Life as an ML Engineer

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October 30, 2018

Intro

Things you already know

1. Interchangable Parts

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2. Testing

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1. Interchangable Parts
2. Testing
3. Integration

Objectives

1. Think about ML from an engineering perspective

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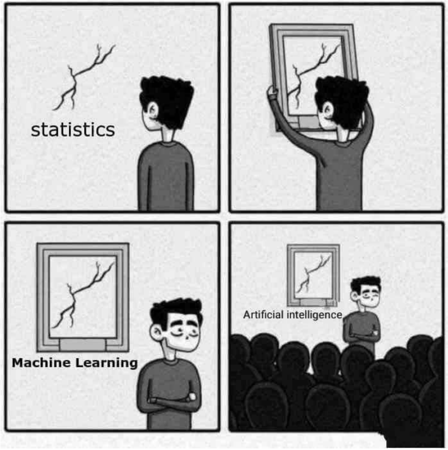
1. Think about ML from an engineering perspective
2. Learn some of the terminology used to help converse between Data Scientists and Engineers like:

ai vs statistics



you're going to need some data

you need to know what you're trying to do

- user stories

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- user stories
- business problem?

you need to know what you're trying to do

- user stories
- business problem?
- black box function

picking your algorithm

- look at your data

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- look at your inputs

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  - or just use deep learning, it's cool
- interpretability

don't forget to look for prior art

- Look at UNet, YOLO, ResNet51, RetinaNet, and many other hyped algorithms.

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- Tensorflow has many sets of "pre-trained" weights

this was a whole section on data prep

- new API

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- new API
- new CSV from a customer

things that matter for ML

- normalizing or "whitening"

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- binning

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- missing values

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- dimensionality reduction

things that matter for ML

- normalizing or "whitening"
- binning
- missing values
- dimensionality reduction
- class imbalance

algorithms

pre-jargon

- letters

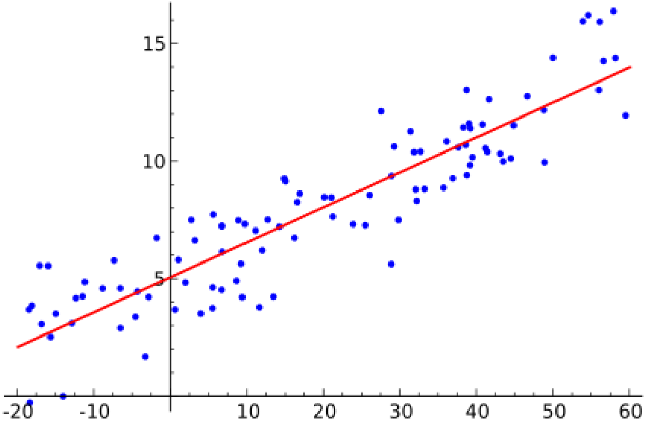
pre-jargon

- letters
- $Y = mx + b$

pre-jargon (cont'd)

$$Y = Wx + b$$

regression



what if there are multiple variables?

- $y = W_1 x_1 + b$

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- $y = W_1 x_1 + W_2 x_2 + \ldots + b$

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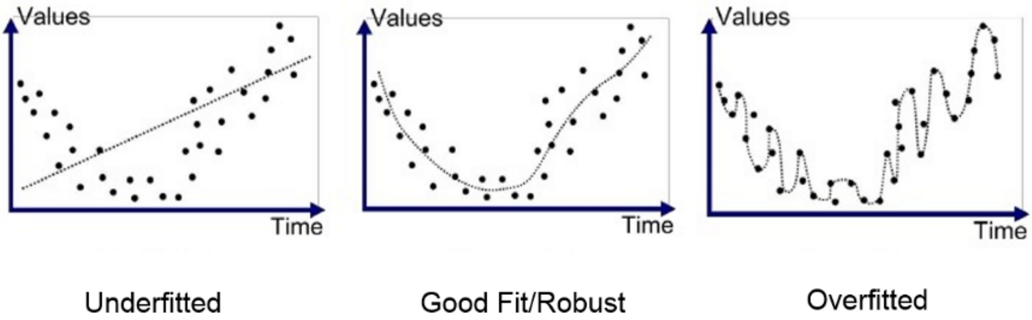
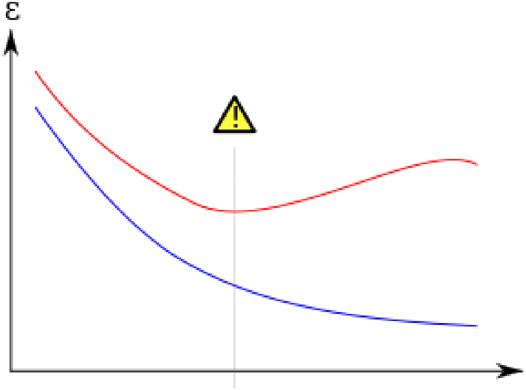
- $y = Wx + b$

overfitting



overfitting



data requirements

- large data

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- large data
- data hacks

data requirements

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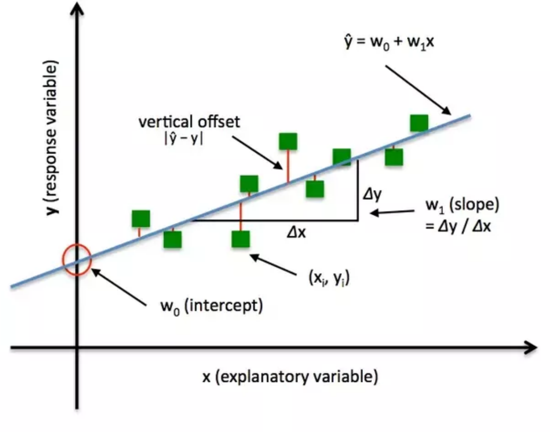
- data hacks
  - data augmentation - zoom, rotate, flip images

gradient descent

losing it (loss function)



