

For this aspect of the presentation, I'll be talking about artificial neural networks and effective prediction of the neural activity. Now, you might be asking yourself, Jean-Marc, why is predicting a neural activity an important aspect? Now, imagine going on a road trip, right? You're going to this new environment, new people, new food. There's a new atmosphere overall, right? Perhaps one of the most important things that you could have is a map, right? Because with a map, you're able to have a better understanding of what you're observing. You have a sense of direction, and it's just practical, right? These are the things that neural networks bring forth when exploring the neural activity, right? So Glaser et al. discovered that neural networks provide better quantitative and qualitative performance results compared to that of the traditional tools used to analyze the neural activity, right? And these traditional tools are more commonly, are more common tools are the linear and the Kalman filters, right? And here in figure one, we see that it has, it consists of the graphs, and it's depicting, each of these graphs is depicting the predictive accuracies of the neural networks compared to that of the traditional tools, linear and Kalman filters, right? And these studies were done over three different brain regions, the motor cortex, the somatosensory cortex, and hippocampus, all of which are important for movement and coordination, right? And in each of these graphs, we see where the neural networks, which are more so over on the right-hand side of the graph, dramatically outperforms the linear and the Kalman filters, which are over here on the left-hand side of the graph, right? So overall, the neural networks have a more, it's a predictive model, and it's much more comprehensive than these common tools that we've been using in analyzing neural activity, right? A study actually by Gucci and Van Verven in 2020, it stated that it gave us the reason why neural networks achieve such high predictive performance, and it's because they are able to associate the dependencies or correlations that exist between variables. I know it's a lot. Let me explain that to you. So these variables that we're talking about are the factors that are involved in creating or stimulating a motor response. So for example, if you shine a light in your eyes, you realize the pupils, the black parts of your eyes, are going to decrease, right? Are decreasing in size. And that's because this external factor, this external variable, the light, is causing some physical change. Your pupil's getting smaller. And that physical change occurs by processes that occur internally within our bodies that affect that change, right? And these are neurons that are sent to our eyes to say, hey, it's smaller, right? So these are the variables that I'm talking about. By doing that, neural networks actually become categorized as being able to learn from data, just by the mere fact that they're capable of doing that.