Teaching science using machine-learning frameworks

Although deep learning is beginning to transform the manner in which we teach traditional domains of knowledge, machine-learning itself is a new domain of knowledge for which new teaching strategies need to be considered. In this talk, we describe not how AI technology can be used to learn about students but rather how students can learn about AI technology.

In the scientific method, the applicability of a theory to a particular class of physical phenomena is measured by the degree to which its mathematical model fits experimental data. Modern machine-learning frameworks, meanwhile, now provide powerful computational environments within which mathematical models of arbitrary complexity can be fitted to data. The natural fit between these two domains represents a pedagogical opportunity that has yet to be exploited.

In our project, science students use Google's TensorFlow ML framework in an unorthodox manner: the neural-network models are discarded and replaced with simple physics models involving human-interpretable parameters such as angular velocity and radial distance; and signals from accelerometer sensors, such as those found in smartphones, are used as the data source from which the model learns.

Such an approach allows science students to readily absorb the concepts and vocabulary of ML as a natural extension of the scientific method.