Executive Summary

Since the seminal paper of Markowitz (1952), the Modern Portfolio Theory (MPT) has been considered very sensitive to small changes in return estimates, leading to the well known concept of *error maximization*. Alternative approaches suggest working with ordering/ranking information about the returns instead of directly using point estimates, in order to reduce the estimation error.
Moreover, machine learning techniques continue to provide important insights in various field, among them, the financial industry. Improved estimation through machine learning algorithms could support the investigation into economic/financial mechanisms underlying investments and justifies its growing role in innovative financial technologies.
Aim of this thesis is to combine the two above-mentioned concepts, in order to assess whether there is a benefit of using ordering information as input parameter in the machine learning tools (in this specific case the *random forest* and the *neural network*) as well as the advantage given by the incorporation of these results into the *entropy pooling approach* (Meucci (2008)), which builds a bridge to the classical MPT.
The strategy presented seems to improve, under certain circumstances, the estimation of the expected return vector/covariance matrix and is able to outperform the benchmarks. We analyse how strategy performance is impacted by factors as features-responses, deciles-complete rankings and underlying model.