[Introduction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live)

[Here's the truth. You need to understand](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=0) [machine learning. I don't care who you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=3.5) [are, I don't care what your job is, you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=7) [need to know at least the basics of this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=11.153846153846155) [technology. And here's why. It's because](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=14.61538461538462) [machine learning is becoming so important.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=17.72727272727273) [Machine learning is a bigger and bigger](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=21) [part of our world every single day. I'm](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=23.99999999999999) [David Chappell, and in this course, I'll](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=27.4375) [introduce you to the basics of machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=30.5) [learning. To do that, we'll walk through a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=33.5625) [few modules. We'll start by answering the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=36.79999999999999) [big question, what is machine learning?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=39.59999999999998) [Then, we'll look at the machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=42) [process, and we'll end with a closer look](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=44.7222222222222) [at machine learning. When you're done,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=47.833333333333286) [you'll understand enough about machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=50.57142857142858) [learning to go on to watch more courses,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=53.190476190476204) [or to have intelligent conversation. Ready? Let's go.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m1&clip=0&mode=live&start=57.38095238095241)

[What Is Machine Learning?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live)

[Getting Started](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live)

[Let's begin at the beginning. What is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=0) [machine learning? There's probably no](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=3.705882352941176) [definition that the whole world would](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=6.352941176470588) [agree on, but there certainly are some](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=9.285714285714286) [core concepts. To think about those, think](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=11.538461538461538) [about what machine learning does. The core](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=15.307692307692307) [thing machine learning does is finds](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=19) [patterns in data. It then uses those](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=22) [patterns to predict the future. Some](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=25.5) [examples, you could use machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=28.5) [to detect credit card fraud. Suppose you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=31.5) [have data about previous credit card](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=34.94117647058823) [transactions. You could find patterns in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=37.76470588235293) [that data potentially. That will let you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=40.588235294117624) [detect when a new credit card transaction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=43.75) [is likely to be fraudulent. Or, maybe you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=46.8125) [want to determine whether a customer is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=50.3125) [likely to switch to a competitor. Again,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=53.375) [you could possibly find patterns in the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=56.470588235294116) [existing customer data that will help you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=59.76470588235293) [do that. Or, maybe you want to decide when](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=63.05882352941174) [it's time to do preventive maintenance on](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=66.67647058823525) [a factory robot. Once again, you could](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=69.3529411764705) [look at existing data, you can find](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=72.11904761904759) [patterns that predict when a robot is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=74.95238095238088) [going to fail. There are lots more, but](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=77.78571428571416) [the core idea is that machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=81.22222222222221) [lets you find patterns in data, then use those patterns to predict the future.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=0&mode=live&start=84.33333333333331)

[Finding Patterns](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live)

[Let's take a step back. What does it mean](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=1.0205) [to learn? For example, how did you learn](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=5.47313157894737) [to read? Well, learning requires](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=9.431026315789476) [identifying patterns. In reading, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=12.2205) [instance, you identify letters, and then](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=15.220499999999998) [the patterns of letters together to form](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=18.820500000000003) [words. You then had to recognize those](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=22.4205) [patterns when you saw them again. That's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=25.9205) [what learning means, just as when you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=29.28892105263158) [learn to read. And that's what machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=31.86786842105263) [learning does with data that we provide.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=34.44681578947366) [So, for example, suppose I have data about](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=37.634785714285705) [credit card transactions. Suppose I have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=41.69827777777777) [only four records, each one has three](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=44.364944444444426) [fields; the customer's name, the amount of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=47.476055555555526) [the transaction, and whether or not it was](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=50.72050000000001) [fraudulent. What's the pattern that this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=54.45383333333336) [data suggests for fraudulent transactions?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=57.920500000000004) [Well, it's obvious, isn't it? If the name](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=60.9205) [starts with P, they're a criminal. Well,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=64.34907142857143) [probably not. The problem with having so](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=67.32050000000001) [little data is that it's easy to find](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=70.12050000000005) [patterns, but it's hard to find patterns](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=73.3205000000001) [that are correct, correct in the sense](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=76.25383333333333) [that they are predictive, they help us](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=79.36494444444443) [understand whether a new transaction is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=82.47605555555553) [likely to be fraudulent. So suppose I have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=85.69827777777779) [more data. Now I have more records and I](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=88.96397826086957) [have more fields in each one, now I know](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=91.31180434782608) [where the card was issued, where it was](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=93.6596304347826) [used, the age of the user. Now what's the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=98.12049999999996) [pattern for fraudulent transactions? Well,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=103.52049999999991) [turns out that if you look at that, there](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=106.21461764705883) [really is a pattern in this data. It is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=108.86167647058826) [that a transactions is fraudulent if the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=111.55686363636363) [cardholder is in their 20s, if the card is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=113.78413636363632) [issued in the USA, and used in Russia, and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=116.64777272727264) [the amount is more than $1000. You could](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=119.8941842105263) [have found that pattern, I bet, if you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=123.05207894736839) [looked at this data for a little while.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=126.28413636363638) [But once again, do we know that that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=129.73868181818187) [pattern is truly predictive? Probably not.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=133.19322727272737) [We don't have enough data. To do this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=135.86786842105266) [well, you'd have enough data that people](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=139.6573421052633) [just can't find the patterns. You have to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=142.9731315789476) [use software. That's where machine learning comes in.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=1&mode=live&start=149.9205)