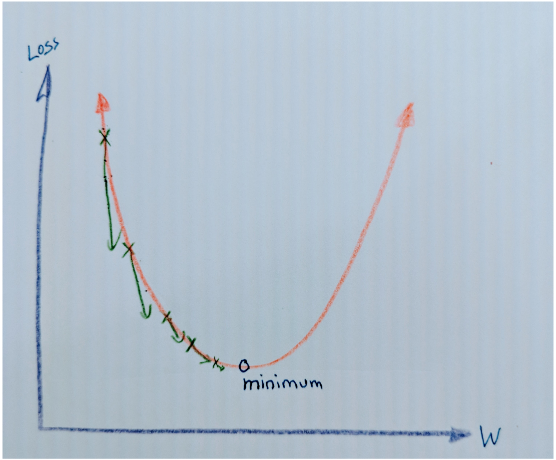
little bit of math

$$\sum_{x}(Wx + b - y_x)^2$$

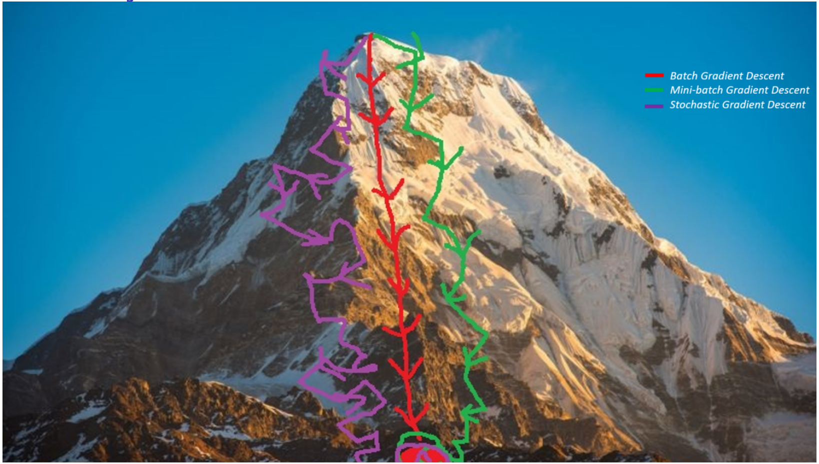
little bit more math

$$\arg\min_{W,b} \sum_{x} (Wx + b - y_x)^2$$

gradient descent



stochasticity, batches, and mini-batches



inference aka "pushing to production"

trained model

- what is truth?

trained model

- what is truth?
- testing?

trained model

- what is truth?
- testing?
- what can go wrong?

trained model

- what is truth?
- testing?
- what can go wrong?
- "master" branch?

scaling (performance, speed)

- easy

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- well defined interfaces

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- shared nothing

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- easy
- well defined interfaces
- shared nothing
- load balancing

model health

- what if incoming data is different than training data?

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  - e.g., hot dog vs not hot dog, and someone gives it a brautwurst

model health

- what if incoming data is different than training data?
  - e.g., hot dog vs not hot dog, and someone gives it a brautwurst
  - or a real example, kangaroos on self driving cars

Operations

- get new data! prompt users for wrong responses

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- online learning: re-train nightly/hourly/steaming w/ new data

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- get new data! prompt users for wrong responses
- online learning: re-train nightly/hourly/steaming w/ new data
- active learning: figure out what labels you need to improve model performance

tensors and flow graph

tensors

- linear relation between vectors, scalars, or other tensors

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- practically: multi-dimensional array

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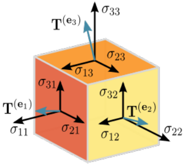
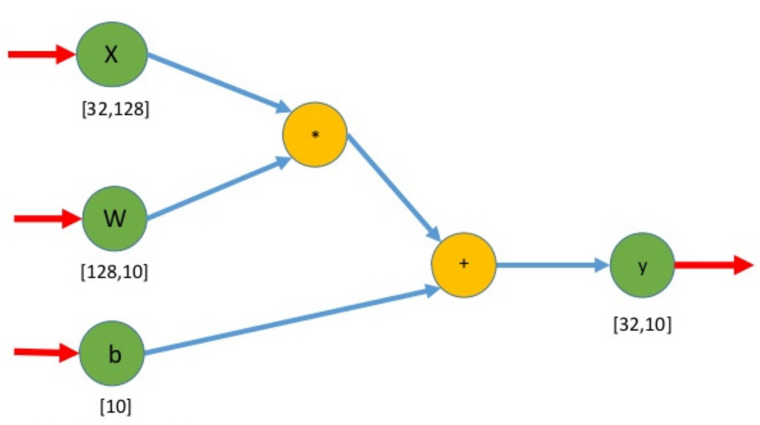
- 

computational flow graph (Directed-acyclic graph)



questions?

other resources

other learning resources

- http://fast.ai
- https://hackernoon.com/choosing-the-right-machine-learning-algorithm-68126944ce1f
- http://ml-cheatsheet.readthedocs.io/en/latest/linear_regression.html

image credits

- ai vs stats
- regression
- overfitting
- more overfitting
- loss functions
- gradient descent
- tensors
- tensorflow graph