1

00:00:00,000 --> 00:00:08,040

I get questions all the time about some

2

00:00:08,040 --> 00:00:09,780

of the new concepts in machine learning

3

00:00:09,780 --> 00:00:12,630

and what they really mean so for example

4

00:00:12,630 --> 00:00:14,969

I get asked what is one hot encoding and

5

00:00:14,969 --> 00:00:16,500

why should I use it it does seem very

6

00:00:16,500 --> 00:00:18,869

inefficient you know that's a great

7

00:00:18,869 --> 00:00:20,850

question so let's take a look at the

8

00:00:20,850 --> 00:00:23,369

answer by digging into some code will

9

00:00:23,369 --> 00:00:25,470

also see how a function called Arg max

10

00:00:25,470 --> 00:00:28,080

complements this perfectly and saves you

11

00:00:28,080 --> 00:00:30,840

a lot of coding here's the popular iris

12

00:00:30,840 --> 00:00:33,329

classification data set where the values

13

00:00:33,329 --> 00:00:36,210

implemented in a JavaScript array you'll

14

00:00:36,210 --> 00:00:37,890

notice that there are five values in

15

00:00:37,890 --> 00:00:39,809

each entry four of which are features of

16

00:00:39,809 --> 00:00:41,879

the iris and the fifth which will be

17

00:00:41,879 --> 00:00:42,750

zero one or two

18

00:00:42,750 --> 00:00:45,270

is the classification the classes are

19

00:00:45,270 --> 00:00:47,969

shown here with iris setosa being zero

20

00:00:47,969 --> 00:00:51,000

iris versicolor being one an iris

21

00:00:51,000 --> 00:00:53,489

virginica being two now this seems to be

22

00:00:53,489 --> 00:00:55,710

a really efficient encoding but when

23

00:00:55,710 --> 00:00:57,750

doing machine learning you often have to

24

00:00:57,750 --> 00:00:59,640

transform this into something that

25

00:00:59,640 --> 00:01:02,190

appears to be less efficient such as one

26

00:01:02,190 --> 00:01:04,760

hot encoding which you can see here and

27

00:01:04,760 --> 00:01:08,340

instead of 0 1 & 2 for the values you

28

00:01:08,340 --> 00:01:10,350

have an array with 3 values in it and

29

00:01:10,350 --> 00:01:12,299

here we've only got three options of

30

00:01:12,299 --> 00:01:14,250

flower if we had more options this array

31

00:01:14,250 --> 00:01:16,860

would be much bigger the index of the

32

00:01:16,860 --> 00:01:18,780

array is set to 1 for the relative

33

00:01:18,780 --> 00:01:21,060

flower so for example for its Atossa

34

00:01:21,060 --> 00:01:22,860

the first element is 1 and everything

35

00:01:22,860 --> 00:01:25,830

else is 0 and for virginica the third

36

00:01:25,830 --> 00:01:27,650

element is 1 and everything else is 0

37

00:01:27,650 --> 00:01:30,750

now this might seem a little strange but

38

00:01:30,750 --> 00:01:32,490

when you consider the neural network

39

00:01:32,490 --> 00:01:34,890

that's doing the classification they're

40

00:01:34,890 --> 00:01:36,960

designed with the number of output nodes

41

00:01:36,960 --> 00:01:39,180

equal to the number of classes that you

42

00:01:39,180 --> 00:01:41,549

want to determine we're picking between

43

00:01:41,549 --> 00:01:43,350

three classes here so I have three

44

00:01:43,350 --> 00:01:46,439

output nodes these three output nodes

45

00:01:46,439 --> 00:01:48,630

will then produce three probabilities

46

00:01:48,630 --> 00:01:51,420

the probability that you match class 0

47

00:01:51,420 --> 00:01:54,090

the probability match class 1 or the

48

00:01:54,090 --> 00:01:56,490

probability in match class 2 so it might

49

00:01:56,490 --> 00:01:57,659

look something like this

50

00:01:57,659 --> 00:02:00,570

so now when training the network we can

51

00:02:00,570 --> 00:02:03,600

train it from matching values ie if the

52

00:02:03,600 --> 00:02:06,659

flowers of classes who we want to train

53

00:02:06,659 --> 00:02:09,289

it with a 0 desired output from neuron 0

54

00:02:09,289 --> 00:02:12,010

0 desired output from neuron

55

00:02:12,010 --> 00:02:14,530

and a one desired output from neuron two

56

00:02:14,530 --> 00:02:17,440

so that's one hard encoding it may not

57

00:02:17,440 --> 00:02:19,090

