



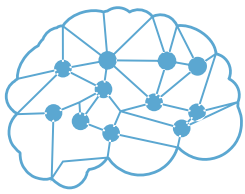
# **ARTIFICIAL INTELLIGENCE IN ROBO-ADVISING:**

RISKS AND SUPERVISORY  
APPROACHES

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**2022**

JACQUELINE  
LESSOFF



# Artificial Intelligence in Robo-Advising: A Supervisory Approach

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## INTRODUCTION

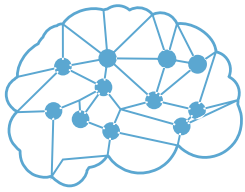
As the use of Artificial Intelligence (AI) has become increasingly adopted in the financial services industry, regulators and supervisors have expressed concern regarding the application of the emerging technology.

While the use of AI by robo-advisory firms is still in its formative stages, its development can lead to risk for consumers and firms.

The use of AI can intensify financial and non-financial risks that are already present in robo-advising, and can have grave consequences for consumer protection. The opaque nature of AI models creates additional risks for firms and regulators, as it is difficult to both prevent issues before they occur and to identify them afterwards. However, despite the presence of these risks, it is possible to use certain precautions to enable AI as tool to create efficient and profitable results (Gurrea-Martinez et al., 2021).

The accuracy and efficient nature of data-powered models often come at the cost of explainability, and the complex nature in which these algorithms find patterns in data can often lead to biases that go undetected until further notice. Furthermore, when an Artificial Intelligence system is based on data from nontraditional sources, it is possible that the models can process this information in a way that is difficult to interpret and regulate (Belanche et al. 2019). Additionally, Artificial Intelligence systems can incorporate assumptions when interpreting traditional robo-advising surveys provided by consumers, leading to suboptimal results.

To fully balance the risks and benefits resulting from the use of Artificial Intelligence in Robo-Advising, it is important to consider existing compliance processes, potential problems, and how the regulatory framework needs to evolve in order to create a strategy that can prevent and address issues (IOSC, 2020). The shortcomings of human advisors and AI-enabled robo-advisors are vastly different. Thus, the transition to AI-powered decision making technologies will require an adjusted framework to address the risks involved for asset management and advisory services.



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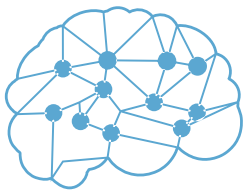
## SHIFT TOWARDS AI

Currently, a majority of robo-advisors are based on rule-based algorithms that are relatively simple to understand and interpret. They collect information on their client primarily through online surveys that focus on capturing the goals, preferences, and basic profiling information such as gender, income, and current asset allocation of the investor. This information is then processed by the robot-advisor to create a profile and make decisions for the investor. The shift towards AI will increase the complexity of such decisions, as well as the data set that is used to create investment strategies (Bhatia et al., 2020).

The consumer base for robo-advisors is composed of consumers from various backgrounds and levels of understanding, and who have different objectives for their investments. This often presents a problem, as Robo-advisory systems rely heavily on the information that they are provided, which is often a limited set of questions. Any model that assumes that all customers have heterogeneous understandings of concepts such as goals and risk appetites is fundamentally flawed. The ability of human advisors to speak with the consumer and obtain a more comprehensive understanding using verbal and nonverbal cues is often beneficial when creating an investment plan for their clients (Maume, 2021).

The use of Artificial Intelligence can create a more comprehensive profiles for the investor by advanced statistical techniques and expansive data sets. Many Artificial Intelligence can draw from financial transactions from the investors such as credit card activity and past investment activity to better understand the desires and tolerances of each client. In addition, the usage of AI allows a continual analysis of each individual, and can recognize subtle changes in activity as the situation of the client evolves.

The system can extrapolate meaning from changes in client activity, and can be used to trigger alerts to review prior assumptions made on the client. While these changes may increase the efficiency and accuracy of investment advice, the added complexity also presents additional risks and regulatory concerns (Bhatia et al., 2020).



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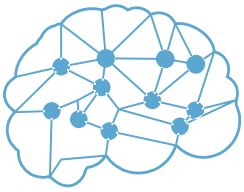
## PROBLEMS AND POTENTIAL RISKS

### A REGULATOR PERSPECTIVE

It is important to recognize the existing regulations and requirements of robo-investors that may be impacted by the use of Artificial Intelligence. Most countries have requirements that robo-advisor firms disclose the risks and benefits of their services in a way that is easily understandable for the consumer. The use of Artificial Intelligence would make conforming to this regulation difficult, and impossible in some cases. For example, many models operate as a 'black box', making it virtually impossible to understand how certain decisions are made. As the models would not even be interpretable by the firms that employ them, the consumers would not be able to understand what their exposures may be. Thus, unless existing regulations change, many types of Artificial Intelligence systems will not be feasible in robo-advising (OECD, 2021).

