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Did you Learn Something New?

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Intro to ML

UTMIST Study Group - Module 1

Topics

- Linear regression & classification
- Loss functions
- Activation functions
- Gradient descent
- Overfitting & regularization

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Linear Regression & Classification Examples

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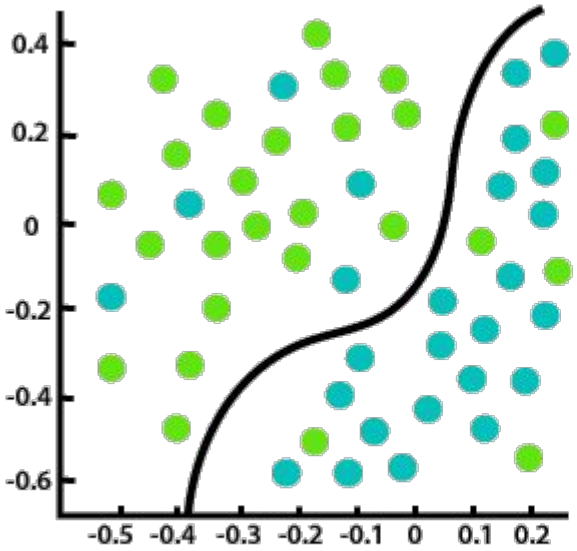
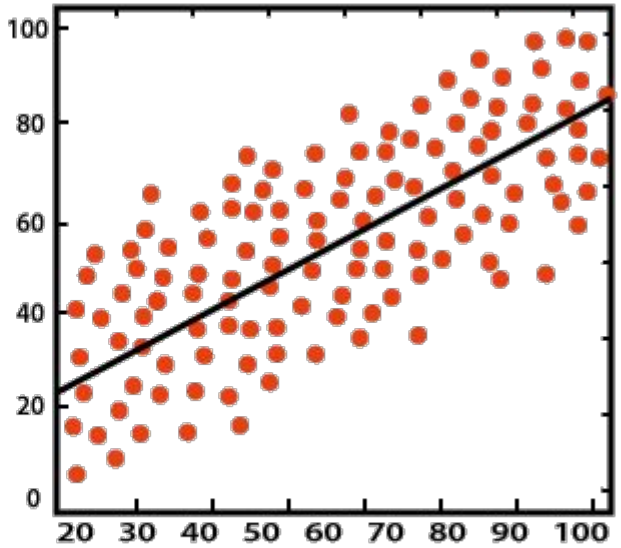
Linear Regression vs Classification



Classification

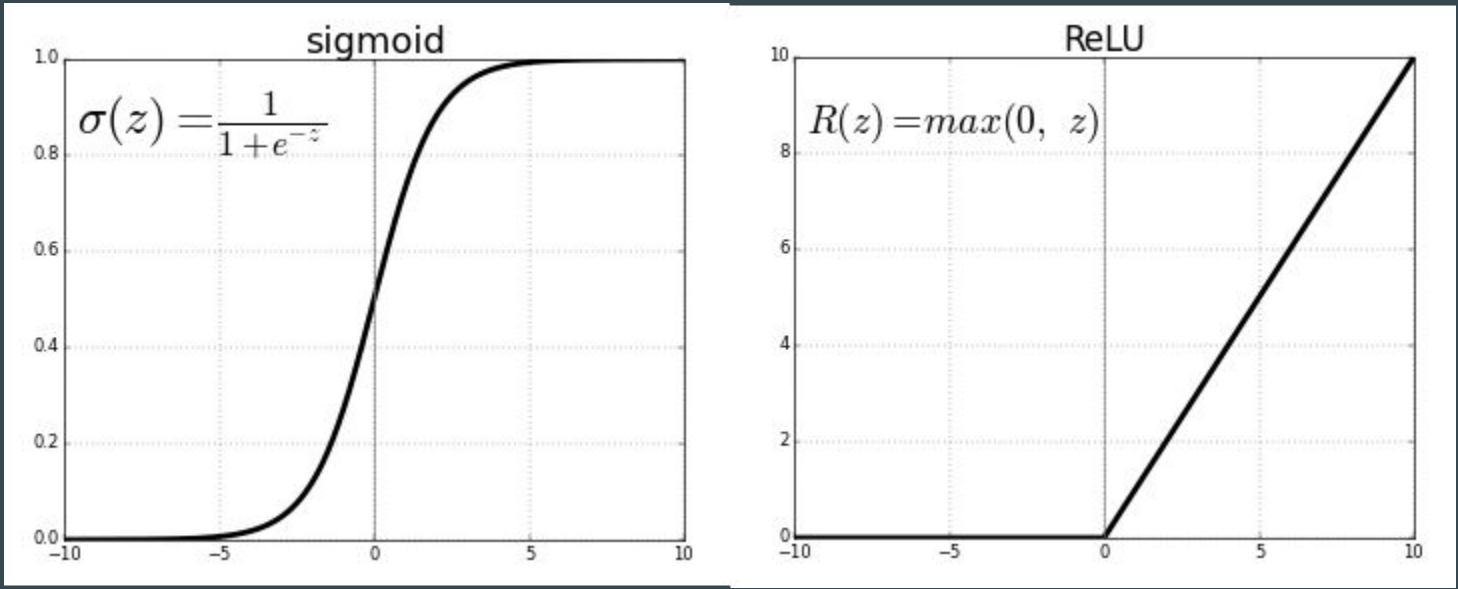


Regression

https://static.javatpoint.com/tutorial/machine-learning/images/regression-vs-classification-in-machine-learning.png

Activation Functions

- How are activation functions useful?
- Difference between linear and non-linear activation functions?
- Various types and their uses?



