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Is decision tree algorithm a linear or nonlinear algorithm?

Recently a friend of mine was asked whether decision tree algorithm a linear or nonlinear algorithm in an interview. I tried to look for answers to this question but couldn't find any satisfactory explanation. Can anyone answer and explain the solution to this question? Also what are some other examples of nonlinear machine learning algorithms?

[machine-learning](#)

[algorithms](#)

[decision-trees](#)

asked Aug 13 '15 at 13:59



[user2966197](#)

126 3

Wonders in what context they meant that, regression, linearly separable data ? – [image_doctor](#) Aug 14 '15 at 10:52

They probably meant the boundary between classes; is it composed of hyperplanes or not. – [Emre](#) Aug 14 '15 at 22:53

3 Answers

A decision tree is a non-linear mapping of x to y . This is easy to see if you take an arbitrary function and create a tree to its maximum depth.

For example:

```
if x = 1, y = 1
if x = 2, y = 15
if x = 3, y = 3
if x = 4, y = 27
...
```

Of course, this is a completely over-fit tree and won't generalize. But it demonstrates why a decision tree is a non-linear mapping.

answered Aug 14 '15 at 12:13



[inversion](#)

141 2

Decision trees are non linear. Unlike Linear regression there is no equation to express relationship between independent and dependent variables.

Ex:

Linear regression - Price of fruit = $b_0 + b_1 \cdot \text{Freshness} + b_2 \cdot \text{Size}$

Decision tree - Nodes: Ripe - Yes or no | Fresh - Yes or No | Size - <5 , >5 but <10 and >10 |

In the second case there is no linear relationship between independent and dependent variables.

answered Nov 19 '15 at 11:34



[Brox](#)

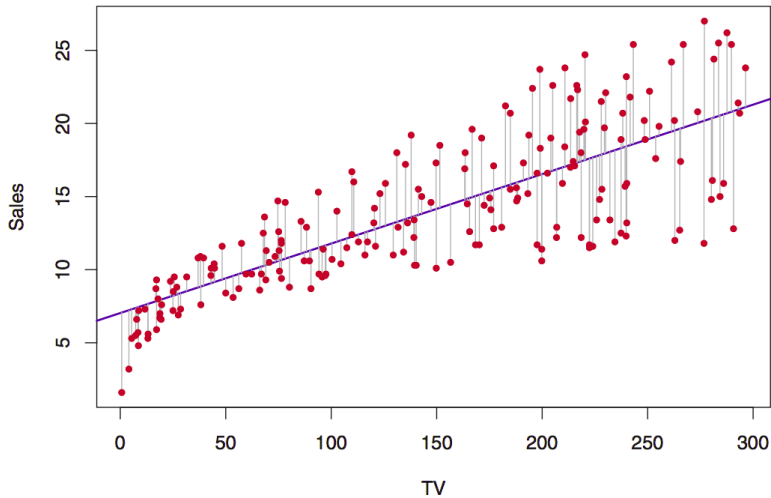
21 8

Recently a friend of mine was asked whether decision tree algorithm a linear or nonlinear algorithm in an interview

Decision trees is a non-linear classifier like the neural networks, etc. It is generally used for classifying non-linearly separable data.

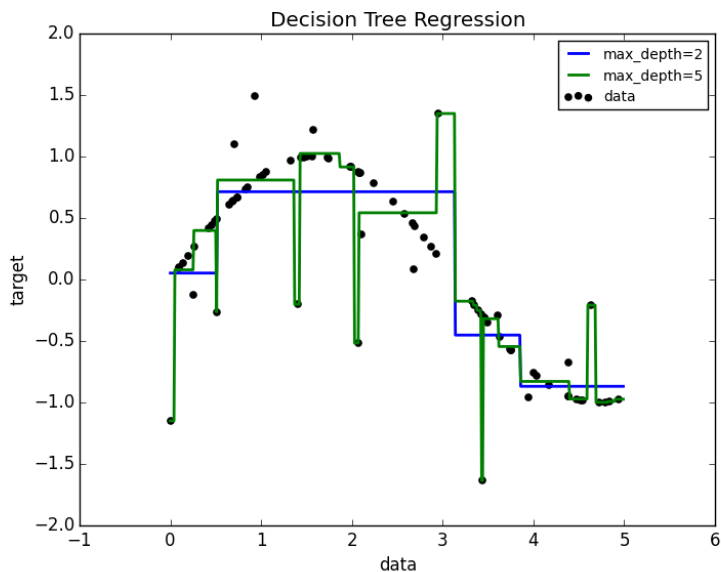
Even when you consider the regression example, decision tree is non-linear.

For example, a linear regression line would look somewhat like this:




The red dots are the data points.

And a decision tree regression plot would look something like this:



So, clearly **decision trees in non-linear**

answered Nov 19 '15 at 11:43

 Dawny33

2,767 3 9 48

Increasing the depth of the tree would lead to more overfitting, and thereby a more non-linear structure. – Dawny33
Nov 19 '15 at 11:49

