qplum

AI investment solutions

Building custom investment solutions using artificial intelligence

www.qplum.capital

January 2019

| Introduction

Calvin Yu, CFA
Qplum
Managing Director, Head of Multi-Asset Solutions

- 12+ years experience in multi-asset portfolio management
- Lead Portfolio Manager and Outsourced CIO at Goldman Sachs
- Vice President at Pacific Global Advisors, an Institutional Solutions business that was acquired from J.P. Morgan

| Qplum overview

- Founded in 2014, Qplum is a SEC registered Investment Advisor ('RIA') and NFA registered Commodity Trading Advisor ('CTA').
- Offer diversified, systematic strategies across all major asset classes using proprietary deep learning, artificial intelligence ("AI") framework with end-to-end automation.

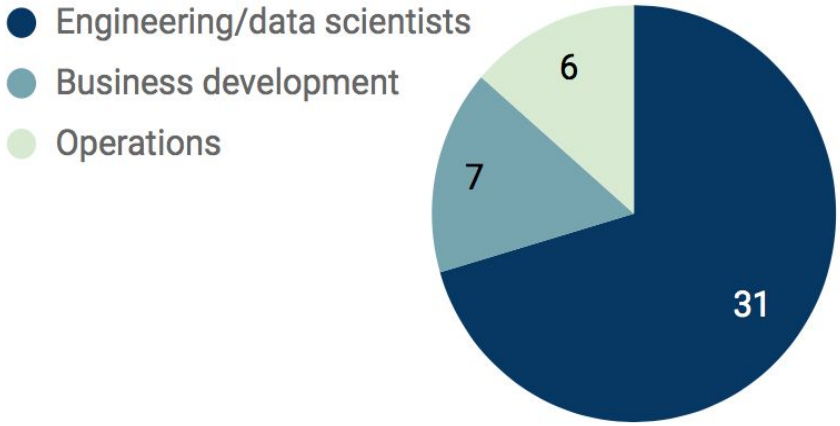
Mansi Singhal, Co-Founder and CEO

- 10+ years experience in Trading and Portfolio Management (systematic global macro)
- Brevan Howard, Bank of America Merrill Lynch.
- Masters in Computer Science from University of Pennsylvania.

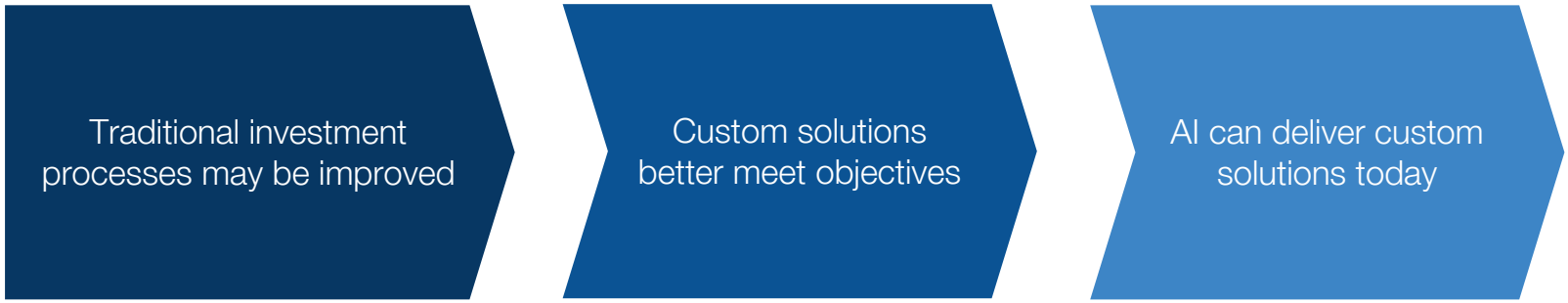
Gaurav Chakravorty, Co-Founder and CIO

- Established one of the most profitable trading groups at Tower Research Capital.
- Youngest partner at Tower Research Capital.
- Masters in Computer Science from University of Pennsylvania.
- Graduated from the prestigious Indian Institute of Technology, Kanpur.

