various types of decision trees

In the beginning, learning Machine Learning (ML) can be intimidating. Terms like "Gradient Descent", "Latent Dirichlet Allocation" or "Convolutional Layer" can scare lots of people. But there are friendly ways of getting into the discipline, and I think starting with Decision Trees is a wise decision.

Decision Trees (DTs) are probably one of the most useful supervised learning algorithms out there. As opposed to unsupervised learning (where there is no output variable to guide the learning process and data is explored by algorithms to find patterns), in supervised learning your existing data is already labelled and you know which behaviour you want to predict in the new data you obtain. This is the type of algorithms that autonomous cars use to recognize pedestrians and objects, or organizations exploit to estimate customers lifetime value and their churn

rates.

In a way, supervised learning is like learning with a teacher, and then apply that knowledge to new data.
DTs are ML algorithms that progressively divide data sets into smaller data groups based on a descriptive feature, until they reach sets that are small enough to be described by some label. They require that you have data that is labelled (tagged with one or more labels, like the plant name in pictures of plants), so they try to label new data based on that knowledge.
DTs algorithms are perfect to solve classification (where machines sort data into classes, like whether an email is spam or not) and regression (where machines predict values, like a property price) problems.
Regression Trees are used when the dependent variable is continuous or quantitative (e.g. if we want to estimate the probability that a customer will default on a loan), and Classification Trees are used

when the dependent variable is categorical or qualitative (e.g. if we want to estimate the blood type of a person).
The importance of DTs relies on the fact that they have lots of applications in the real world. Being one of the mostly used algorithms in ML, they are applied to different functionalities in several industries.

DTs are being used in the healthcare industry to improve the screening of positive cases in the early detection of cognitive impairment, and also to identify the main risk factors of developing some type of dementia in the future.

Sophia, the robot that was made a citizen of Saudi Arabia, uses DTs algorithms to chat with humans. In fact, chatbots that use these algorithms are already bringing benefits in industries like health insurance by gathering data from customers through the application of innovative surveys and friendly chats. Google recently acquired Onward, a company

that uses DIs to develop chatbots that are exceptionally functional in delivering world-class customer care, and Amazon is investing in the same direction to guide customers quickly to a path of resolution.

It is possible to predict the most likely causes of forest disturbances, like wildfire, logging of tree plantations, large or small scale agriculture, and urbanization by training DIs to recognize different causes of forest loss from satellite imagery. DIs and satellite imagery are also used in agriculture to classify different crop types and identify their phenological stages.

DIs are great tools to perform sentiment analysis of texts, and identify the emotions behind them. Sentiment analysis is a powerful technique that can help organizations to learn about customers choices and their decision drivers.
In environmental sciences, DIs can help to determine the best strategy for dealing with invasive species, ranging from eradication to

containment, and mitigation of spread.

DTs are also used to improve financial fraud detection. The MIT showed that it could significantly improve the performance of alternative ML models by using DTs that were trained with several sources of raw data to find patterns of transactions and credit cards that match cases of fraud.

DTs are extremely popular for a variety of reasons, being their interpretability probably their most important advantage. They can be trained very fast and are easy to understand, which opens their possibilities to frontiers far beyond scientific walls. Nowadays, DTs are very popular in business environments and their usage is also expanding to civil areas, where some applications are raising big concerns.

The firm Sesame Credit (a company affiliated with Alibaba) uses DTs and other algorithms to engine a system of social evaluation, taking into consideration various

factors such as the punctuality with which bills are paid and other online activities. The benefits of a good "Sesame score" in China range from a higher visibility on dating sites to skipping the waiting line if you need to see a doctor. Actually, after the Chinese government announced it will apply its so-called social credit system to flights and trains and stop people who have committed misdeeds from taking such transport for up to a year, there is a concern that the system will end up creating a massive "ML-backed Big Brother".