From the perspective of the regulator, it is often difficult to create a regulatory plan until the risks of certain processes are well defined and known. As many of the risks for emerging technology are speculative, it is difficult to create adequate scope for the regulation of these systems. The lack of transparency in AI results creates further difficulty when defining its risks. Moreover, lawmakers and regulators have historically struggled with regulating technology. In the past, regulation has been reactionary in nature and implemented on an ex-post basis, and has been largely ineffective in terms of preventing future risk events (Daldaban, 2019).

In terms of resources, regulators often have troubles keeping up with the pace of development in Artificial Intelligence. One of the biggest problems that regulators and governmental agencies faces is obtaining and retaining skilled technical workers. In comparison to technology companies, governmental organizations often offer reduced salaries and benefits. The infrastructure and operational environment of such regulators is not often adequate to effectively monitor firms with higher budgets and more resources.



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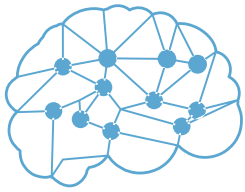
In addition to emerging risks, existing regulatory issues, such as problems with record-keeping and data governance can be amplified by the implementation of Artificial Intelligence and Machine Learning. What may now be considered by regulators to be a relatively benign shortcoming relating to the collection, governance, and processing of data could be magnified when data is increasingly used to automate decisions.

Regardless of the quality and power of Artificial Intelligence models, Data is the foundation of any automated result, and the integrity, completeness, and security of data is necessary for reliable results. Thus, in addition to regulating Artificial Intelligence Systems, regulators must redefine and emphasize their supervisory approach towards data governance as well (OECD, 2021).

## A FIRM PERSPECTIVE

The pressure for the immediate implementation of Artificial Intelligence systems to take advantage of efficiency benefits and compete with other robo-advisors will trigger new pressures for firms in terms of risk management, meeting regulatory expectations, and organizational changes. A comprehensive strategy must be identified and carried out in order to effectively navigate these new tensions. In addition to addressing new risks, firms will be challenged by addressing existing risks that manifest in novel ways. Furthermore, firms must address who is accountable for the decisions made by AI systems, and the unintentional and negative consequences that may occur.

Many firms who adopt the implementation of Artificial Intelligence into their advisory services do so without properly updating their existing governance and structure. In many such organizations, there exist incompatible databases, legacy infrastructure, and communication silos among different business lines that can prevent the correct application of data. If AI systems are implemented before these issues are addressed, it is likely that firms are unintentionally and unknowingly increasing their exposure to risks and regulatory consequences (Fong et al., 2021).



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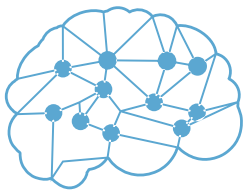
Effective and knowledgeable senior leadership is necessary for the adoption of AI and ML techniques. However, senior leadership at many firms are unaware of how the technology differs from existing technologies, and may not be prepared to adequately handle the technical risks that come with the advanced statistical models. This presents a problem with accountability, as the responsibility for the use of these models currently fall onto the senior leadership. Moreover, compliance personnel at firms may not be sufficiently trained in identifying potential risks with the new systems (Fong et al., 2021)).

As robo-advising firms increasingly adopt the technology, there has been growing literature that calls an assignment of legal personhood to robo-advisors (Kerikmäe et al., 2020). Many argue that the traditional legal framework for financial professionals is ineffective when considering Artificial Intelligence (legal person or agent). This can result in regulation that is fundamentally flawed. Currently, regulatory bodies are not considering this argument. A 2020 UNESCO document regarding the Recommendation on the Ethics of Artificial Intelligence states: "When developing regulatory frameworks, governments should, in particular, take into account that responsibility and accountability must always lie with a natural or legal person; responsibility should not be delegated to an AI system, nor should a legal personality be given to an AI system" (UNESCO, 2020). While there is currently little appetite for the legal assignment of personhood to robo-advisors, this will be a development to monitor in the future as the technology progresses.

In addition to the concern of corporate infrastructure, the implementation of Artificial Intelligence can have adverse effects on the culture and talent strategy of an organization. The implementation of Artificial Intelligence systems can result in significant changes in the structure of employee composition of an organization, as well as the responsibilities of employees. Moreover, many firms will be competing over candidates with similar attributes, who are already scarce in the job market. This may lead to high turnover rates, as well as understaffing or the employment under qualified candidates. Thus, if there is an event caused by the failure or inadequacy of an Artificial Intelligence application, there may not be adequate staff to address the problem or manually perform tasks (Belanche et al., 2019).