Technology driven investment organization
40+ member team – Experienced investment experts, engineers and data scientists

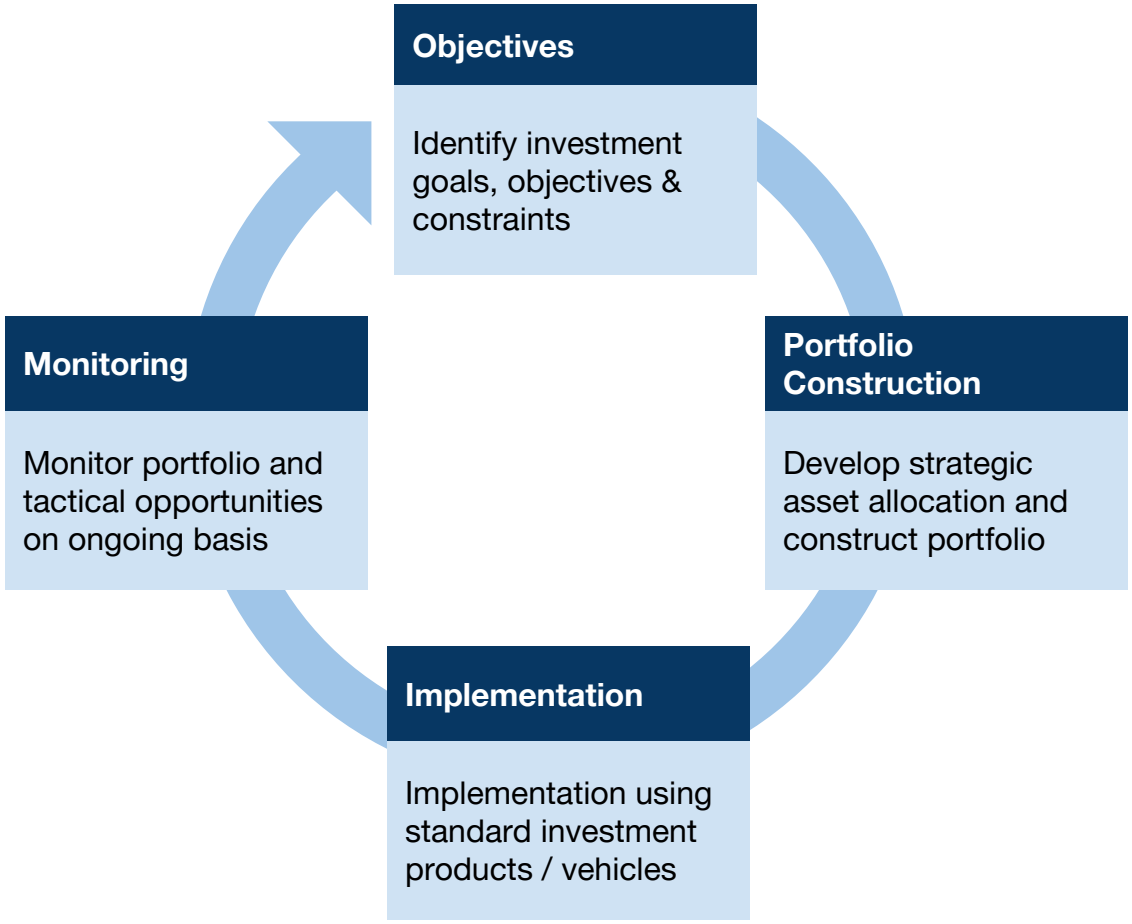


Key takeaways



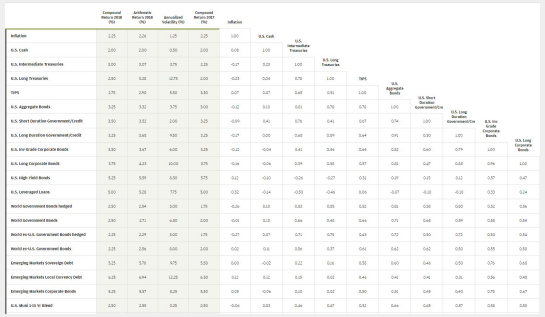
Traditional processes

| Traditional investment process



Potential considerations of traditional investment process

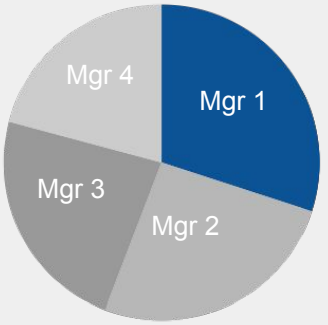
Dated assumptions



Delays in tactical decisions

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
MSCI Emerging Markets	Bloomberg Barclays Agg	MSCI Emerging Markets	Russell 2000 Growth	Bloomberg Barclays Agg	MSCI Emerging Markets	Russell 2000 Growth	S&P 500 Growth	S&P 500 Growth	Russell 2000 Value	MSCI Emerging Markets
39.38%	5.24%	79.51%	29.09%	7.84%	18.23%	43.30%	14.89%	5.52%	31.74%	37.28%
MSCI World ex USA	Bloomberg Barclays High Yield	Bloomberg Barclays High Yield	Russell 2000	Bloomberg Barclays High Yield	Russell 2000 Value	Russell 2000	S&P 500	S&P 500	Russell 2000	S&P 500 Growth
12.44%	-26.16%	58.21%	26.85%	4.98%	18.05%	38.82%	13.69%	1.38%	21.31%	27.44%
S&P 500 Growth	Russell 2000 Value	Russell 2000 Growth	Russell 2000 Value	S&P 500 Growth	S&P 500 Value	Russell 2000 Value	S&P 500 Value	Bloomberg Barclays Agg	S&P 500 Value	MSCI World ex USA
