

A wide-angle photograph of a cricket pitch. In the foreground, the stumps are visible, with the brand name 'MATADOR BBQS' printed vertically on the three stumps. A red cricket ball is suspended in the air, just above the stumps. The pitch is marked with white lines, and there are blue lines on the grass on either side of the stumps. In the background, there is a large building with a green roof, and a banner with various advertisements is visible along the edge of the field. The sky is clear and blue.

Line and Length Classifier Using Deep Learning

Explained by Dinuka Fernando

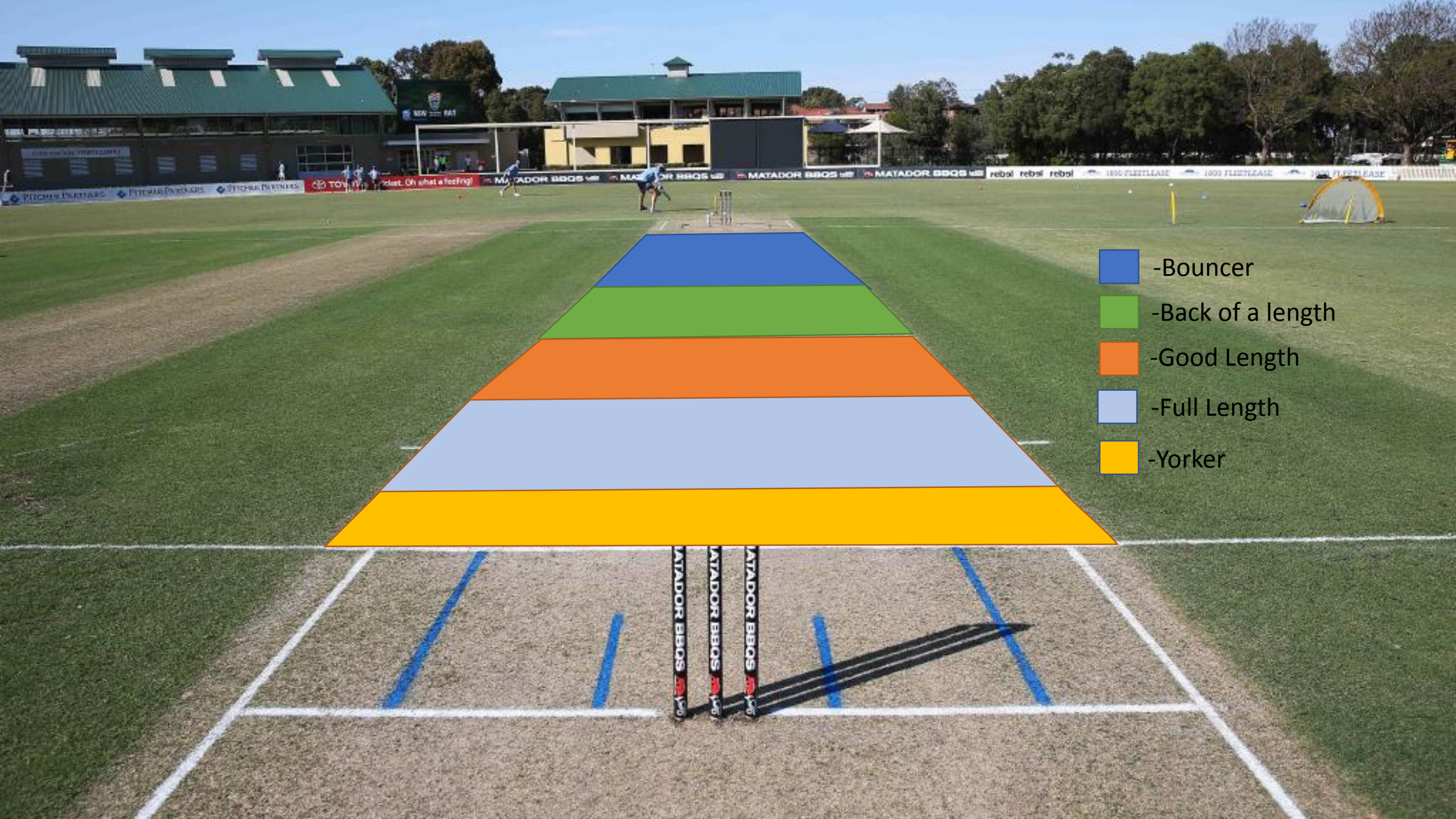


Imagine if you are a right handed batsman facing a fast bowler.

