

The Ph.D thesis will focus on developing a probabilistic model for legal decisions in a system where jurisprudence has a significant role. Even though the French system is a civil system, no one denies that jurisprudence is nowadays a significant source of Law.

The simple but fundamental starting observation is that numerous uncertainties occur during the process of legal decision making. These are consequences of human factors, of the incomplete information available to the parties, as well as various other causes. It follows from this observation that a legal decision can naturally be modelled by a random variable, and that the sequence of decisions in a given domain can be viewed as a stochastic process adapted to a filtration which is the reflect of the jurisprudence: this is so because jurisprudence, that is, past decisions, constrains future ones, which is exactly the definition of a filtration.

The advantage of such a view is that it offers theoretical as well as practical bases to current applications of mathematics to law, including both the field known as "law and economics" and decision prediction through machine learning.

The Ph.D thesis will aim at defining and studying a stochastic process able to reflect some fundamental features of legal decisions making, and in particular the fact that the natural filtration of this process is driven by jurisprudence. The process will be built by a careful analysis of the relations between written law, jurisprudence, and the necessary freedom of appreciation left to judges. The probabilistic properties of the process will be studied, including in particular its large scale and long term behaviour. In addition, statistical aspects will be dealt with : considering as an application decisions made in the field of intellectual property, estimators will be proposed and studied for the parameters defining the process.

Such a model-based approach is likely to open new avenues for the understanding of the impact of the legal system on the society, in particular from an economical point of view.

In order to conduct such a project, a close collaboration between lawyers and mathematicians is mandatory: the former will provide relevant criteria to set up the model, guide the choices all along the way and validate the results, while the latter will formalize the model, study its probabilistic properties and consider the statistical aspects. A particular effort will be put on the performative aspect of the model. Both these ingredients, that is, collaborations between lawyers and mathematicians, and the study of performative effects, are in the expertise and the focus of the ANJA team at Inria Rennes.