[Machine Learning in a Nutshell](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live)

[Machine learning in a nutshell looks like](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=0.854555555556) [this. You start with data that contains](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=4.354555555556001) [patterns. You then feed that data into a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=7.854555555556001) [machine learning algorithm, it'd be more](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=11.687888888889335) [than one, that finds patterns in the data.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=14.545031746032192) [This algorithm generates something called](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=18.354555555556) [a model. A model is functionality,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=20.854555555556) [typically code, that's able to recognize](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=23.854555555556) [patterns when presented with new data.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=26.88396732026188) [Applications can then use that model by](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=30.060437908497164) [supplying new data to see if this data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=33.76632026143834) [matches known patterns, such as supplying](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=37.854555555556) [data about a new transaction. The model](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=40.854555555556) [can return a probability of whether this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=44.354555555556) [transaction is fraudulent. It knows that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=47.854555555556) [because of the patterns. Machine learning in a nutshell.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=2&mode=live&start=52.354555555556)

[Why Is Machine Learning So Hot Right Now?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live)

[[Autogenerated] Why's machine learning so](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=1.24) [hot right now? Well, there are several](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=2.59) [reasons. Ah, big one is that doing the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=5.6) [shell learning well requires lots of data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=8.23) [which more and more we have. We live in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=11.64) [the big data era, right? It requires lots](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=14.13) [of compute power, which Maur and more we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=17.35) [have. We live in the cloud air and it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=20.17) [requires effective machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=24.25) [algorithms which more? More we have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=26.6) [because we have seen researchers spend](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=30.09) [years decades in this space lording what](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=32.41) [works. All of these things are now Maura](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=36.51) [available than ever. And that's a big](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=40.37) [reason why machine learning is so hot](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=43.31) [today. Who's interested? Machine learning?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=46.22) [Well, you can think about three groups of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=52.64) [people who care about this topic. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=56.01) [first is business leaders. They want](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=59.75) [solutions to business problems, things](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=62.57) [I've described so far, fraudulent](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=65.54) [transactions, deciding where the customers](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=67.77) [are gonna switch or not. All these things](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=70.2) [these air business problems, good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=72.33) [solutions have real business value. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=74.91) [other organizations do things faster,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=78.51) [better, cheaper, and so business leaders](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=80.29) [really want those solutions. This is a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=83.31) [good thing because business leaders also](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=86.82) [have the money to pay for those solutions.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=89.16) [Very important software developers also](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=91.7) [care about this because they want to build](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=95.88) [better applications. And, as we saw,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=98.58) [applications can rely on models.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=101.9) [Creativity in machine learning to make](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=104.36) [better predictions. If you're a software](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=106.94) [developer, machine learning can help you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=109.22) [build smarter APS, even if you're not the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=111.95) [one who creates the models, you can just](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=115.34) [use the models and the third category of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=117.59) [people who are really involved in this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=121.95) [space, called data scientists who want](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=123.65) [powerful, easy to use tools. Obvious](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=127.02) [question here. What is a data scientist?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=130.84) [The answer generally is it's someone who](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=134.77) [knows about three things. Statistics,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=137.78) [machine learning software and how to write](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=140.92) [code typically and ideally AH, problem](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=143.77) [domain such as credit card transaction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=148.2) [fraud or robot preventive maintenance or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=151.62) [some other area. There are key things to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=155.94) [know about data scientists First, good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=160.56) [ones were scarce. Second, unsurprisingly,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=164.62) [good ones are expensive. And the reason is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=168.97) [if you can solve important business](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=173.11) [problems with machine learning, you can](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=175.17) [save a lot of money. There's really](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=177.71) [business value there. And so good data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=180.12) [Scientists who know all three of these](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=183.12) [things statistics, machine learning and a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=186.09) [problem domain can have enormous value.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=187.97) [That's why right now that commands](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=192.14) [substantial salaries are often hard to keep in your employ](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=3&mode=live&start=193.94)

[The Ethics of Machine Learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live)

[[Autogenerated] Like most technologies,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=3.79) [machine learning can raise ethical issues.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=5.51) [But the ethics of machine learning are](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=8.34) [really important. It's critical to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=10.44) [understand what some of the possible](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=12.58) [pitfalls are here. Recall the basic model.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=14.82) [We start with data. We processed that data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=19.34) [using machine learning algorithms to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=22.82) [produce a model. Great the venues that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=24.87) [model to make decisions. But what happens](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=28.44) [if the data is biased? For example, think](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=32.85) [about bank lending. Suppose we create a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=37.03) [model to decide whether or not somebody](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=40.59) [should get alone. But suppose the data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=43.22) [that we used to create that model is from](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=45.98) [historic loan patterns and suppose that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=49.04) [data contains \_\_\_\_\_\_ bias. If that's the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=52.06) [case, our model will also contain that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=55.54) [\_\_\_\_\_\_ bias. And we might not even know it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=58.81) [because the data could be so large that we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=62.15) [couldn't see the bias ourselves. I think](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=64.64) [about this. Suppose you got a model for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=68.42) [doing bank landing, and someone accuses](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=71.57) [you of having a bias model. How can you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=74.04) [explain the model decision? It's important](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=77.94) [to realize that models generated by](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=82.01) [machine learning are different from other](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=84.95) [kinds of software. Traditional software is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=87.4) [written directly by people who could work](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=90.54) [out in great detail exactly what the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=92.86) [software does, if you need to. Somebody](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=94.74) [could look at that code directly to figure](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=98.09) [out why it behaves in a certain way with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=100.49) [the model, though models are generated by](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=103.88) [the machine learning process. As I've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=106.57) [shown you, that process commonly uses](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=108.21) [complex statistical techniques, and the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=111.76) [result is an ordinary computer code. You](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=114.46) [can't just look at it to see why it's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=117.4) [doing what it's doing. The point is that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=119.11) [some kinds of models can be very hard to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=122.18) [explain, and there are scenarios where you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=124.46) [might be required legally required to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=127.52) [explain your model. It's important to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=131.04) [realize this and to realize this could be](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=133.54) [a real concern with machine learning. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=135.62) [ethics of machine learning are a very important issue to be aware of.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=4&mode=live&start=139.5)

