**Relationships between machine learning topics**

1. Definitions for topics:

A brief understanding and the definitions of the topics first just in case I am wrong and lead me to the wrong relations.

* Gradient Descent (First-order optimization algorithm):

Given a function defined by a set of parameters, gradient descent starts with an initial set of parameter values and iteratively moves toward a set of parameter values that minimize the function.

* Linear Regression (Wikipedia):

linear regression is a linear approach for modeling the relationship between a scalar dependent variable y and one or more explanatory variables (or independent variables) denoted X.

* Neural Network:

Information that flows through the network affects the structure of the Nerual Network because a neural network changes - or learns, based on that input and output.

Weight (parameter trying to optimize with backpropagation) refers to the strength or amplitude of a connection between two nodes.

One more thought about the abstract definition of machine learning: It is like starting at a “unstable” state without order. Algorithms on a big scale (ex. Regression, neural network) are like models which try to fit every data in to give them “order”. Something like gradient descent (also algorithm) is lower level tools who execute the commands and keep working on it until done. So implementing machine learning algorithms is to pick the method first, and let tools under it to do the job.

1. Relations between topics

* Relation between gradient descent and other topics

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|  | Gradient descent |
| Gradient descent |  |
| Neural Network Classification | Backpropagation: After doing forward calculations, Using gradient descent to propagate backwards, calculating error for each neuron and update parameters to minimize errors. |
| Linear Regression(single) | Repeat gradient descent until parameters in the linear regression function convergence, this means the total error between data and plot is minimum. With single variable, only update two parameters in one iteration. |
| Linear Regression(Multi) | Similar to linear regression with single variable, update (n+1) parameters simultaneously when having n variables |
| Effect of number of samples | The number of examples will affect the accuracy of training set cost function if it is too small, then update parameters in a wrong direction when implementing gradient descent, finally affect the result of algorithms (no matter which one used, linear/non-linear). |