9.13%	-28.92%	34.47%	24.50%	4.65%	17.68%	34.52%	12.36%	0.55%	17.40%	24.21%
Russell 2000 Growth	Russell 2000	MSCI World ex USA	MSCI Emerging Markets	S&P 500	MSCI World ex USA	S&P 500 Growth	Bloomberg Barclays Agg	Russell 2000 Growth	Bloomberg Barclays High Yield	Russell 2000 Growth
7.05%	-33.79%	33.67%	18.88%	2.11%	16.41%	32.75%	5.97%	-1.38%	17.13%	22.17%
Bloomberg Barclays Agg	S&P 500 Growth	S&P 500 Growth	Bloomberg Barclays High Yield	S&P 500 Value	Russell 2000	S&P 500	Russell 2000 Growth	MSCI World ex USA	S&P 500	S&P 500
6.97%	-34.92%	31.57%	15.12%	-0.48%	16.35%	32.39%	5.60%	-3.04%	11.96%	21.83%
S&P 500	S&P 500	Russell 2000	S&P 500 Value	Russell 2000 Growth	S&P 500	S&P 500 Value	Russell 2000	S&P 500 Value	Russell 2000 Growth	S&P 500 Value
5.49%	-37.00%	27.17%	15.10%	-2.91%	16.00%	31.99%	4.89%	-3.13%	11.32%	15.36%

Implementation in isolation



Custom solutions

| Custom solutions may better meet objectives

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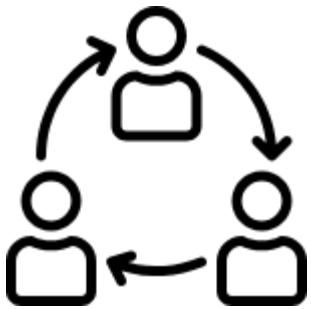
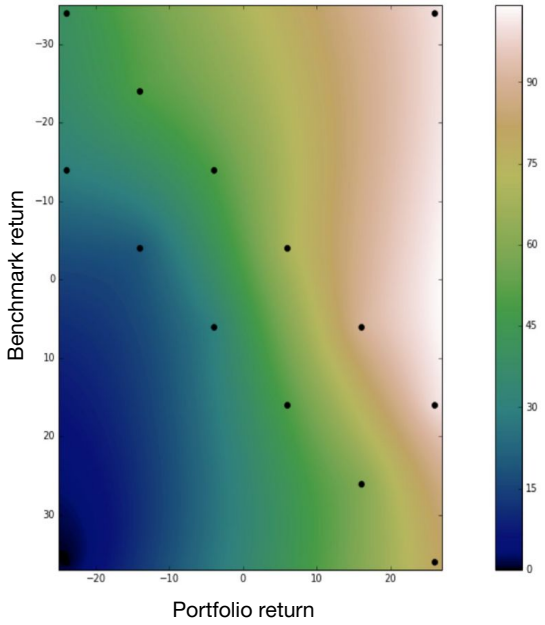
Discussions to understand investor objectives

