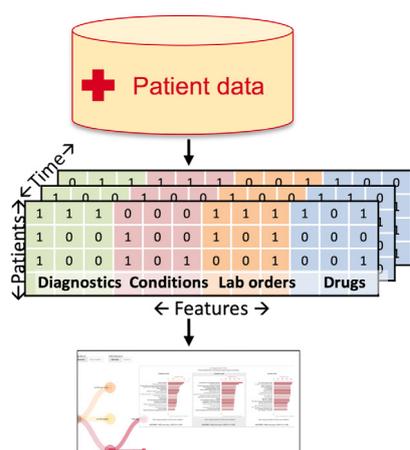





Adjusting chemotherapy dosages with artificial intelligence



©NPG/Nigam Shah, Adrien Coulet

Finding the right dose of medication by trial and error can be a painful experience for patients who are already suffering because of their disease. Artificial intelligence can greatly accelerate this process thanks to a new algorithm created by Adrien Coulet, lecturer at the Université de Lorraine and researcher in a joint Inria and Loria team, in collaboration with researchers from Stanford University. By analyzing patients' digital data, this innovative tool can predict in advance whether patients will need a lower dose of medication thus reducing the suffering caused by side effects. This result was published in Nature Scientific Reports.

Using artificial intelligence as a tool to help prescribe treatment

Using electronic patients' data from Stanford University Hospital, the team of researchers was able to identify those who required a lower dose than the standard one for certain drugs, even before treatment started. They used an automatic learning method called «Random Forest Classifier»; this algorithm combines the results of decision trees based on slightly different subsets of data.

The method was already known, so the innovative side of this project lies in the preparation and selection of the data used. Scientists compiled information from very different sources (analysis results, notes, prescriptions, etc.) on groups of patients who needed to have their dosage of drugs changed or not. Patients' data from Stanford University Hospitals has been computerized for years so the algorithm had multiple data on the highly variable responses of patients to their treatments. This computerization of the health system allowed the algorithm to learn and then predict whether patients who had never taken the drugs in question at the time would need a lower dosage.

Refined predictions about complex drugs

Adrien Coulet and his collaborators were particularly interested in drugs that interact with the family of the P450 enzymes. Malfunctions of this enzyme family are linked to adverse reactions to several types of medications, including some anti-cancer drugs. These adverse reactions can be limited when the dosage of the anti-cancer drugs prescribed as part of a chemotherapy are adjusted to each individual patient according to his or her needs.

Traditionally these dosages are very difficult to adjust because the activity of the P450 family of enzymes is highly dependent on the individual characteristics of the patients. Thus the effects felt by patients taking these drugs, whether positive or negative, can vary greatly depending on their genes, their personal history or their way of life. The precision and completeness of the algorithm have made it possible to take this multitude of possibilities into account to apply it to new patients and make accurate predictions.

Researchers now wish to adapt this technology to the data and the scientific, social and legal environment of French hospitals. The computerization of the health system can provide valuable support to health personnel and avoid unnecessary inconvenience and suffering for patients.

To find out more, read the article in *Nature Scientific Reports*:
<https://www.nature.com/articles/s41598-018-33980-0>



About Loria: LORIA is a french research laboratory supported by CNRS, Inria and University of Lorraine. It has the status of a UMR (Mixed Research Unit). Formed in 1997, the lab's mission is to conduct fundamental and applied research in computer science and information and communication technology (CS & ICT). Loria is one of the biggest laboratory of the Grand Est region. En savoir plus : www.loria.fr
Loria gathered 28 research teams, 48 nationalities, 190 researchers and 100 PhD students. Nine researchers are ERC grant winner and deux are IUF members. Our research wok gave birth to 14 start-ups linked to e-health, cybersecurity, robotics and artificial intelligence.

About Inria Nancy – Grand Est research centre: Settled in Lorraine since 1986 to contribute to the economic revival of the region, the center has grown steadily from 7 project-teams and 50 people to 21 project-teams and 450 people today. the project-teams are located in three sites : Nancy, Strasbourg, and Saarbrücken. Inria Nancy - Grand Est research centre conducts most of its scientific activities in partnership with the French National Centre for Scientific Research (CNRS), the University of Lorraine and the University of Strasbourg. We also maintain close ties with research institutes and universities from the wider region, notably in Saarbrücken and Luxembourg. Find our more about our four axes of research : <https://www.inria.fr/en/centre/nancy/overview/inria-nancy-grand-est-centre>

About Inria : Inria, the French national research institute for the digital sciences, promotes scientific excellence and technology transfer to maximise its impact. It employs 2,400 people. Its 200 agile project teams, generally with academic partners, involve more than 3,000 scientists in meeting the challenges of computer science and mathematics, often at the interface of other disciplines. Inria works with many companies and has assisted in the creation of over 160 startups. It strives to meet the challenges of the digital transformation of science, society and the economy.

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