[The Main Points](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live)

[[Autogenerated] the main points are these.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=3.17) [First machine learning lets us find](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=5.84) [patterns in existing data, then create and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=9.07) [use a model that recognizes those patterns](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=12.19) [in new data. Machine learning has gone](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=15.5) [mainstream. Lots of organizations use it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=18.85) [today in lots of different ways, although](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=21.52) [it raises ethical concerns. The most](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=25.64) [important point, though, is this. It is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=29.77) [that she learning can probably help your organization.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m2&clip=5&mode=live&start=32.88)

[The Machine Learning Process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live)

[Getting Started](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live)

[Understanding machine learning means](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=0) [understanding the machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=3.5555555555555554) [process, and the machine learning process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=7.1111111111111125) [is iterative. You repeat things over and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=10.368421052631575) [over, in both big and small ways. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=13.68421052631578) [machine learning process also is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=17.470588235294116) [challenging, typically. It's rarely easy,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=19.823529411764696) [and the reason is that you're working with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=22.176470588235276) [what are often large amounts of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=25.705882352941174) [potentially complex data, and you're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=27.823529411764696) [trying to find patterns, meaningful](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=29.58823529411763) [patterns, predictive patterns, in this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=31.636363636363637) [data. This can be hard. It's why we work](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=34.818181818181806) [with specialists, it's why data scientists](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=39.72222222222223) [are often so important to machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=42.30555555555557) [projects. And finally, the machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=45.31944444444447) [learning process is often rewarding. As](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=47.75) [I've said, the benefits of success here](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=50.75) [can be substantial. But not always. It's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=54.25) [always possible that you will fail; be](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=57.25) [aware of that. This process is worth doing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=59.875) [in many, many cases, but it doesn't always succeed.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=0&mode=live&start=66)

[Asking the Right Question](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live)

[The first problem you face in the machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=1.6884333333333) [learning process is deciding what question](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=5.1884333333333) [to ask. Asking the right question is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=7.8134333333333) [really important. In fact, it's fair to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=11.056854385964876) [say that choosing what question to ask is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=14.37264385964908) [the most important part of the process.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=18.021766666666633) [And the reason why this is true is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=20.355099999999958) [probably obvious. It's that if you ask the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=23.021766666666615) [wrong question, you won't get the answer](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=25.9384333333333) [you care about. Choosing what question to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=28.5634333333333) [ask is really important, and then you've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=31.288433333333295) [got to ask yourself, do you have the right](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=34.088433333333285) [data to answer this question? Maybe, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=37.6884333333333) [example, the question you want to ask is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=40.13843333333331) [how can I predict whether a credit card](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=42.93843333333332) [transaction is going to be fraudulent?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=45.63580175438594) [Well, maybe it's the case that the most](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=47.53053859649121) [predicted piece of data for doing this is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=50.05685438596491) [whether the customer is a homeowner or a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=53.08843333333329) [renter. Or maybe it's how long they live](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=56.28843333333328) [at a current address. You might not have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=59.233887878787826) [this data, and you won't know this until](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=62.142978787878704) [some later point, if ever. So you want to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=65.02176666666662) [ask yourself, do you think you have the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=68.02176666666658) [right data to answer this question?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=70.68843333333321) [Because if you don't, you won't get an](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=72.97414761904759) [answer you like. You also want to ask](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=76.40271904761903) [yourself this, do you know how you'll](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=80.54557619047614) [measure success? Because ultimately what](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=84.54557619047613) [you're going to get is a model that makes](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=87.0730487179487) [predictions. How good must those](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=91.2268948717949) [predictions be to make this entire process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=93.82176666666662) [qualify as a success? For example, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=97.55509999999994) [credit card transactions, if you find that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=101.2766686274509) [you're accurate about fraud prediction in,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=104.98255098039199) [say, 8 out of 10 cases, is that good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=108.15902156862721) [enough? How about 6 out of 10? Do you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=111.2338878787875) [demand 9 out of 10? How do you decide?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=114.09752424242382) [Knowing this up front is important,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=119.688433333333) [because if you don't, you will never know when you're done.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=1&mode=live&start=125.688433333333)

[Illustrating the Machine Learning Process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live)