[1][2]

You need to judge the length...





-Bouncer



-Back of a length



-Good Length

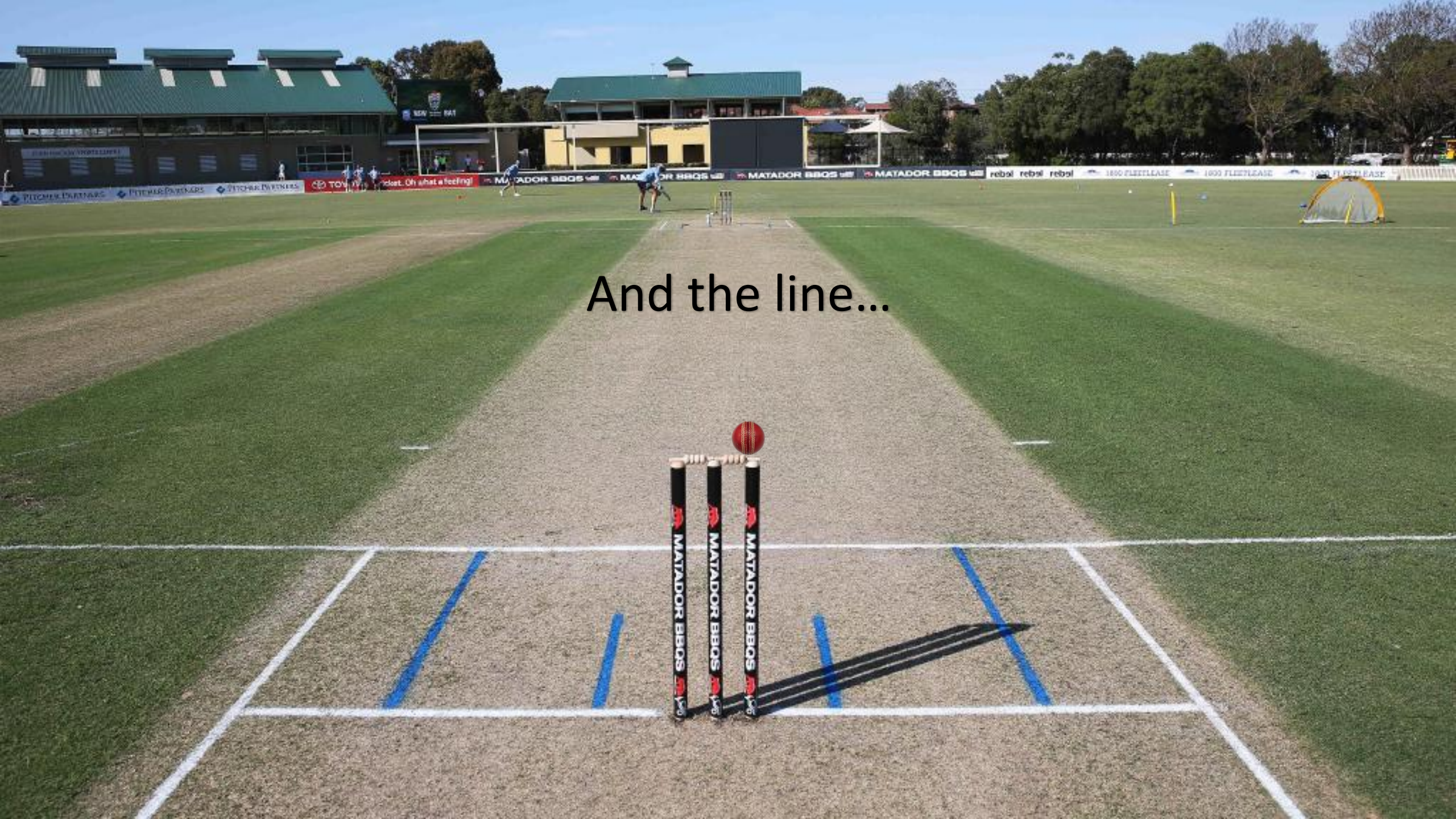


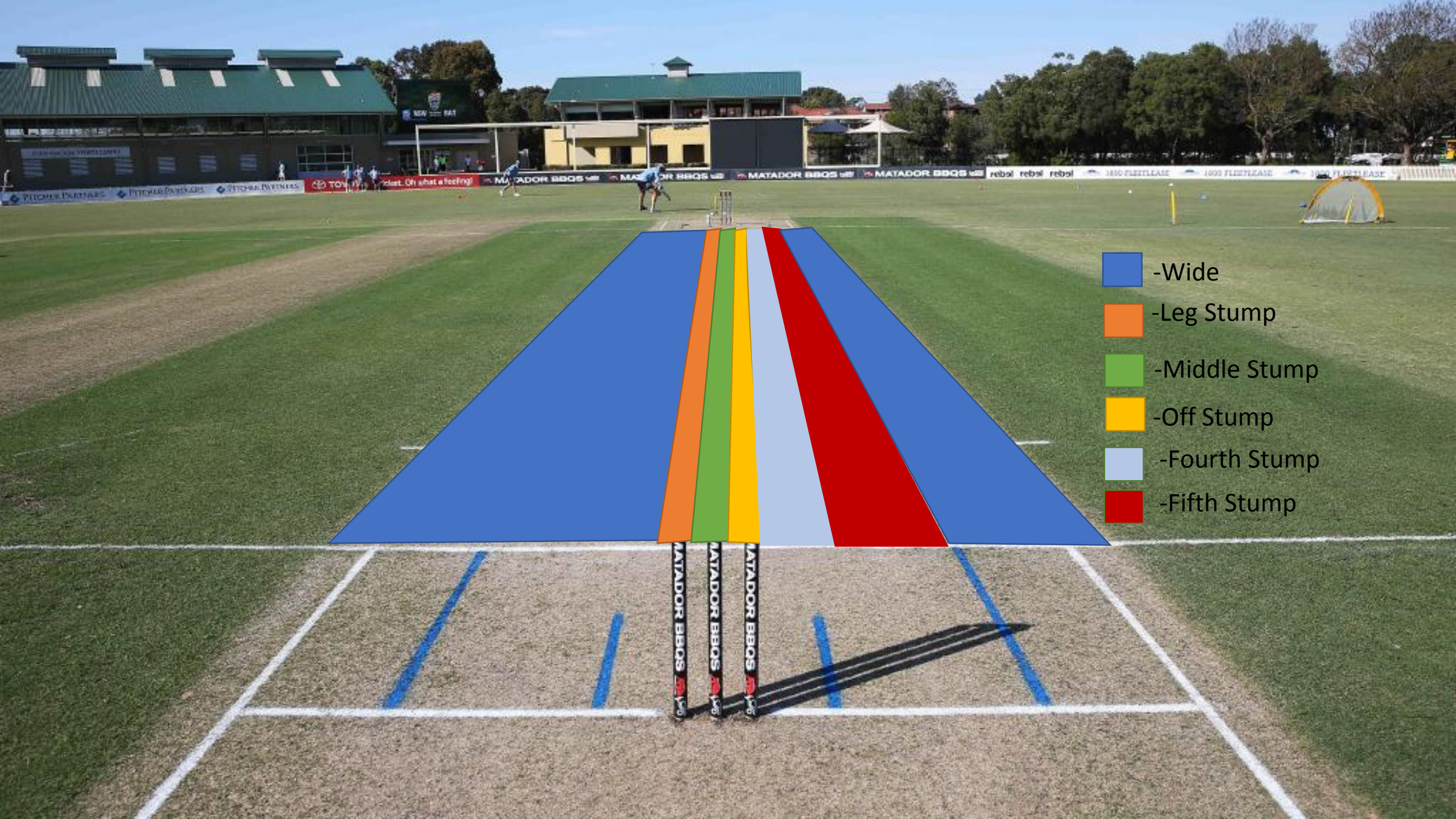
-Full Length



-Yorker

And the line...