Custom utility function of investor preferences

Develop custom investment solution to better meet objectives





Illustrative customization process

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- Risk and return mandate
- Asset & sub-asset class, geographic, sector constraints
- Unique utility functions

- Investment parameters
- Risk budgeting
- Investment universe
- Investment strategies
- Risk management

- Blind Walk-forward
- Back-tested Performance
- Scenario analysis & Simulations
- Portfolio Characteristics

- Portfolio construction
- Trading & operations
- Tax optimization
- Currency hedging
- Portfolio monitoring

AI driven investing

| AI can map complex relationships in financial markets

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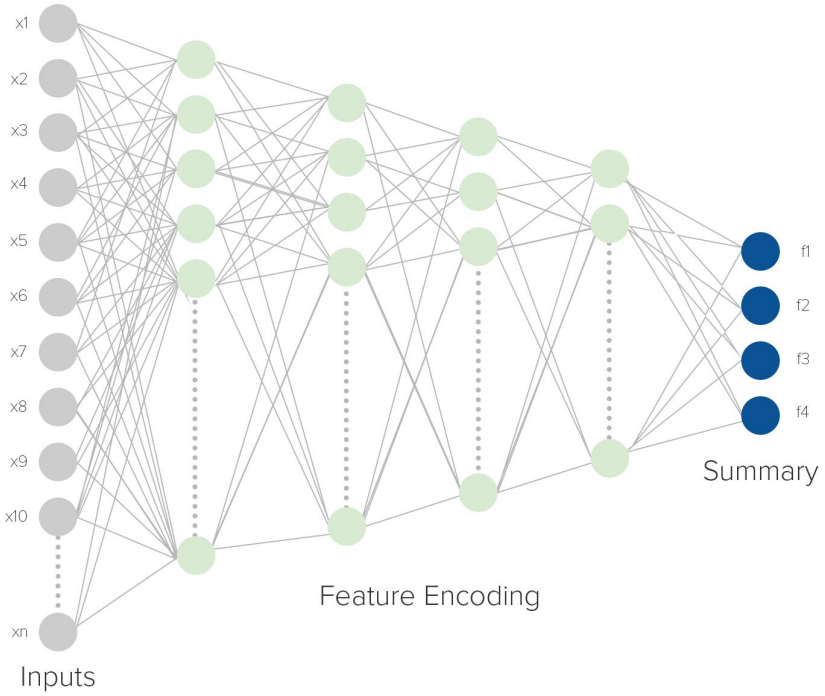
Automated Feature Extraction



- Regime detection
- Data-driven strategies
- Expected returns model
- Portfolio characteristics

Input Layer → Neural networks separate strong indicators from weak indicators in an adaptive manner → Output Layer