[Let's look at the machine learning process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=1.8688000000003) [in a little more detail. To start, you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=4.202133333333634) [choose the data that you want to work](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=6.8233454545457555) [with. You often are going to work with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=9.368800000000302) [domain experts in the area to do this,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=11.914254545454849) [people who know a lot about, say,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=14.813244444444747) [transaction fraud or robot failure](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=17.53546666666697) [detection, or whatever problem you're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=19.479911111111416) [trying to solve. These are the ones who](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=21.392609523809817) [know what data is most likely to be](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=24.440228571428854) [predictive. But the data you start with,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=27.48784761904789) [the raw data, is almost never in the right](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=30.1188000000003) [form. It has duplicates, it has missing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=33.4938000000003) [data, it has extra stuff. Typically you've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=36.33938823529443) [got to apply some pre-processing to that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=39.221741176470914) [data, and machine learning products](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=42.268800000000304) [commonly provide a variety of data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=44.60213333333365) [pre-processing modules to do this. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=47.40213333333366) [result is some prepared data, data that's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=50.11880000000031) [been worked on to be more appropriate as](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=53.26880000000033) [an input for machine learning. Do you do](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=56.8688000000003) [this just once? Oh, no. You commonly](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=59.94572307692339) [iterate until the data is ready. The truth](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=62.757688888889184) [here is that in typical machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=66.31324444444473) [projects, you'll spend most of your time](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=69.42435555555583) [right here, working on the data, getting](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=72.44022857142889) [it ready, getting it clean, getting it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=75.4402285714289) [prepared. Once you have that data, you can](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=78.44022857142892) [then begin applying learning algorithms to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=81.66880000000035) [the data. And again, machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=84.06880000000038) [products commonly provide a number of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=87.33033846153876) [machine learning algorithms. The result of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=91.02264615384644) [this is a model, but is it your final](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=94.20213333333359) [model? No. It's a candidate model. Is the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=98.20213333333345) [first model you create the best one?](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=101.5003789473684) [Almost certainly not, and you can't know](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=103.71090526315784) [that until you've produced several, and so](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=105.92143157894728) [once again, you iterate. As I said before,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=109.1188) [this process is iterative. You do this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=113.6188) [until you have a model that you like, that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=117.06880000000001) [you think is good enough to actually](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=120.66880000000006) [deploy. Once you deploy the model,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=123.4688000000001) [applications can now make use of it. So,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=126.64657777777778) [there's iteration at small levels, as you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=131.09102222222216) [can see here, and there's also iteration](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=134.6188) [at the largest level. You've got to repeat](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=137.31324444444445) [the entire process over and over, you've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=140.8688000000001) [got recreate your model regularly. Why is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=143.9799111111113) [that? It's because the world changes, and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=146.9740631578948) [so you need to keep your model up-to-date](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=149.9214315789475) [with reality. That might mean processing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=153.40213333333332) [new data or new algorithms or something](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=156.6021333333333) [else. But recognize that you need to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=160.33546666666663) [recreate your model regularly. This](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=166.8688) [process is iterative at both small and large scales.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=2&mode=live&start=171.8688)

[Example Machine Learning Scenarios](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live)