look efficient from a storage

58

00:02:19,090 --> 00:02:21,879

perspective but it Maps really neatly to

59

00:02:21,879 --> 00:02:24,099

our desired output and thus is very

60

00:02:24,099 --> 00:02:27,010

efficient for training another function

61

00:02:27,010 --> 00:02:29,830

called Arg max is then really handy for

62

00:02:29,830 --> 00:02:32,650

helping you find the desired values so

63

00:02:32,650 --> 00:02:34,569

instead of searching through a list to

64

00:02:34,569 --> 00:02:36,489

find the biggest value it would

65

00:02:36,489 --> 00:02:38,620

transform that list of priorities into

66

00:02:38,620 --> 00:02:41,440

something like this and from there you

67

00:02:41,440 --> 00:02:43,510

can derive the correct class so let's

68

00:02:43,510 --> 00:02:45,069

jump back into the code and we'll see

69

00:02:45,069 --> 00:02:45,870

this in action

70

00:02:45,870 --> 00:02:48,760

here I'm going to evaluate a flower with

71

00:02:48,760 --> 00:02:51,010

the features five point eight two point

72

00:02:51,010 --> 00:02:53,590

seven five point one and one point nine

73

00:02:53,590 --> 00:02:56,590

I know that this is an iris virginica

74

00:02:56,590 --> 00:02:59,200

which is class two but let's see what

75

00:02:59,200 --> 00:03:01,660

the neural network gives me well first

76

00:03:01,660 --> 00:03:03,340

take a look at the raw prediction and

77

00:03:03,340 --> 00:03:05,109

then we'll take a look at the prediction

78

00:03:05,109 --> 00:03:06,670

that's been determined using Arg max

79

00:03:06,670 --> 00:03:09,160

let's run this in the browser when i

80

00:03:09,160 --> 00:03:11,200

refresh the JavaScript will start

81

00:03:11,200 --> 00:03:13,810

executing and here you can see my epochs

82

00:03:13,810 --> 00:03:16,540

and my loss at that epoch it's steadily

83

00:03:16,540 --> 00:03:20,230

decreasing which is good and now I get

84

00:03:20,230 --> 00:03:22,299

my classification and you can see that

85

00:03:22,299 --> 00:03:24,849

has very low probabilities for 0 and 1

86

00:03:24,849 --> 00:03:27,519

and a very high probability for 2 which

87

00:03:27,519 --> 00:03:30,700

is what we'd expect if I then execute

88

00:03:30,700 --> 00:03:34,299

Arg max on this I will get to consider

89

00:03:34,299 --> 00:03:35,980

the amount of code that you would have

90

00:03:35,980 --> 00:03:38,349

to write in this case it's not a lot

91

00:03:38,349 --> 00:03:39,910

with just two classes but if there are a

92

00:03:39,910 --> 00:03:41,109

lot more classes

93

00:03:41,109 --> 00:03:43,209

and you needed to find the biggest you'd

94

00:03:43,209 --> 00:03:45,370

have a lot of coding to do but Arg max

95

00:03:45,370 --> 00:03:47,410

does this for you given that these

96

00:03:47,410 --> 00:03:50,109

values are in a tensor I hope this was a

97

00:03:50,109 --> 00:03:52,389

useful explanation of one heart encoding

98

00:03:52,389 --> 00:03:54,310

and how it complements an Arg max

99

00:03:54,310 --> 00:03:56,799

function these are some of the concepts

100

00:03:56,799 --> 00:03:58,359

that are a bit different when you're

101

00:03:58,359 --> 00:04:00,250

coding for machine learning but they're

102

00:04:00,250 --> 00:04:02,079

incredibly useful and powerful

103

00:04:02,079 --> 00:04:04,989

one harden coding is great because it's

104

00:04:04,989 --> 00:04:06,849

a way of mapping your classes to the

105

00:04:06,849 --> 00:04:08,650

shape that a neural network outputs

106

00:04:08,650 --> 00:04:11,169

values an Arg max is a function that

107

00:04:11,169 --> 00:04:13,720

saves you writing a lot of code to go

108

00:04:13,720 --> 00:04:15,340

over all those values to find the

109

00:04:15,340 --> 00:04:17,829

biggest there's lots of useful functions

110

00:04:17,829 --> 00:04:19,599

and transforms like these intensive flow

111

00:04:19,599 --> 00:04:21,340

and we'll continue to cover them on this

112

00:04:21,340 --> 00:04:22,840

channel so go ahead and hit that

113

00:04:22,840 --> 00:04:25,560

subscribe button now thank you

114

00:04:25,560 --> 00:04:34,769

[Music]