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  - AI4T
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DECISION MAKING WITH AI IN MEDICINE AND JUSTICE

When it comes to decision making assistance, two areas already have a history with using IA Law and Medicine.
Considering the importance of the decisions taken in those fields, they are interesting examples to look at.

AI AND MEDICINE

"*AI is indeed at the heart of the medicine of the future with assisted operations, remote patient monitoring, intelligent prostheses, or even personalised treatments thanks to the cross-referencing of data (bigdata).*"[1]

About 50 years ago, it's in the field of diagnosis that one of the most well-known expert system was developed: MYCIN.
"*It was an early expert system that used artificial intelligence to identify bacteria causing severe infections, such as bacteraemia and meningitis, and to recommend antibiotics, with the dosage adjusted for patient's body weight*"[2].

Developed from 1972, MYCIN was able, 6 years later, to outperform doctors in establishing accurate diagnoses. In a full-scale test, MYCIN and 9 doctors, interns and academics, are asked to carry out diagnoses and perform prescriptions on 80 patients with meningitis. The diagnoses and prescriptions were then blindly evaluated by 8 meningitis specialists and meningitis specialists and ... MYCIN scored higher than the human experts.

Today, one important field of machine learning use for medical purpose is the image analysis for medical diagnoses[3]. In a few words, let's see how it works as explained by Gaël Varoquaux,

AI Inria researcher:

"*Machine learning is a branch of Artificial Intelligence (AI). In a nutshell, it involves feeding software thousands of examples so that it learns to carry out identification tasks, e.g. looking through images to identify dogs or cats. Beauty spots or malignant melanomas. In theory, this should open up a wide range of applications in medicine. For example, x-rays are collected from thousands of patients suffering from the same condition - what is known as a cohort. Then, using this machine learning data, the computer will detect the same visual characteristics in any new images taken during screening for other individuals. This becomes the target data*."[4]

AI AND JUSTICE

In the field of justice, two main uses of AI systems are identified.

First are the tools that can help in the decision-making process. An AI system can assist a judge in the investigation of a case, for example, by informing him or her of all the judgments handed down by relevant courts in similar cases. In this case, AI enhances the information search but the decision is made by the judge on his/her own[5].

Then there are tools that can predict decisions. In this case, AI proposes directly to the judge a court decision[6]. The software analyses a large number of examples of court decisions and "automatically" derives decision rules. The emergence of predictive justice is raising many concerns.

If "*The application of AI in the field of justice can contribute to improve the efficiency and quality*" [it] "*must be implemented in a responsible manner which complies with the fundamental rights*"[7]. On the European level, an Ethical Charter on the Use of Artificial Intelligence in Judicial Systems and their environment was adopted in 2018.

Organised around 5 principles, it recognises the importance of non-discrimination, respect of fundamental rights, non-discrimination, quality, security, transparency, impartiality and fairness.

It finally stresses out the "under user control" principle: "*precluding a prescriptive approach and ensuring that users are informed actors and in control of their choices*."[7]

In Law as in Education or Medicine, decision support from the AI system can improve the decision made. In regard to the potential consequences of these same decisions, maintaining human oversight is an important issue for AI system development in the coming years.

Any user of those has to be able to keep critical use of the proposition of decision made by AI systems. For example, in the detection of certain cancers, the systems are so well trained on certain visual features that they make excellent diagnostics on these manifestations but are no longer able to recognise the others. There is still a need for a doctor's eye to see what missed the well-trained AI.

1. Translated from the French article Intelligence artificielle et santé: Des algorithmes au service de la médecine / *Artificial intelligence and health: Algorithms in the service of medicine* - Website of "Institut national de la santé et de la recherche médicale" / *French National Institute of Health and Medical Research* (consulted 08/23/2022). ↩
2. Mycin, Wikipedia article (consulted 08/23/2022) ↩
3. Varoquaux, G., Cheplygina, V. - Machine learning for medical imaging: methodological failures and recommendations for the future. *npj Digit. Med.* 5, 48 (2022). ↩
4. Varoquaux, G. - Medical imaging: can artificial intelligence deliver? - Interview on Inria Website (consulted 08/23/2022) ↩
5. In this case it refers to "Decision augmentation" or "Decision support" as mentioned in the previous section on "Decision Making with AI". ↩
6. Here it refers to "Decision automation" as mentioned in the previous section on "Decision Making with AI". ↩
7. From Ethical Charter on the Use of Artificial Intelligence in Judicial Systems- European Commission for the efficiency of justice Web site (consulted 08/29/2022). ↩ ↩