[[Autogenerated] to put all of this in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=2.24) [context, let's walk through a few](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=3.07) [scenarios illustrating how you might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=5.33) [actually use machine learning. Let's start](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=8.18) [with the example I've been using](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=11.45) [throughout this course detecting credit](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=13.43) [card fraud. Suppose you have some number](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=15.67) [of credit card customers who are supplying](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=18.63) [their credit cards to sum payment](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=21.38) [application. Maybe it's a point of sale](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=23.65) [terminal at a grocery store, and they're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=26.77) [providing Visa or MasterCard. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=29.51) [challenge is to work out which of those](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=32.26) [transactions the application should reject](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=33.89) [because they're like, be fraudulent. To do](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=35.95) [this as we've seen, we could start with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=38.94) [historical transaction data, run that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=41.83) [through the machine learning process and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=44.85) [get a model that the application can call](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=47.22) [to make this decision simple,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=50.83) [straightforward. Here's a slightly more](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=53.54) [complex city area. Suppose your problem is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=58.7) [predicting customer churn. Imagine that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=62.68) [your mobile phone company, for example,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=66.04) [you got customers who call into a call](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=68.24) [center whose staff relies on some call](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=71.22) [centre application. Here's what you want](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=74.23) [to do for each caller. You want the call](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=76.83) [center staff to be able to figure out how](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=80.91) [likely that customer is to churn that is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=84.02) [switched to a competitors. There's real](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=88.35) [value here because you might offer a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=90.9) [customer who's about to switch a better](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=94.49) [deal than one who's loyal. There's a real](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=96.46) [business value in doing this, and it might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=99.92) [seem like magic. But in fact, machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=101.78) [learning can help with this, at least in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=105.05) [some cases for mobile phone company, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=106.49) [example, they have lots of very detailed](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=109.77) [call data about their customers. Imagine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=112.91) [that in this case that data is just too](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=117.14) [for detailed, and so they create on](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=119.57) [application toe aggregate it. And that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=122.74) [application might use some big data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=125.56) [technology like Hadoop or Spark or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=127.68) [something else. The phone company might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=129.87) [then combine this area to call data with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=133.31) [other data, such as data from their CR M](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=137.58) [system to actually create the data that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=140.76) [machine learning wants to use. That's very](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=143.91) [common. It's common to use data from](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=146.84) [different sources as input to the machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=149.13) [learning process. The result is a model](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=152.27) [that the call center application can use](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=156.24) [to make good estimations of whether or not](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=159.36) [a given customer is going to turn. This is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=162.76) [a really example. Firms really do this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=166.6) [today, and it has really value. It also](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=168.93) [illustrates another important thing, which](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=171.56) [is that machine learning is commonly used](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=173.99) [in concert with other data technologies.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=177.18) [In this case, it's Hadoop or Spark, or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=181.04) [something like that. There could be others](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=183.69) [as well. And here's one more scenario.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=185.5) [Suppose you got a bunch of devices,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=191.64) [robots, former stats, whatever that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=194.09) [generate. Lots of streaming data that's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=197.65) [being handled by some kind of real time](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=200.31) [data processing software. That software is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=202.93) [looking for anomalies or patterns that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=206.78) [predict imminent failure. When it finds](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=210.34) [these things, it contacts some](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=213.45) [application, which then notifies business](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=215.96) [users to take action, such as performing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=218.63) [proactive maintenance. Well, the obvious](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=221.58) [question is, how does that really time](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=224.43) [data processing software know what to look](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=226.8) [for? How could it tell when the device is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=229.54) [about to fail, for example? Well, the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=233.31) [answer could well be that you've got a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=236.19) [historical database from the data these](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=238.63) [devices have produced already. You use](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=242.27) [that data as input to machine learning and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=245.62) [create a model that the real time data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=249.68) [processing software can use once again.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=252.82) [Ah, pragmatic solution to a very real](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=256.38) [problem that depends on good data and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=258.83) [machine learning. There are many other](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=261.85) [ways that machine learning is used, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=266.84) [example. But she learning underlies the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=269.53) [recommendation engines that you see in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=272.38) [video sites, shopping sites and so on the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=275.65) [software that recommends other things you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=278.6) [might like if you've purchased this or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=280.29) [watch this or whatever. But she and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=282.37) [learning also underlies much of modern](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=286.02) [speech recognition. This wasn't true](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=289.28) [originally, but machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=291.66) [approaches turn out to be very effective](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=293.52) [at doing speech recognition. Similarly,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=296.24) [Monsieur Learning underlies language](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=300.09) [translation. Things like Google translate](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=301.85) [and well, more important example is facial](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=306.62) [recognition. Machine learning is very good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=309.57) [at creating software that recognizes faces](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=312.98) [now recall. I mentioned earlier that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=316.11) [machine learning can bring some serious](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=317.91) [ethical issues. This is an area where](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=320.06) [that's exactly true. Facial recognition](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=322.68) [well, very useful in some circumstances](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=325.99) [can also be great for surveillance. And](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=328.37) [there are plenty of people who don't much](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=331.13) [like the idea of living in a country where](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=332.94) [that is ubiquitous. The point is, this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=335.89) [approach to building software is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=339.92) [incredibly useful. It has been, is being](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=342.09) [used in all sorts of ways expected to be used and lots more going forward](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=3&mode=live&start=345.8)

[The Main Points](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live)

[The machine learning process begins when](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=2.7221777777783) [you ask the right question. You then need](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=5.449450505051026) [to choose the right data to answer that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=8.985335672515141) [question, and get that data into good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=12.353756725146717) [shape. So I mentioned earlier, this part](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=15.301125146199345) [of the process typically takes a majority](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=18.3471777777783) [of the time. Once you have the right](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=21.4096777777783) [prepared data, you iterate on that data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=24.626939682540197) [until you have a model that makes good](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=27.293606349206854) [predictions. You then periodically rebuild](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=30.34122539682589) [that model, because you want to reflect](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=32.4721777777783) [the world as it is. And, of course, you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=35.5346777777783) [deploy the model. If it can't be used,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=38.96027301587354) [this is just a science project, so](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=41.43646349206402) [deploying the model is a very important](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=43.60313015873069) [part of the process. In the next module,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=46.504786473430485) [we'll look in more detail at the machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=50.15696038647398) [learning process. There's more you need to know, so don't go away.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m3&clip=4&mode=live&start=53.80913429951748)

[A Closer Look at the Machine Learning Process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live)

[Getting Started](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live)

[It's time we took a closer look at machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=0) [learning. In this last module, I want to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=4.5) [talk about machine learning concepts in a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=8.071428571428571) [somewhat more detailed way. I also want to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=10.571428571428575) [use the terminology that a machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=13.714285714285715) [learning person would use. So, we're going](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=16.28571428571429) [to talk about training data. We're going](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=18.500000000000004) [to talk about supervised and unsupervised](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=21.181818181818187) [learning. We're going to look at how we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=24.454545454545467) [classify machine learning problems and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=27.153846153846146) [algorithms. I'll discuss training a model,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=28.69230769230768) [which actually means something very](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=31.142857142857135) [simple, as you'll see. We'll look at](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=33.28571428571428) [testing a model, and finally, we'll talk just a little more about using a model.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=0&mode=live&start=38)

[Some Terminology](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live)

