolio Showcase

Figure 1. Cumulative Return of Top Picks and Bottom Picks Portfolios (2012-01-03 to 2020-06-01)

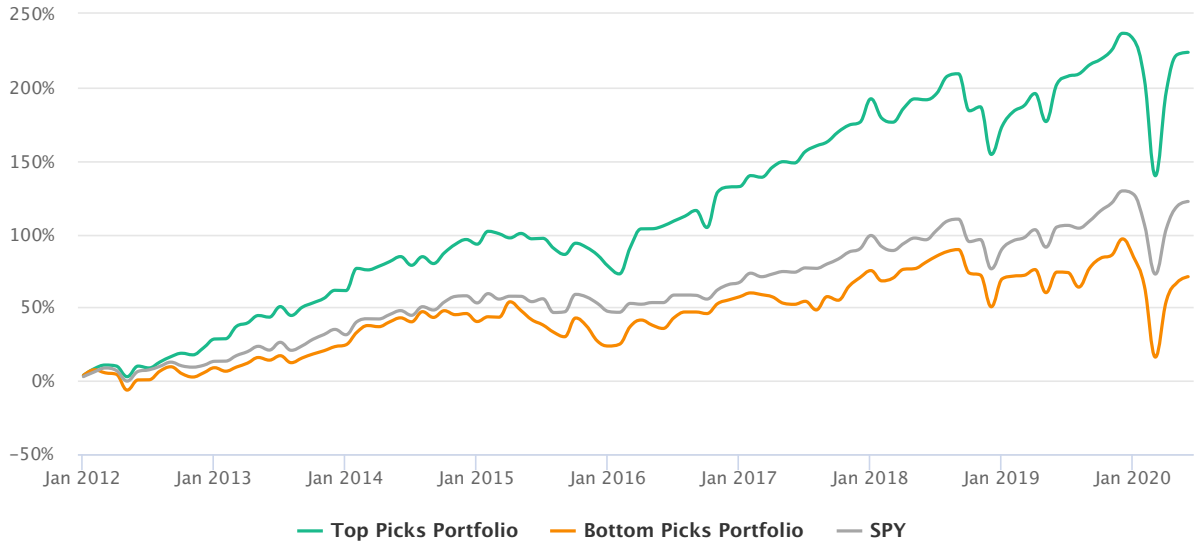
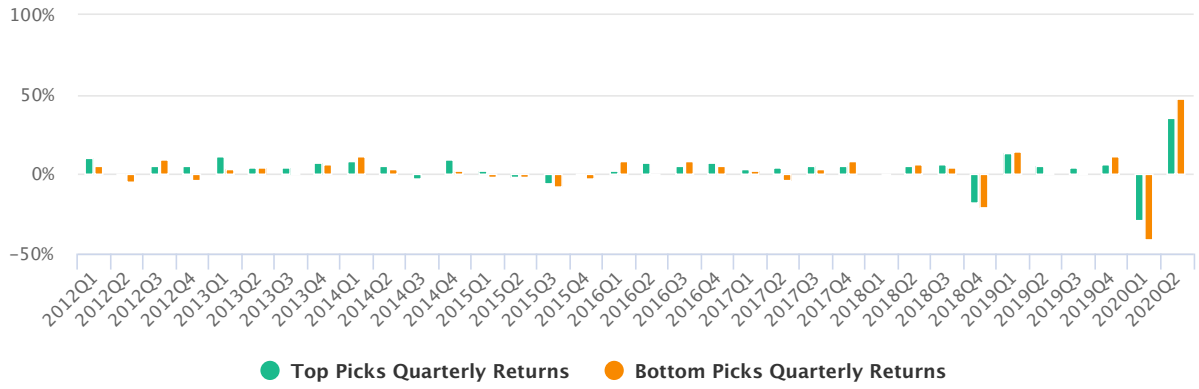


Table 2. Return Statistics

Statistics	CAGR	Alpha	Volatility	Beta	Sharpe
Top Picks	14.82%	3.64%	17.24%	1.13	0.89
SPY	11.20%	0.00%	12.79%	1.00	0.90
Bottom Picks	6.51%	-5.84%	21.68%	1.39	0.40

Figure 3. Quarterly Returns



Back Test and Portfolio Showcase

Kai Bottom Picks Portfolio

The Bottom Picks portfolio, which consists of stocks with stocks in K Score of 1, has generated only a 70.89% cumulative return from 2012-01-03 to 2020-06-01. This far lags the benchmark's performance of 122.11% over the same time period.

As summarized in Table 2, the Bottom Picks portfolio overall has a lower return and higher volatility. The compound annual growth rate (CAGR) for the Bottom Picks portfolio is just 6.51%, which is significantly lower than the 11.20% CAGR of the benchmark . Adjusted for volatility, the Bottom Picks portfolio also has a very low Sharpe ratio of 0.40 than the benchmark's 0.90. In other words, low K Scores have been very predictive for the corresponding stocks' future underperformance.

As we can see in Figure 3, even though the highest quarterly return generated by the Bottom Picks portfolio was 47.24% back in 2020Q2, the returns are mixed and volatile, with the worst quarterly performance coming in at -40.96% in 2020Q1.

Moreover, the Bottom Picks portfolio is substantially more volatile than the Top Picks portfolio, suggesting there are more risks associated with the Bottom Picks portfolio.

With these insights, investors can use K Score to potentially mitigate risk in their equity portfolios by avoiding stocks with low K Scores.

Conclusion

Kavout utilizes and develops state of the art AI and machine learning (ML) engines that turn vast amounts of complex data into useful investment intelligence. Our AL/ML approach provides a predictive framework that is not only methodical and powerful, but also adaptive and scalable. We will continuously fine-tune and add additional capabilities to our Kai intelligence platform. In our view, this is a very bright direction that will lead our clients to long-term successes in investing.

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