



# Introducing rangl for finance

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In 2019 Oxquant participated in a Newton Institute programme on [the mathematics of energy systems](#), identifying the rangl project as an attractive proposition at the boundary of the [physics-constrained](#) machine learning/artificial intelligence (AI) world.

[rangl](#) is a brand new advanced competition platform aimed at solving dynamic mathematical problems in finance and other domains. It is being created at The Alan Turing Institute and serves as a new model of collaboration between academia and industry.

[Oxquant](#) is an official rangl industrial collaborator.

## [rangl](#) challenge platform

Complex control problems arise in many areas of work including (amongst others) real-time systematic trading in finance; the operation of critical infrastructure, including electricity, gas, water and transportation; and systems dealing with maintaining safety. AI, with its speed, scale and accuracy, offers transformative potential in applications to these problems. Robust controllers for significant trading operations or critical infrastructure should be designed and tested in an appropriate simulation environment.

Challenge platforms assess user-submitted algorithms for specific tasks, helping the best classes of solutions to emerge. They have popularized the use of deep neural networks on unstructured data and are a proven mechanism to realize the potential of AI.

[rangl](#) is an AI challenge platform dedicated to control problems. Through integration with [OpenAI Gym](#), rangl offers a user-friendly environment to develop learning approaches to data-driven control problems. Any control problem that can be coded in OpenAI Gym is likely to be suitable for the platform.

[rangl](#) aims to create controllers with intelligent characteristics. Forecasts of system inputs, driven by demand have both quantifiable uncertainty (randomness) and unquantifiable uncertainty (ambiguity) which must both be handled. The economic constraints and objectives can be incorporated. Intuition based on experience is needed because complex systems regularly enter previously unseen states. Rangl assesses controllers robustly by performing extensive simulations in the cloud. This is because serious failures (large financial losses) should be rare, but their causes may be completely different under two similar control algorithms. Extensive testing over mid/long-term time horizons is therefore required to evaluate the robustness of AI controllers.

## [Suitable problems in finance](#)

Finance has historically used static supervised learning methods to tackle financial data problems. Whether the modelling tool of choice is a random forest or humble regression, the approach is much the same. Find a model that works reasonably well and consistently in-sample and apply it out-of-sample in the hope that it will do nearly as well. But does this approach match the main objective of the investor? Setting the same problem up as dynamic is perhaps a more accurate modelling approach. It is certainly closer to real life. The alternative data and physical system

models may improve the investor's experience and represent the step toward explainable (XAI) and trusted AI.

We can think about problems in asset allocation, risk management, trading or any number of situations in which there is a temporal dimension. Whilst rangl won't cope with every conceivable problem in finance, it may identify improved solutions for problems which may or may not already have reasonable solutions.

## rangl challenge sponsors

rangl challenges are provided by sponsors. Commercial organizations are obvious sponsors but interesting dynamic problems may also come from elsewhere.

The sponsor of each rangl challenge will provide documentation including guiding principles based on the organization's domain knowledge. Such knowledge is essential to designing a good AI controller for a complex, perhaps costly engineering problem. Support for sponsor's in terms of setting up and handling problems on rangl will be available from the broader rangl team, which includes Oxquant.

## Data privacy

One of rangl's key design features is that it takes into account the potentially sensitive nature of data from, e.g. financial or infrastructure systems, by working with The Alan Turing Institute's privacy-preserving [data safe havens in the cloud](#) project.

Each challenge will have a measure of performance and online leaderboards will display the best controllers developed so far. Competition entrants are required to document their controllers properly, helping the challenge sponsor to develop insights into the leading classes of solution.

Given the open nature of the platform's deployment, anybody can propose a rangl challenge, compete in a challenge by designing a controller, or contribute an 'off-the-shelf' AI controller for users to customize. The intellectual property of all participants is protected. rangl can also be deployed in a closed manner, for example in company 'hackathons' or recruitment exercises.

## Contact

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