- Wide
- Leg Stump
- Middle Stump
- Off Stump
- Fourth Stump
- Fifth Stump

A wide-angle photograph of a cricket pitch taken from the bowler's end. In the foreground, the three stumps are set up on the pitch, with a red cricket ball floating just above them. The pitch is marked with white lines, including the stumps' crease and the popping crease. Blue lines are also visible on the pitch. In the background, there is a large green-roofed building, likely a clubhouse or stadium, and a line of trees. A few players are visible in the distance. The sky is clear and blue.

This is a full length delivery pitching at off stump.

A wide-angle photograph of a cricket field. In the foreground, a set of three stumps is positioned on the pitch, with a red cricket ball resting on top of them. The stumps have 'MATADOR BBQS' written on them. The pitch is a mix of green grass and brown dirt. In the background, there is a large stadium with a green roof and several tiers of seating. The sky is clear and blue. The text 'How can you get a computer to do this?' is overlaid in the center of the image.

How can you get a computer to do this?

A wide-angle photograph of a cricket field under a clear blue sky. In the foreground, a set of three black stumps with 'MATADOR BBQS' written on them stands on the pitch. A red cricket ball is positioned directly above the stumps. The pitch is a mix of green grass and brown dirt, with white and blue boundary lines. In the background, there's a large green-roofed building, likely a clubhouse, and a long advertising hoarding with various logos including 'MATADOR BBQS', 'rebel', and '1800 FLEETLEASE'. A few players in blue uniforms are visible in the distance.

This process involves supervised learning.

There are two neural network used which identify the line and length respectively.





I created 100 images of different deliveries using PowerPoint.



The pictures were labelled using a csv file.





80 images were used for the training set.

In other words, the computer tries to recognize the 80 images.

Eg.

Top image- Good length.

Middle Image-Full length

Bottom Image-Back of a length





20 images were used for the validation set.

In other words, the computer tries to classify 20 images which it has not seen before.

Eg.

Top image- Full length.

Middle Image-Bouncer

Bottom Image-Yorker

The neural networks are created using the fastAi library.
The dataset has been trained using a pretrained model (resnet50).

Default settings are used as a starting point.

```
learnLength = cnn_learner(lengthDataBunch, models.resnet50, metrics=accuracy)
```