For Illustrative purposes only

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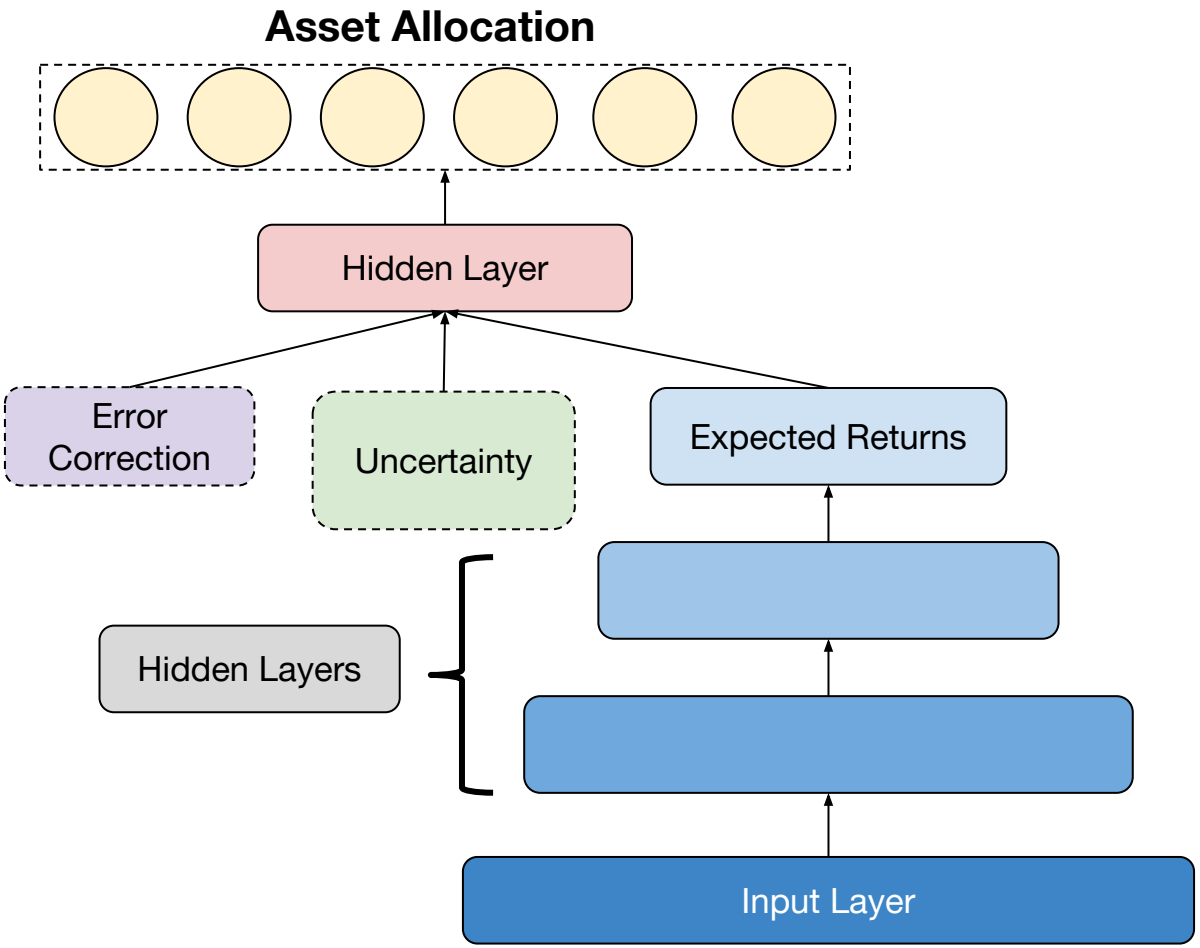
SSRN whitepaper:

Deep Learning for Tactical Asset Allocation

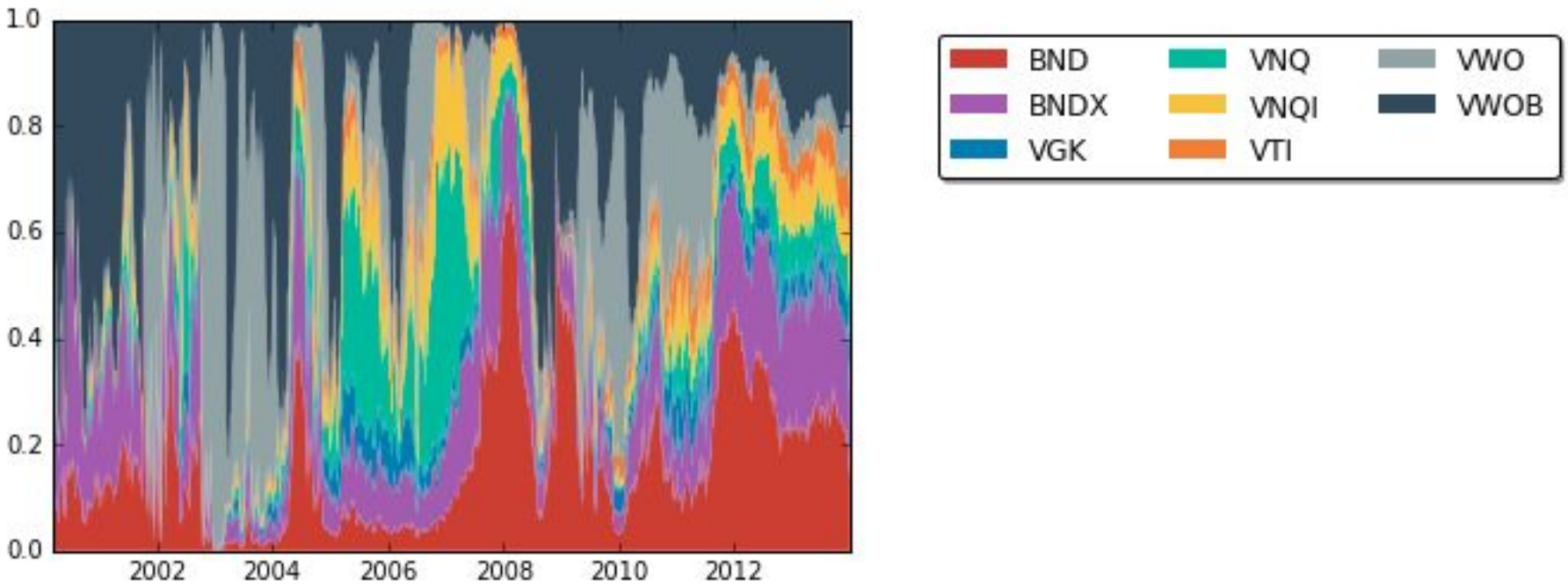
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3242432

| Deep Learning for Tactical Asset Allocation



Source: SSRN whitepaper: Qplum - Deep Learning for Tactical Asset Allocation
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3242432

| Deep Learning for Tactical Asset Allocation (cont'd)



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Illustrative applications

AI can deliver custom solutions today

Illustrative application - Risk-targeted global tactical strategies

qplum

- Qplum designed a set of custom risk-targeted global tactical strategies, based on the following specifications:

○ Strategy:	Global tactical asset allocation
○ Benchmark:	Set of risk benchmarks based on global market cap portfolio (e.g., 12% vol, 8% vol, and 4% vol)
○ Universe:	Global equities, fixed income, and commodities
○ Drawdown/risk management:	Based on client specific risk tolerance
○ Implementation:	Listed ETFs in a separately managed account
○ Currency hedging:	Dynamic currency hedging to reduce hedging costs
○ Liquidity:	Daily

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Illustrative application - Risk-targeted global tactical strategies (cont'd)

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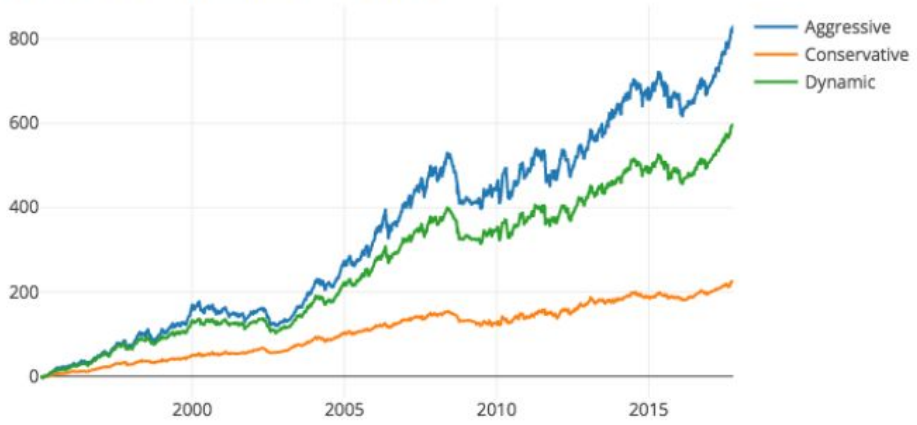
Illustrative portfolio performance (backtested)



	Aggressive	Dynamic	Conservative
Annualized Returns	10.2%	8.8%	5.3%
Standard Deviation	10.7%	8.2%	4.7%
Sharpe Ratio	0.96	1.08	1.13
Max. Drawdown	22.0%	17.8%	14.6%
Max. yearly loss	20.2%	16.5%	12.7%
Positive months	64.6%	65.7%	65.3%
Annual Turnover	6.2	5.9	5.7

*Backtested performance from January 1995 until October 2017.