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Furthermore, the shift towards Artificial Intelligence requires a collective mindset shift to create a culture that is open to scientific processes. Many firms do not take a wholistic approach to AI systems, and use it in a sporadic fashion (Fong et al., 2021). Skepticism from leadership may result in less time and resources invested in the system, creating tension in the organization, and a less cohesive framework for AI systems. This may prove more difficult in certain firms than others, as training AI models take a significant amount of time and resources before they are ready to be deployed (ISIC, 2020).

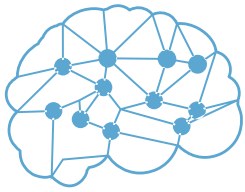
## THE PATH FORWARD

### HYBRID ADVISORS

The use of hybrid-advisors, or the combination of human and robo-advisors may provide reasonable and efficient results, and address several regulatory concerns. In a hybrid model, Artificial Intelligence systems can be used in specific ways to automate tasks that may otherwise take advisors several hours or more. This can result in the growth of more specialized roles, and allow advisors to spend more time in client facing activities. Thus, rather than replacing human advisors, AI systems can optimize the quality and speed of their services. This model is becoming more commonplace, and mitigates some of the risks that are present in the use of Artificial Intelligence in robo-advising (OECD, 2020).

A hybrid advisor, in many cases, may be a reasonable alternative to investment strategies. Hybrid systems are often preferred by traditional investment firms, and inspire confidence from customers of various ages and backgrounds. For example, older clients and those less familiar with financial markets may be more comfortable when interacting with an advisor face-to-face. However, younger clients may trust robo-advisors due to their efficiency and accessibility (Fisch et al. 2020).

In terms of regulatory benefits, the hybrid model allows human intervention that may help to mitigate several of the risks involved in the



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use of Artificial Intelligence in robo-advice. Face to face interaction with a financial advisor would allow a more in depth analysis of a customer that is difficult to capture with surveys and financial data such as their knowledge of finance, and their true risk tolerance. On the other hand, the use of Artificial Intelligence can help to mitigate some of the risks that are inherent to human advisors, such as conflicts of interests, and bias towards certain portfolios that do not truly match the needs and desires of the investor.

A hybrid model would also give a clearer idea of who is ultimately accountable for the decisions of Artificial Intelligence systems when providing advice. While the human advisor would not be responsible for the training and implementation of the model they use, their role would help provide another check to the decisions made using Artificial Intelligence. By limiting Artificial Intelligence systems to be a tool in a suite of resources available to an advisor, it would provide the efficiency benefits of the technology, while also allowing an effective challenge to the results.

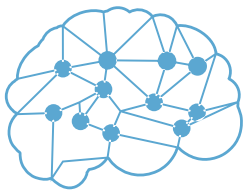
In terms of the shifting landscape of robo-advice, the implementation of a hybrid model rather than a model that solely relies on robo-advisors powered by Artificial Intelligence would enable a gentler introduction of the use of Artificial Intelligence in robo-advising. The gradual implementation of Artificial Intelligence systems would give regulators time to identify risks that may result from the implementation of the systems. Moreover, it would allow the robo-advising firm to integrate the systems more holistically into their organization, creating a more sustainable environment for the technology, and avoiding risks that that would result from a sudden cultural and organizational shift.

## EXPLAINABLE AI

The growing use of opaque Artificial Intelligence techniques, particularly relating to systems using deep learning and neural networks, has triggered a call for 'explainability' of the results of such systems. The concept of 'explainable AI' will address many of the concerns currently

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cited by Supervisors regarding the technology. Explainable AI (also known as XAI) refers to 'building algorithms in which the underlying model or the model's predictions can be explained to the users' (Brière & Bianch, 2021 ). The implementation of explainable AI techniques goes beyond interpreting the results, and will requires human understanding of the internal processes that take place during the training between and/or decision making processes of the model (Linardatos et al., 2021).

There are still several weakpoints in the identification and implementation of XAI. For instance, there is not a concrete definition for explainability, and there are various techniques that can be used to achieve claimed 'explainability' in various models. In the future, the use of mathematical formality and rigorousness may be useful or required when building Explainable AI systems, and specific metrics may be created to help create a standard definition of explainability (Linardatos et al., 2021).

