

MSc Project Brief

Causal Reasoning in Machine Learning

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- Problem

Thanks to recent advancements in Machine Learning and Deep Learning, has been possible for Artificial Intelligence (AI) models to achieve superhuman performance in specific applications. Although, these type of models are currently not able to generalise to a good extent for different (but similar) types of applications. Additionally, good performance of Deep Learning models is highly dependent on providing large amount of data. Due to these limitations, it could then be almost impossible to manage to create any form of Strong AI architecture. One possible approach which can be used in order to overcome these type of limitations, is to design models able to capture Causal Relationships between different variables in a dataset (e.g. Supervised/Unsupervised Learning) or elements in an environment (e.g. Reinforcement Learning).

- Goals

This project aims to:

1. Outline today's main Machine Learning limitations and propose possible alternatives.
2. Create an Epidemic Modelling online dashboard which can be used in order to design different possible scenarios and answer causality based questions.
3. Research different ways to overcome Machine Learning limitations and provide example applications using Graphical Methods and Explainable AI.

- Scopes

Successful application of Causality in Machine Learning, could potentially lead to major breakthroughs in the field of Artificial Intelligence and have a huge commercial impact. Causal Reasoning, could in fact allow us to create more explainable models which could then be applied in different sensitive fields such as Medicine or Law. Additionally, it could make possible to apply AI not just in automation based tasks but also in more creative applications (e.g. text/audio automatic generation). Finally, increasing the transparency of the decision making process of the model, would ultimately also make end users more confident/comfortable in using causal based models.