The charts above compare the returns of simulations that are based on back-tested data, of the investment strategy of qplum, a customized strategy built for the client's needs. Additionally, the information in the graph reflects simulated allocation to various sectors of the investment strategy that is based on back-tested data. The investment strategy used to produce the simulated returns is the same as the investment strategy that qplum intends to initially use in managing the portfolio, but the program may alter its investment strategy in accordance with its governing documents in the future. The simulated returns are net of trading fees and transaction costs but gross of the management fee and incentive allocation that will be charged by the Investment Manager. The returns reflect the reinvestment of dividends and interest. Performance is reported gross of all other expenses such as custodial and other fees. The simulated returns do not reflect the results of actual trading decisions. Unlike the results from actual trading decisions, simulated results may have over-or-under compensated for the impact of certain market and macroeconomic factors, such as market disruptions, lack of liquidity, and the effect of interest rates. Simulated results also are designed with the benefit of hindsight. No simulated trading can completely account for the impact of financial risk in actual trading (for example, the ability to adhere to a particular trading program in spite of trading losses and the fact that an actual portfolio may not be fully invested at all times). There are frequently sharp differences between simulated results and the results subsequently achieved from actual trading. No representation is being made that a portfolio managed by qplum in accordance with the parameters in this presentation would achieve profits or losses similar to those set forth herein.

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Illustrative application - 130/30 small-mid cap equity strategy

qplum

- Qplum designed a custom multifactor long/short equity strategy, based on the following specifications:

Strategy:	130/30 small-mid cap equity
Benchmark:	Russell 2500 Growth
Universe:	US small and mid cap stocks
Active risk budget:	2%
Beta to benchmark:	1.0
Turnover:	Below 150%
Implementation:	Single name stocks in a separately managed account
Liquidity:	Daily

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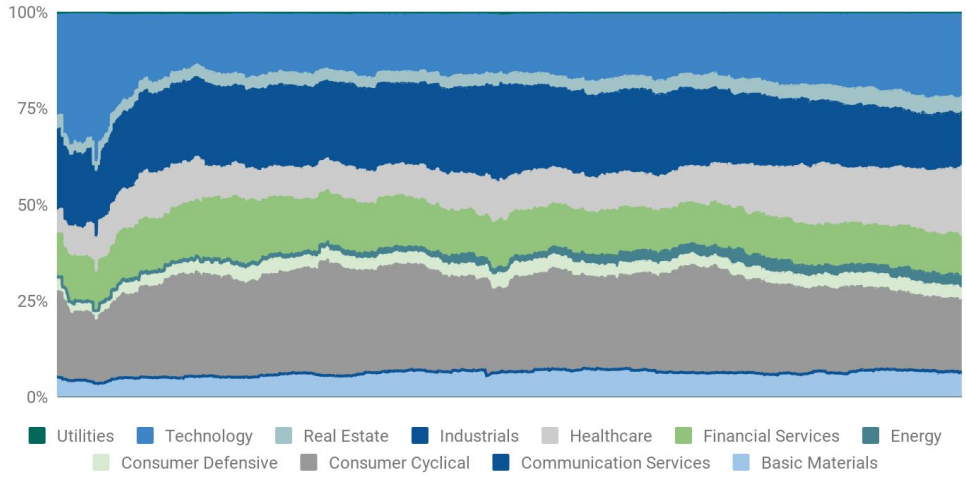
Illustrative application - 130/30 small-mid cap equity strategy (cont'd)

Illustrative portfolio performance



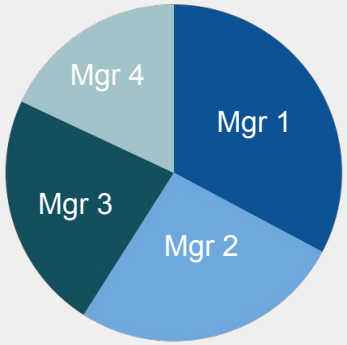
*Backtested performance from January 2003 until September 2018.