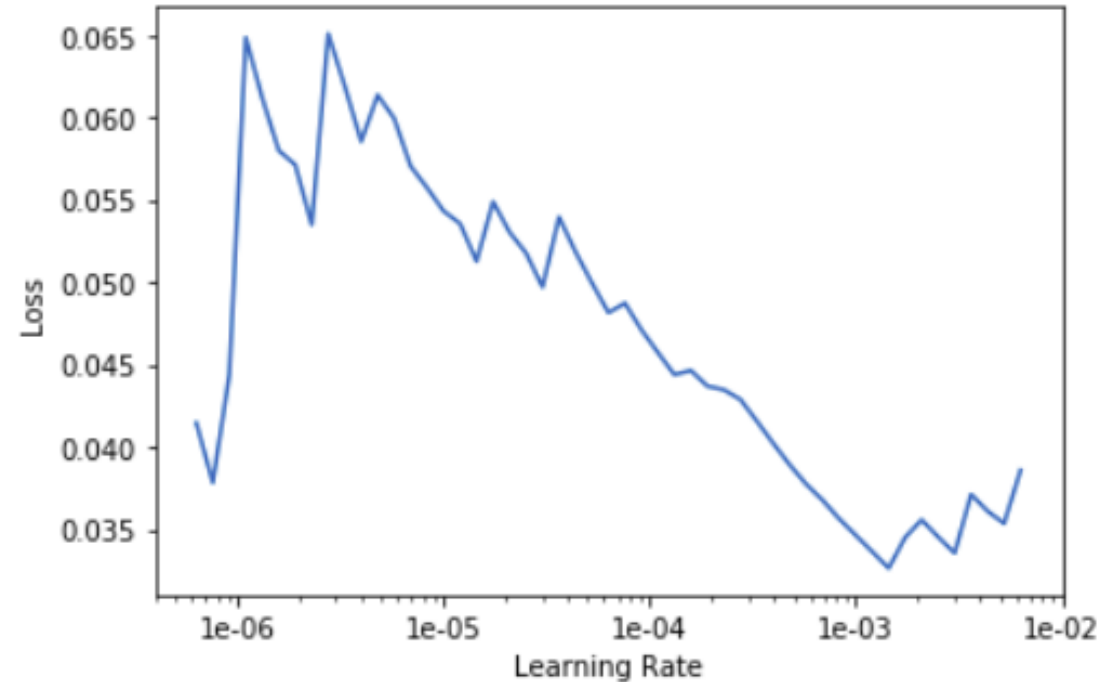


This pretrained model can already classify multiple objects. Only the weights near the last few layers are tweaked accordingly.

There are AI researchers who use this technique to achieve higher accuracy whilst reducing time.

The initial results for detecting length are shown below.

epoch	train_loss	valid_loss	accuracy	time
0	2.487618	2.334050	0.150000	00:03
1	1.289890	2.261957	0.250000	00:03
2	0.887085	1.554783	0.350000	00:03
3	0.646340	1.387026	0.350000	00:03
4	0.509642	1.385116	0.350000	00:03



In the accuracy column 1 represent 100%.

Parameters are tweaked in order to improve results.

```
learnLength.fit_one_cycle(10, max_lr=slice(1e-4,1.5e-4) , wd = 0.3)
```

Set a condition on the weights to reduce underfitting.

epoch	train_loss	valid_loss	accuracy	time
0	0.111469	0.798398	0.700000	00:03
1	0.072062	0.649933	0.800000	00:03
2	0.122023	0.811473	0.800000	00:03
3	0.090593	1.311500	0.750000	00:03
4	0.082717	1.078450	0.900000	00:03
5	0.082713	0.880208	0.900000	00:03
6	0.069507	0.878031	0.800000	00:03
7	0.079710	1.026887	0.800000	00:03
8	0.071355	1.045996	0.850000	00:03
9	0.069311	1.055478	0.900000	00:03

Tweak the learning rates of all layers in the CNN from 1e-4 to 1.5e04.

Learning rates refer to how quickly the computer learns.
High learning rate-Miss key details
Low learning rate- Too slow

Ideally you want
train_loss
<valid_loss.
This is a good
sign.


The computer is able to identify
the correct length 90% of the time.

[3][4]

Here are the final results for the line classification model.

```
learnLength.fit_one_cycle(10, max_lr=slice(1e-4,1.6e-4) , wd = 0.5)
```