[The first thing we need to do is walk](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=2.8078) [through some terminology. Like most](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=6.123589473684209) [fields, machine learning has its own](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=7.965694736842103) [unique jargon, which you must understand.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=10.341133333333334) [Let's start with the idea of training](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=13.541133333333333) [data. Training data just means the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=17.27446666666667) [prepared data that's used to create a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=20.5001076923077) [model. So rather than prepared data, I](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=24.26933846153848) [will from now on refer to training data.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=26.950657142857146) [Why is it called training data? Because in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=29.8078) [the jargon of machine learning, creating a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=32.91891111111111) [model is called training a model. So,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=35.64113333333331) [training data is used to train to create a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=39.379228571428584) [model. Also, there are two big broad](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=45.1649428571429) [categories of machine learning. One is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=49.40780000000001) [called supervised learning, and what it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=53.00780000000002) [means is that the value you want to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=56.14113333333333) [predict is actually in the training data.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=59.69668888888887) [For instance, in the example I've been](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=62.8078) [using of data for predicting credit card](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=65.75516842105262) [fraud, whether or not a given transaction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=68.70253684210523) [was fraudulent is actually contained in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=72.00779999999999) [each record. That data in the jargon of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=75.60779999999995) [machine learning is labeled, and so we're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=79.14113333333331) [doing what's called supervised learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=81.86335555555551) [when we try to predict whether a new](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=83.8078) [transaction is fraudulent. The](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=88.17143636363637) [alternative, unsurprisingly, is called](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=90.3078) [unsupervised learning, and here the value](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=92.3078) [you want to predict is not in the training](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=95.3078) [data. The data is unlabeled. Both](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=99.70779999999998) [approaches are used, but it's fair to say](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=102.55779999999994) [that the most common approach is supervised learning.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=1&mode=live&start=106.3577999999999)

[Data Pre-processing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live)

[The machine learning process starts with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=3.064077777778) [data. It might be relational data, it](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=5.397411111111334) [might be from a NoSQL database, it might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=8.119633333333558) [be binary data. Wherever it comes from,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=11.264077777778) [though, you need to read this raw data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=14.064077777778003) [into some data preprocessing modules](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=17.264077777778) [typically chosen from the things your](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=19.91023162393185) [machine learning technology provides. You](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=23.60253931623955) [have to do this because raw data is very](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=26.427714141414363) [rarely in the right shape to be processed](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=29.700441414141633) [by machine learning algorithms. As I said](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=32.60953232323254) [earlier, you'll spend lots of your time,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=35.11407777777801) [often the majority of your time, in a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=37.56407777777802) [machine learning project on this aspect of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=40.36407777777803) [the process. For example, maybe there are](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=43.28630000000022) [holes in your data, missing values, or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=46.39741111111132) [duplicates, or maybe there's redundant](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=49.39741111111134) [data where the same thing is expressed in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=51.06407777777802) [two different ways in different fields, or](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=53.7307444444447) [maybe there's information that you know](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=56.23074444444466) [will not be predictive, it won't help you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=58.564077777777975) [create a good model. You want to deal with](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=61.67518888888906) [all of these issues. The goal is to create](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=65.85355146198853) [training data. The training data, as we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=70.11670935672537) [saw in my simple example earlier, commonly](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=72.8497920634923) [has columns. Those columns are called](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=75.34979206349233) [features. So, for example, in the simple](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=77.61963333333354) [illustration I showed of data for credit](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=80.34185555555574) [card fraud, there were columns containing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=83.064077777778) [the country the card was issued in, the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=84.95881461988323) [country was card was used in, the amount](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=87.48513040935687) [of the transaction. Those are all features](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=90.376577777778) [in the jargon of machine learning. And](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=93.439077777778) [because we're talking now about supervised](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=96.50852222222244) [learning, the value we're trying to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=99.1751888888891) [predict, such as whether a given](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=101.84185555555575) [transaction is fraudulent, is also in the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=104.564077777778) [training data. In the jargon of machine learning, we call that the target value.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=2&mode=live&start=108.064077777778)

[Categorizing Machine Learning Problems](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live)

[It's common to group machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=1.5) [problems into categories. There are lots](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=3.83997647058847) [of categories, but three of them show up](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=6.17995294117694) [an awful lot. One of those is the category](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=9.415647619048286) [called regression. The problem here is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=13.272790476191146) [that we have data, and we'd like to find a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=15.695150724638351) [line or a curve that best fits that data.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=19.608194202899213) [Regression problems are typically](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=23.129933333334) [supervised learning scenarios, and an](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=25.129933333334) [example question would be something like,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=27.629933333334) [how many units of this product will we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=30.713266666667334) [sell next month? A second category of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=35.37993333333401) [machine learning problems is called](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=39.52993333333401) [classification. Here we have data that we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=42.529933333334014) [want to group into classes, at least two,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=45.79660000000066) [sometimes more than two. When new data](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=49.3521555555562) [comes in, we want to determine which class](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=52.52993333333401) [that data belongs to. This is commonly](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=56.263266666667356) [used with supervised learning, and an](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=59.329933333334) [example question would be something like,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=61.72993333333399) [is this credit card transaction](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=64.129933333334) [fraudulent? The example I've been using](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=66.629933333334) [throughout this course fits here. Because](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=69.629933333334) [when a new transaction comes in, we want](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=72.60361754386031) [to predict which class it's in, fraudulent](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=76.39309122807083) [or not fraudulent. And often what you'll](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=79.70888070175504) [get back is not yes or no, but a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=83.04297681159487) [probability of which class this new](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=87.34732463768184) [transaction might be in. A third category](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=90.21688985507315) [on machine learning problems is commonly](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=93.49356969697035) [called clustering. Here we have data, we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=96.22084242424307) [want to find clusters in that data. This](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=99.30384637681227) [is a good example of when we're going to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=102.78210724637752) [use unsupervised learning, because we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=106.69515072463842) [don't have labeled data. We don't know](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=109.129933333334) [necessarily what we're looking for. An](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=112.629933333334) [example question here is something like,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=115.67160000000067) [what are our customer segments? We might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=118.9216000000007) [not know these things up front, but we can](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=122.27699215686341) [use machine learning, unsupervised machine learning, to help us figure that out.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=3&mode=live&start=125.1887568627458)