The charts above compare the returns of Russell 2500 Growth Index and the simulated returns, that is based on back-tested data, of the investment strategy of qplum, a customized strategy built for the client's needs. Additionally, the information in the graph reflects simulated allocation to various sectors of the investment strategy that is based on back-tested data. The investment strategy used to produce the simulated returns is the same as the investment strategy that qplum intends to initially use in managing the portfolio, but the program may alter its investment strategy in accordance with its governing documents in the future. The simulated returns are net of trading fees and transaction costs but gross of the management fee and incentive allocation that will be charged by the Investment Manager. The returns reflect the reinvestment of dividends and interest. Performance is reported gross of all other expenses such as custodial and other fees. The simulated returns do not reflect the results of actual trading decisions. Unlike the results from actual trading decisions, simulated results may have over-or-under compensated for the impact of certain market and macroeconomic factors, such as market disruptions, lack of liquidity, and the effect of interest rates. Simulated results also are designed with the benefit of hindsight. No simulated trading can completely account for the impact of financial risk in actual trading (for example, the ability to adhere to a particular trading program in spite of trading losses and the fact that an actual portfolio may not be fully invested at all times). There are frequently sharp differences between simulated results and the results subsequently achieved from actual trading. No representation is being made that a portfolio managed by qplum in accordance with the parameters in this presentation would achieve profits or losses similar to those set forth herein.

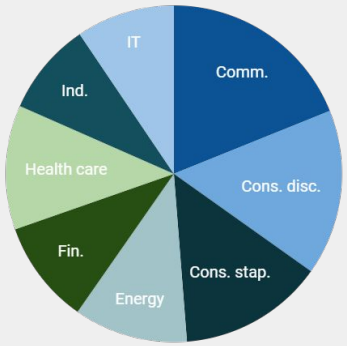
Other Portfolio Applications of Deep Learning

Liability Driven Investing (LDI)

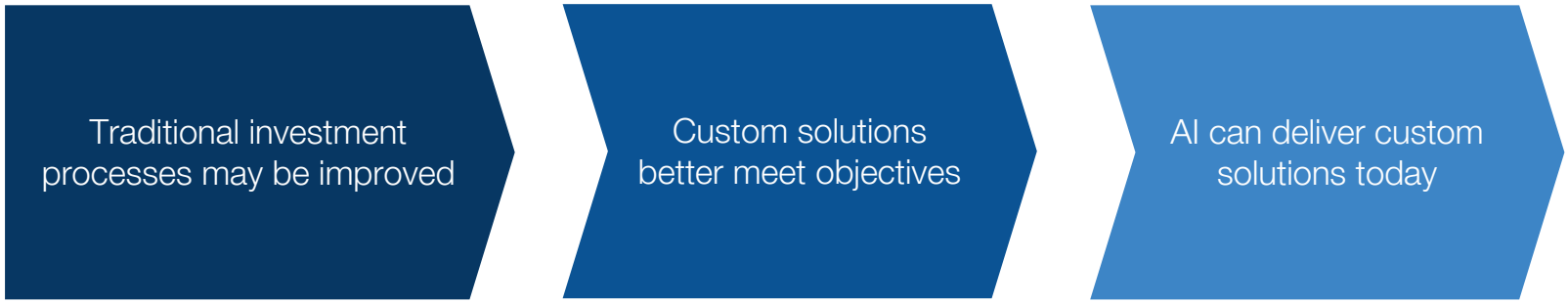
Investment Manager Allocation



Portfolio Construction



Key takeaways



Thank you

Contact:	calvin@qplum.co
Website:	www.qplum.capital
Past webinars:	https://www.qplum.co/investing-events
SSRN whitepaper:	Qplum - Deep Learning for Tactical Asset Allocation https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3242432