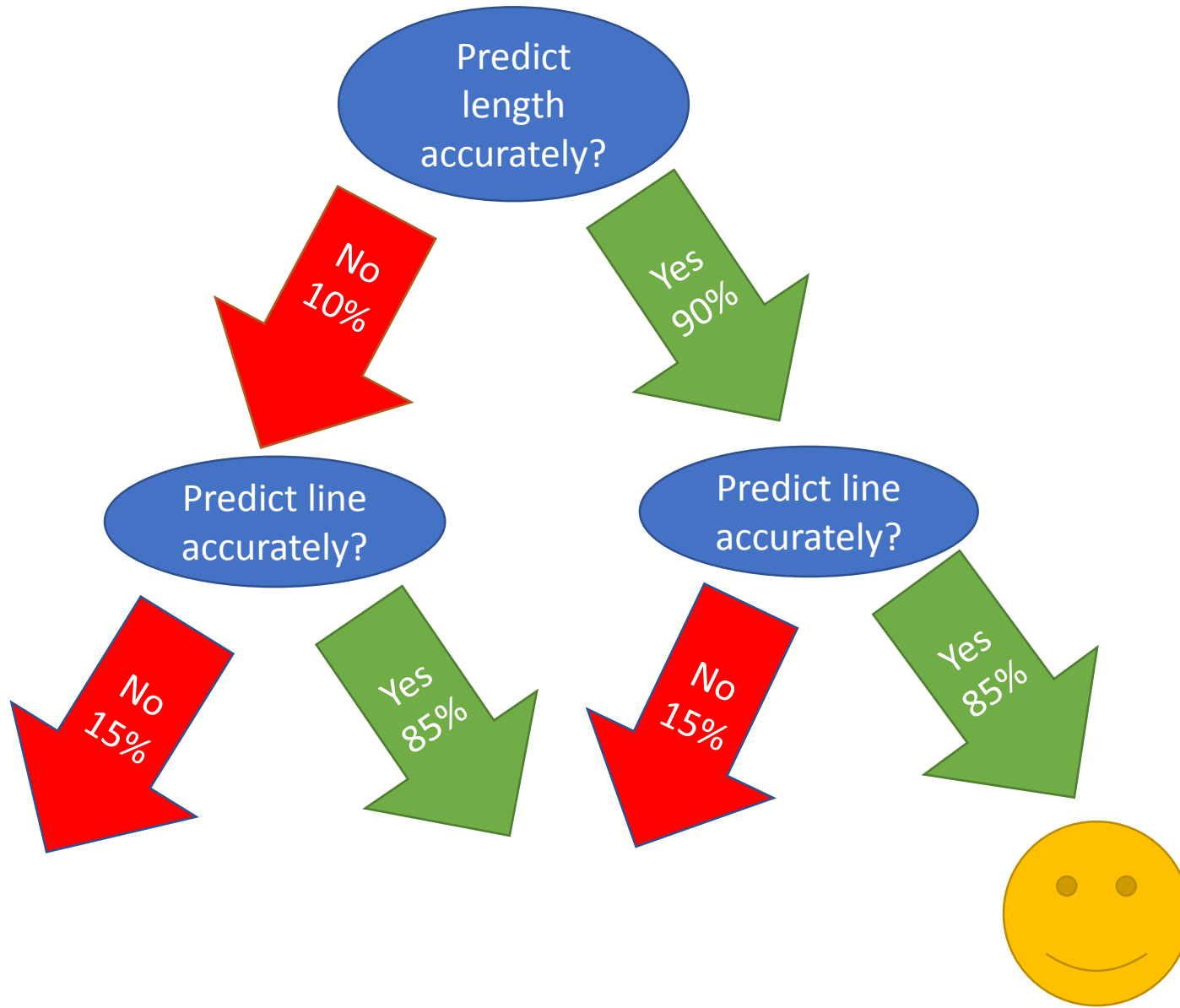
epoch	train_loss	valid_loss	accuracy	time
0	0.047111	0.307772	0.850000	00:03
1	0.038165	0.295550	0.850000	00:03
2	0.042266	0.966980	0.750000	00:03
3	0.055058	0.826749	0.800000	00:03
4	0.055858	0.531523	0.850000	00:03
5	0.072878	0.943986	0.800000	00:03
6	0.088196	0.885688	0.850000	00:03
7	0.099183	0.813027	0.800000	00:03
8	0.105549	0.768120	0.800000	00:03
9	0.097884	0.791694	0.800000	00:03



The computer is able to identify the line correctly 85% of the time.



What does this all mean?



Using basic math, the probability that the neural networks will accurately predict line and length is simply:

$$(0.9 * 0.85) * 100 = 76.5\%$$

Still a work in progress.

Image References:

[1] Whack Sports, *WHACK-test-4-pce-156g-red-cricket-ball*. 2020.

[2] The Daily Telegraph, *The wicket area is rolled for an hour a day to create firmness on the pitch. Phil Hillyard*. 2020.

AI References:

[3] J. Howard, *Lesson 1: Image classification*. 2020.

[4] "fastai", *Docs.fast.ai*, 2020. [Online]. Available: <https://docs.fast.ai/>. [Accessed: 23- Jan- 2020].

Thank you for watching.