ML Week   0xJ2-1   SVM

credit: reddit

1. We have 2 colors of balls on the table that we want to separate.

2. We get a stick and put it on the table, this works pretty well right?

3. Bad guy puts more balls on the table, it kind of works but one of the balls is on the wrong side and there is probably a better place to put the stick now.

4. SVMs try to put the stick in the best possible place by having as big a gap on either side of the stick as possible.

5. Now when the villain returns the stick is still in a pretty good spot.

6. There is another trick in the SVM toolbox that is even more important. Say the villain has seen how good you are with a stick so he gives you a new challenge.

7. There's no stick in the world that will let you split those balls well, so what do you do? You flip the table of course! Throwing the balls into the air. Then, with your pro ninja skills, you grab a sheet of paper and slip it between the balls.

8. Now, looking at the balls from where the villain is standing, they balls will look split by some curvy line.

Vocabulary

- Balls = data

- Stick = classifier (also: hyperplane)

- Biggest gap = optimization

- Table jump = kerneling

- Paper = hyperplane

- Balls near margin = support vectors

video: svm-with-polynomial-kernel.mp4

What is wonderful and beautiful

- Only depends on support vectors

- Only depends on dot products of vectors, so kernel functions are possible ($K(x_i \cdot x_j) = \phi(x_i) \cdot \phi(x_j)$)

History

- Invented by Vladimir Vapnik

- PhD in USSR early 1960's

- Thought kernels weren't very important

- No computers to test his theories

- Worked at an Oncology Institute developing applications

- Invited to Bell Labs, decided to move to the U.S. in 1991

- 1992: three papers to NIPS (Neural Information Processing Systems), refused

- Bell Labs interested in handwriting recognition

- 1993: Dinner bet that SVM's can do handwriting recognition better than ANN's

- Colleague succeeds with kernel with $n = 2$

- *https://www.youtube.com/watch?v=_PwhiWxHK8o*

- Since 2014 at Facebook