[Styles of Machine Learning Algorithms](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live)

[[Autogenerated] the kinds of problems that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=3.84) [machine learning addresses aren't the only](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=5.11) [thing that can be categorized. It's also](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=7.26) [useful to think about the styles of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=9.98) [machine learning algorithms that are used](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=11.93) [to solve those problems. For example,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=14.38) [there are regression algorithms, which are](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=17.84) [good option for regression problems. There](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=20.31) [are decision trees, which are sometimes](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=23.6) [group together into decision forests,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=25.95) [their own neural networks, which imitate](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=29.34) [in some ways how the brain works. One](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=31.72) [particular way of using neural networks is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=34.85) [known as deep learning, something you](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=37.43) [might have heard of. They're also Beijing](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=39.34) [algorithms that use based serum to work of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=42.89) [probabilities. And there are K means](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=45.62) [algorithms that are used for clustering.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=48.32) [They're also lots more. The details of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=51.04) [these algorithms are way outside the scope](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=54.72) [of this course. They get complicated fast,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=57.33) [but having some broad sense of what the styles are is useful](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=4&mode=live&start=60.54)

[Training and Testing a Model](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live)

[Let's take a closer look at the process of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=1.5) [creating a model, of training a model. We](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=5.1168375000005435) [start with our training data, which we've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=8.402155555556522) [worked with until it's beautiful,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=11.707711111112072) [pristine, just what we need. Because we're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=14.06882222222318) [using supervised learning, the target](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=17.4299333333343) [value is part of the training data. In the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=19.9299333333343) [case of the credit card example, for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=23.874377777778744) [instance, that target value is whether a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=25.429933333334294) [transaction is fraudulent or not. Our](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=26.985488888889844) [first problem is to choose the features](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=29.611751515152488) [that we think will be most predictive of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=33.42993333333431) [that target value. For example, in the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=37.793569696970685) [credit card case, maybe we decide that the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=40.903617543860626) [country in which the card was issued, the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=43.850985964913285) [country it's used in, and the age of the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=46.864715942029946) [user are the most likely features to help](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=50.777759420290785) [us predict whether it's fraudulent. We've](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=54.256020289855975) [chosen, let's say, features 1, 3, and 6 in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=56.89147179487276) [our training data. We then input that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=61.045317948718896) [training data into our chosen learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=64.61175151515248) [algorithm. But notice this. We only send](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=67.88447878787976) [in 75%, say, of all the data for the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=71.4299333333343) [features we've chosen. Why is that? I'll](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=75.9299333333343) [tell you in a minute. But first, think](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=79.14421904762003) [about this. How do we decide which](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=82.57279047619147) [features were most predictive, and how do](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=85.78287450980488) [we choose a learning algorithm? There are](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=89.0769921568637) [lots of options as we've seen. The answer](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=92.1299333333343) [is, if it's a simple problem, or maybe our](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=94.92993333333425) [technology is simple for machine learning,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=98.0799333333342) [the choices can be limited, not too hard.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=100.3530102564111) [If we have a more complex problem, though,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=103.429933333334) [with lots of data and a powerful machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=106.37730175438661) [learning technology with lots of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=109.32467017543921) [algorithms, this can be hard. If we have,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=111.48256491228138) [for example, training data that has, I](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=115.69309122807086) [don't know, how about 100 features, how](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=119.37730175438665) [about 200? Which ones are predictive? How](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=122.70266060606127) [many should we use? 5, 10, 50? The answer](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=125.87437777777845) [is this is what data scientists are for.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=129.8743777777785) [This is why people who have knowledge and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=133.429933333334) [facility with these technologies, as well](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=137.429933333334) [as domain knowledge about some particular](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=140.429933333334) [problem, are so valuable. It's because](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=143.429933333334) [they can help us do this. It can be a hard](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=146.429933333334) [problem. In any case, the result of this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=152.3246701754392) [is to generate a candidate model. The next](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=156.95624912280752) [problem is to work out whether or not this](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=161.229933333334) [model is any good. And so, we do that in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=164.82993333333405) [supervised learning like this. We input](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=169.429933333334) [test data to a candidate model. That test](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=172.429933333334) [data is the remaining 25%, the data we](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=176.32993333333397) [held back for the features we're using, in](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=179.92993333333388) [this case, 1, 3, and 6. We use that data,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=183.5299333333338) [because our candidate model can now](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=187.85850476190532) [generate target values from that test](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=190.42993333333382) [data. But here's the thing. We know what](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=193.00136190476232) [those target values should be, because](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=196.7457228070183) [they are in the training data. All we have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=199.58782807017627) [to do is compare the target values](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=203.57279047619113) [produced by our candidate model from the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=206.2394571428578) [test data with the real target values,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=208.90612380952444) [which are in the training data. That's how](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=211.629933333334) [we could figure out whether or not our](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=214.82993333333405) [model is predictive or not when we're](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=218.0299333333341) [doing supervised learning. Suppose it's](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=222.42993333333393) [not. Suppose our model's just not very](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=225.229933333334) [good. How can we improve it? Well, there](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=228.02993333333404) [are some usual options. One of them is,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=231.179933333334) [maybe we've chosen the wrong features.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=234.179933333334) [Let's choose different ones. How about 1,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=236.429933333334) [2, and 5 this time? Or maybe it's the case](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=238.65720606060668) [that we have the wrong data, let's get](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=241.8390242424248) [some new data, or at least some more](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=244.81454871794935) [example data. Or maybe the problem is the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=248.50685641025697) [algorithm. Maybe it's the case that we can](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=251.64045964912353) [modify some parameters in our algorithm,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=254.58782807017624) [they commonly have them, or choose another](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=256.929933333334) [one entirely. Whatever we do will generate](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=260.429933333334) [another candidate model, and we'll test](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=263.617433333334) [it, and the process repeats. It iterates.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=266.242433333334) [Now, iteration is a fancy way of saying](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=269.3530102564109) [trial and error. So, don't be confused.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=273.04531794871855) [This process is called machine learning,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=276.179933333334) [but notice how much people do. People make](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=278.804933333334) [decisions about features, about](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=282.67437777777843) [algorithms, about parameters. The process](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=285.16326666666725) [is very human, even though it's called machine learning.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=5&mode=live&start=289.029933333334)

