Abstract/Résumé

A little journey through Causality

Philippe Bastien
L'Oréal
Philippe.bastien@rd.loreal.com

Surprisingly today causality can be seen as an emerging field, particularly due to the work of Judea Pearl at the turn of the last century. Even if the notion of causality was preexisting to the development of probability theory (De Moivre, The Doctrine of Chances, 1718), asking the questions in terms of causality until recently could even be considered unscientific. Causality almost disappeared as a specific concept at the end of the 19ème century with the appearance of the notion of correlation (Galton, 1888).

Correlation is not causation, but we will see that some correlation implied causation.

Causality is not a statistical notion, but an enrichment of the Statistic to uncover part of the world that traditional methods cannot approach. Traditional statistical methods are oriented towards inference (Fisher, 1922), associated more with a parsimonious description of the data than a description of the process responsible for the data. As a result, when using conventional statistical methodology without causal lenses some paradox appears like the most known Simpson's paradox. We will explain this paradox and show that it is no more a paradox when using a causal approach.

We will show, by taking up the work of Judea Pearl, how one can access to causality from simple observed data, without necessarily resorting to a randomized trial, by using simple graphic rules associated with a representation of the world.

Let's note that the notion of causality extends beyond the observable domain, mixing observed and unobserved worlds, through the notion of counterfactual to answer questions that statistics cannot answer, as in the case of mediation.

The purpose of this presentation will be to introduce in a succinct way some essential notions around the causality.

[1] Dana Mackenzie, Judea Pearl, The book of Why, Penguin publisher, 2018.

[2] Judy Pearl, Causality, Cambridge university Press, 2000.