The use of 'explainable AI' can also be interpreted as using models that are inherently less complex than other models. It is important to note that there is a trade off between accuracy and interpretability/explainability, as shown in the figure below that compares different Machine Learning techniques (Lin et al. 2021).

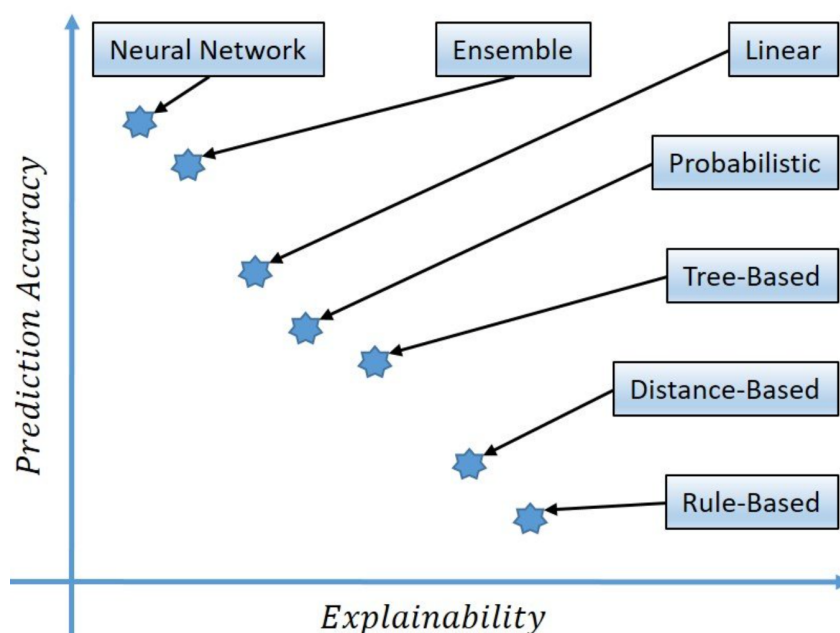
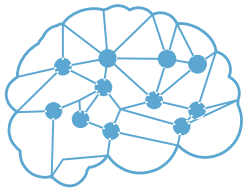


Fig 1. (:Hacker et al., 2020)



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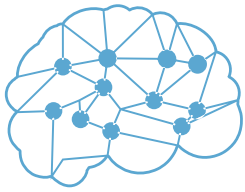
For the purpose of this figure, explainability is defined as a combination of transparency, or how easily a model can be interpreted by algorithmic transparency and post-hoc interpretability, as well as how easily a decision can be explained (Hacker et al., 2020). Going forward, it will be necessary for firms and regulators to find a balance between explainability and accuracy for the application of robo-advising. This will likely be incorporated in the firm's risk appetite, and be subjected to regulatory review.

## CONCLUSION

There are numerous challenges concerning the identification and mitigation of the risks presented to robo-advisors by Artificial Intelligence. The specific risks that will be introduced by Artificial Intelligence systems are impossible to fully predict and difficult to prevent. It is likely that a new regulatory framework will be required, or existing regulatory frameworks will need significant adjustments. From the perspective of sustainable AI systems in robo-advising, cross-industry and international cooperation and coordination will help ensure that best practices are identified and followed.

To comply with regulation and limit risk exposure, robo-advisory firms implementing Artificial Intelligence systems will have to assess their current practices relating to data management and risk management. Additionally, the introduction of an AI-powered ecosystem will force a cultural shift, often creating internal tensions. Furthermore, as robo-firms shift away from simpler rule-based advisory algorithms, there will be increased pressure on risk and compliance functions to understand complex technology that is largely uninterpretable by design.

As the technology progresses, techniques and processes have been identified to help alleviate the risks presented by AI for robo-advisory firms. The implementation of hybrid-advisors will create a greater understanding of the risks of Artificial Intelligence, and how it can be appropriately used as a tool to aid human decisions. The hybrid model will allow a more gradual shift in regards to organizational and cultural



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changes to the existing robo-advising model.

The application of Artificial Intelligence systems must be met with methods to interpret and explain results used for decision making. The use of Explainable Artificial Intelligence will be imperative to successfully use the complex models and meet supervisory and regulatory requirements.

Sustainable methods to incorporate Artificial Intelligence will be founded on ability to easily explain results to investors as well as regulators and key stakeholders.

Effective regulation and risk management is the best path forward for firms looking to incorporate Artificial Intelligence models into their robo-advisory operations. The presence of a strong risk framework will improve customer perception of safety, and create more demand and less skepticism regarding the models. A human-centric approach to Artificial Intelligence has the potential to strengthen cooperation between the supervisor and robo-advisory firms, creating more efficiency and a safer environment for advisory services.

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