Module 2: Introduction to transfer learning and fast.ai

John Keefe: I really like working with images because it really gives you a feel for what machine learning can do and what it can't do, sometimes where its failings are.

And you actually may run into a trove of images in your journalism or you actually may run into data that can be turned into images. For example, these maps. Right? So, the one on the left is a helicopter path - this is a helicopter over New York City - and it's just going straight. Not super interesting.

The one on the right is a helicopter that is hovering over something that's interesting. So, I'm more interested in like a hovering helicopter and I can see the difference. But can I teach a computer to see the difference? If you ask a Google vision for help with this, you get a very funny response. OK. Really?

I have to make my own machine learning model to separate these two images. It's not something that Google vision even knows how to do.

So, in order to do that, what we do is we actually go back to our friend then resin that model. Remember? From the first time we tried to identify images in a folder. So we're going to use that ResNet model, and we're going to actually train it a little bit more. It's already been trained on 14 million images, but we're going to train it additionally on our maps of helicopter flight paths. And that is going to allow us to sort these images into hovering and not hovering.

So, here's a little bit about how that works. If you have a picture of a Chihuahua and you put that into the ResNet model. What's happening is that the pixels are processed by thirty-four layers of weights and math that are trained on image net. That database of 14 million images. And at the end, it determines, oh, this is a Chihuahua. Of the 1000 things I know how to identify, this looks most like a Chihuahua.

Well, in fact, it's actually the very last layer that makes that sort of final determination of which of the thousand things is this most likely to be. And so, what we can do is lop off that last layer here in pink, just take it off. And still all of that math, all of these weights that are in the image now model are still really good at processing images. And then what we do is we retrain the end of this model just to understand the difference between our images. The difference between circling and not circling. So, it uses all of that prior knowledge, but on our particular data set. And so, when we put in a new image, it can make the decision between circling or not circling.

Now, this has been around for a while, this notion which is called transfer learning. But when I first heard about it a couple of years ago, it was kind of like, oh, yeah, with a cow and a chicken and some wheat, you can make a souffle.

Right. The steps between using the base ingredients or animals and the final outcome was not at all clear to me.

Income's fast.ai. There are a lot of machine learning libraries out there, but this is the first one that made actual sense to me. So fast.ai. is a library for Python and the organization is devoted to making neural networks uncool again? So, kind of get rid of the business actually put them to good use. And it also has this class I've mentioned before, which is practical deep learning for coders where you can go through lessons and really get into the

nitty gritty of how to use fast.ai. to do image classification. And it's what we're going to use to sort our maps between the circling paths of helicopters and the non-circling paths.

Next, we'll actually do this in code using fast.ai.