Acceptance speech
21 de septiembre de 2021

Isabelle Guyon, awardee in the Information and Communication Technologies category (12th edition)

I am very grateful and honored to be one of the recipients of the 2020 BBVA Foundation Frontiers in Knowledge Award in Information and Communications Technology, together with my colleagues Vladimir Vapnik and Bernhard Schölkopf, for helping advance the field of Artificial Intelligence with seminal contributions to Machine Learning.

I also want to thank two of my greatest supporters: my mother Denise Passy and my husband Bernhard Boser. Before becoming a professor of Electrical Engineering at UC Berkeley, and making ground breaking contributions to AtoD converters and micro-mechanical inertial sensors, Bernhard worked at Bell Labs in Machine Learning with me and my co-laureates, and implemented the very first Support Vector Machine algorithm, which led to the work that is honored by this award.

My work concerns data driven Artificial Intelligence, also called Data Science or Machine Learning. The essence of Machine Learning is to create programs that learn from examples, instead of hand-crafting rules. The beauty of this approach is its versatility: Some of the applications I have worked on include biomedicine, computer vision, electric power transportation, and protection of data privacy.

I'll give you an example. In the 1990's, people thought that one day the pen would replace the keyboard as a computer interface. Therefore, early in my career, I was interested in handwriting recognition. The goal is to have algorithms learn the patterns that form handwritten letters or words, then transcribe them to digital text. Support Vector Machines was one approach we used to solve such pattern recognition problems. But, although much progress was made in handwriting recognition, typing remains much faster, so the promised transition to a pen

computer never happened. But luckily for me, patterns are everywhere, not just in handwriting. I turned my attention to cancer research and recognizing other kinds of patterns: the analyses of tissue, blood, or urine samples, which carry molecular signatures of disease.

Working on cancer research, I explored some of the other powerful abilities of Machine Learning. I looked into determining which risk factors or symptoms characterize best a given disease. This led me to work on another type of problem called variable selection. And one thing leading to another, I became aware that, to cure disease one must act on causes of disease not on consequences. Both causes and consequences may be predictive variables, but only acting on causes yields effective treatments. This led me to dedicate many years of work on the problem of discovering causal relationships.

I'm only one researcher, and yet I've had my hands in all these different topics and types of problems! You can therefore start to understand how Machine Learning, and Artificial Intelligence in general, has begun to influence every aspect of our lives and societies, from the advertisements we see, to the medical diagnostics we receive, to the cars we drive. And as excited as I am to see the current rapid growth of Artificial Intelligence research and applications, there are both unprecedented opportunities and legitimate worries about its potential mis-uses. Two problems stand out to me as great frontiers in Artificial Intelligence research: putting the power of these methods in the hands of the many such that it is not mis-used by the powerful few, and protecting and properly using the data that powers our algorithms.

With my colleagues and students, we are committed to help make Artificial Intelligence more accessible to a large population segment. One approach is to reduce the need for expertise in order to use Artificial Intelligence methods. To that end, we organize scientific competitions in Automated Machine Learning, exposing the community to progressively harder and more diverse settings, ever reducing the need for human intervention in the modeling process, in medicine, engineering, social sciences, physics. There are of course many other ways to ensure that a larger, more diverse subset of the population has access to Artificial Intelligence methods, and I invite you all to join me in the effort to democratize Artificial Intelligence.

The second challenge in ensuring secure and ethical Artificial Intelligence is the proper use and protection of data. There is no good data-driven Artificial Intelligence without good data.

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Therefore, our objective is to instill good practices to reduce bias in data and irreproducible results due to lack of sufficient data. We also work on the protection of data by creating software to replace real data by realistic synthetic data. This will facilitate broadening access to confidential or private data, having a commercial value or the potential to harm individuals.

In describing my work, I said "we" because the work I have done involves many collaborations and the support of several institutions. It started with my thesis advisors Gérard Dreyfus and Léon Personnaz at the school of Physics and Chemistry in Paris, with whom we did pioneering work on artificial neural networks, back in the 80's. Then, I was very fortunate to work at Bell Labs in New Jersey, under Larry Jackel, who had assembled a group of people who were incredibly creative, and included top algorithm, theory, and hardware researchers like Yann LeCun, Yoshua Bengio, Léon Bottou, Hans-Peter Graf, Bernhard Boser, Patrice Simard, Corinna Cortes, and John Denker, and also my co-laureates Bernhard Shölkopf and Vladimir Vapnik. Shortly thereafter, I had the opportunity to help assemble, with the two of them, another incredible group of researchers for the startup Biowulf, headed by Doctor Stephen Barnhill, and which included Jason Weston, Olivier Bousquet, Olivier Chapelle, André Elisseeff, Nello Cristianini, Peter Bartlett, and Asa Ben Hur.

More recently, I attracted several of my colleagues to form a non-for-profit organization called ChaLearn to organize challenges in Machine Learning. Some of my closest collaborators include directors of ChaLearn: Gideon Dror, Vincent Lemaire, Alexander Statnikov, Sergio Escalera, Hugo Jair Escalante, Kristin Bennett, Antoine Marot, and Wei-Wei Tu, to name a few. Lastly, I joined Université Paris-Saclay, in Michèle Sebag and Marc Schoenauer's group. This gave me the opportunity to become a professor and work with many talented students.

This award honors all of them and gives a recognition to the field that we are all passionate about, and I am proud to represent our community and represent women in science. It is a great encouragement to all of us that the BBVA Foundation is honoring progress in Artificial Intelligence and particularly Machine Learning.

In closing, I would like to thank the nominators and evaluators who have assisted the BBVA Foundation with their work, and express my gratitude to the BBVA Foundation for establishing this award. Thank you.