[Using a Model](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live)

[[Autogenerated] There's one last thing for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=1.24) [us to talk about, and that's a using a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=3.12) [model. In some ways, this is the most](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=6.1) [important topic of all, because until](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=8.63) [models air used that really have much](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=11.26) [value. An application, for example, can](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=13.53) [call a model, providing values for the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=17.3) [features the Mahler requires. Remember,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=20.5) [models make predictions based on the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=24.11) [features that were chosen when the model](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=26.6) [was trained. The Molik then return the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=29.03) [value predicted using these features. That](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=33.27) [value might be whether introduction is](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=37.28) [fraudulent estimated revenue, a list of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=39.56) [movie recommendations or something else.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=42.93) [The point here is that machine learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=45.57) [can help people create better applications.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=6&mode=live&start=48.01)

[Implementing Machine Learning](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live)

[[Autogenerated] the focus of this course](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=4.54) [is on concepts, not implementation of](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=6.05) [machine learning. Still, it's good to have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=8.87) [some basic knowledge of how people](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=11.46) [implement this stuff. So here are a few](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=14.05) [examples. One approach is to create custom](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=16.3) [models in languages like R and Python.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=20.86) [Visit both popular, and they both have](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=25.29) [lots of general machine learning packages](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=27.48) [available. They're also both open source.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=29.99) [Another option is to use somewhat more](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=34.54) [specialized, more focused packages to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=37.38) [create custom models. Among the most well](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=40.18) [known of these is Tensorflow. Tensorflow](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=43.14) [has built in support for deep learning,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=46.18) [which, as I mentioned earlier, uses neural](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=49.14) [networks. Another choice is to rely on the](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=51.23) [cloud service is that we're seeing appear](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=56.86) [for machine learning, such as Amazon Sage](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=59.66) [Maker. These provide complete end end](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=61.96) [solutions, and they let you use other](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=64.95) [things as well, like python and](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=67.04) [tensorflow. And finally, one more](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=68.92) [possibility is to realize that you can use](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=73.27) [machine learning without ever building](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=76.94) [your own model. Turns out there are lots](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=80.36) [of fairly standard problems for which](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=84.02) [predefined models already exist, such as](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=86.85) [those in azure. Cognitive service is if](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=90.18) [you're doing image processing or speech](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=93.84) [recognition or building a recommendations](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=96.16) [engine. You might just be able to use a](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=98.74) [pre existing model provided for you by](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=103.22) [typically a cloud service and not have to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=106.67) [build your own at all. If this is possible, it's generally the best choice.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=7&mode=live&start=109.02)

[Summary](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live)

[[Autogenerated] and that's it. Let me end](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=1.51) [by summarizing the key points. First](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=4.32) [machine learning has come of age. It's no](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=8.64) [longer some technology that's only for](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=11.64) [researchers in faraway labs. Machine](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=14.2) [learning also isn't hard to understand. I](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=17.83) [hope you agree after watching this,](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=20.78) [although it can be hard to do well.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=23.22) [Finally, I said this before, but I want to](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=26.41) [say it again because in some ways it might](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=29.48) [be the most important point. I'm making](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=32.87) [the entire course. It is this. It is that](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=34.97) [machine learning can probably help your](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=38.59) [organization. I'm David Chappelle. Thanks for watching.](https://app.pluralsight.com/player?course=understanding-machine-learning&author=david-chappell&name=understanding-machine-learning-m4&clip=8&mode=live&start=41.23)