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Different Types of Loss Functions

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Loss Functions

Mean Squared Error (MSE) Loss

- Regression loss
- Average of squared difference
- Penalize wrong predictions that were further away

$$MSE = \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n}$$

Cross Entropy Loss

- Classification loss
- Penalize wrong predictions that were confident

$$CrossEntropyLoss = -(y_i log(\hat{y}_i) + (1 - y_i) log(1 - \hat{y}_i))$$

https://towardsdatascience.com/common-loss-functions-in-machine-learning-46af0ffc4d23

Optimization Algorithms

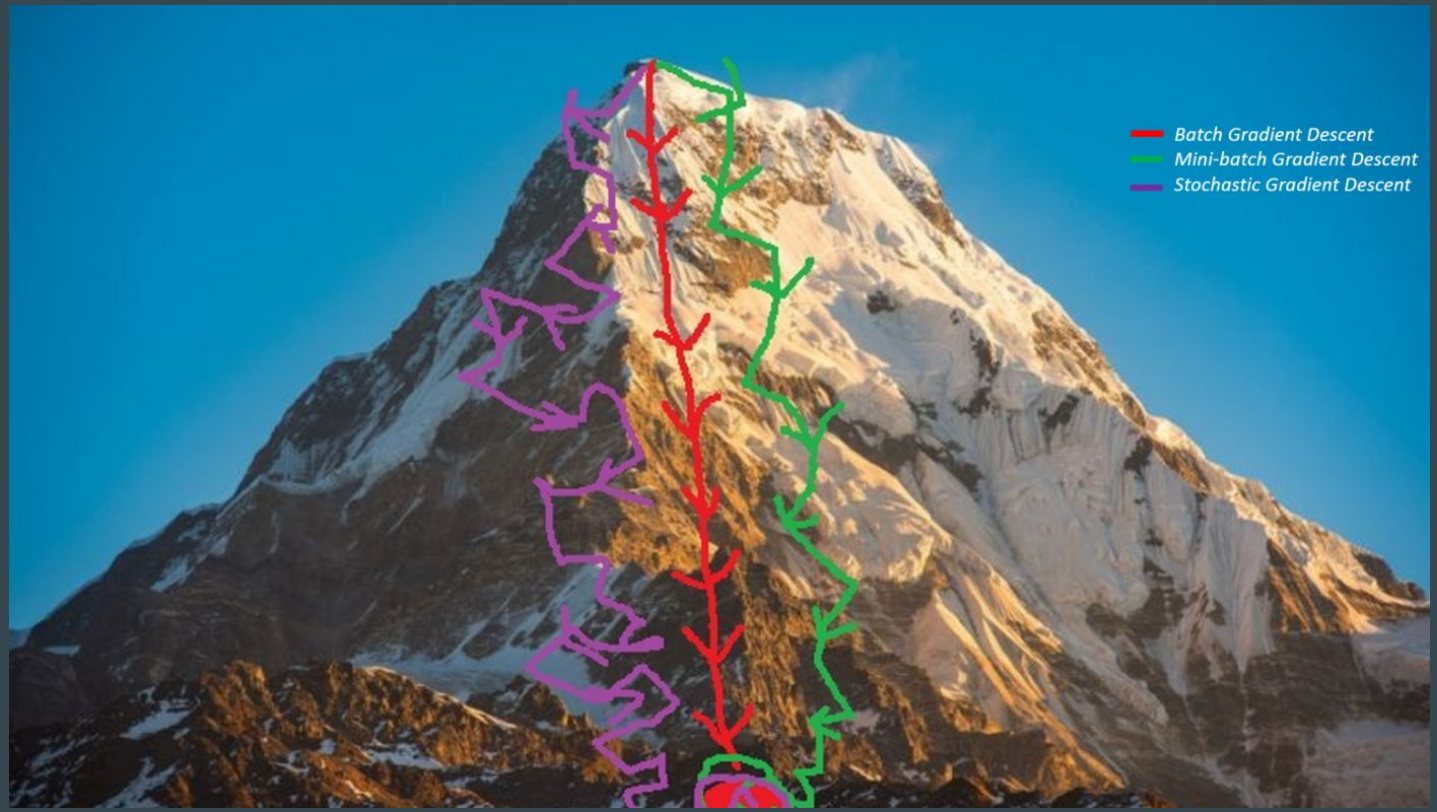
In breakout room groups, try to recall these terms:

- Optimization algorithm
- Gradient
- Gradient descent
- Learning rate
- Stochastic gradient descent

Optimization Algorithms

- Optimization algorithm: function's min/max
- Gradient: direction of steepest ascent
- Gradient descent: first-order (first derivative) optimization algorithm
- Learning rate: size of step in each iteration
- Stochastic gradient descent: randomly select data point to represent

Gradient Descent



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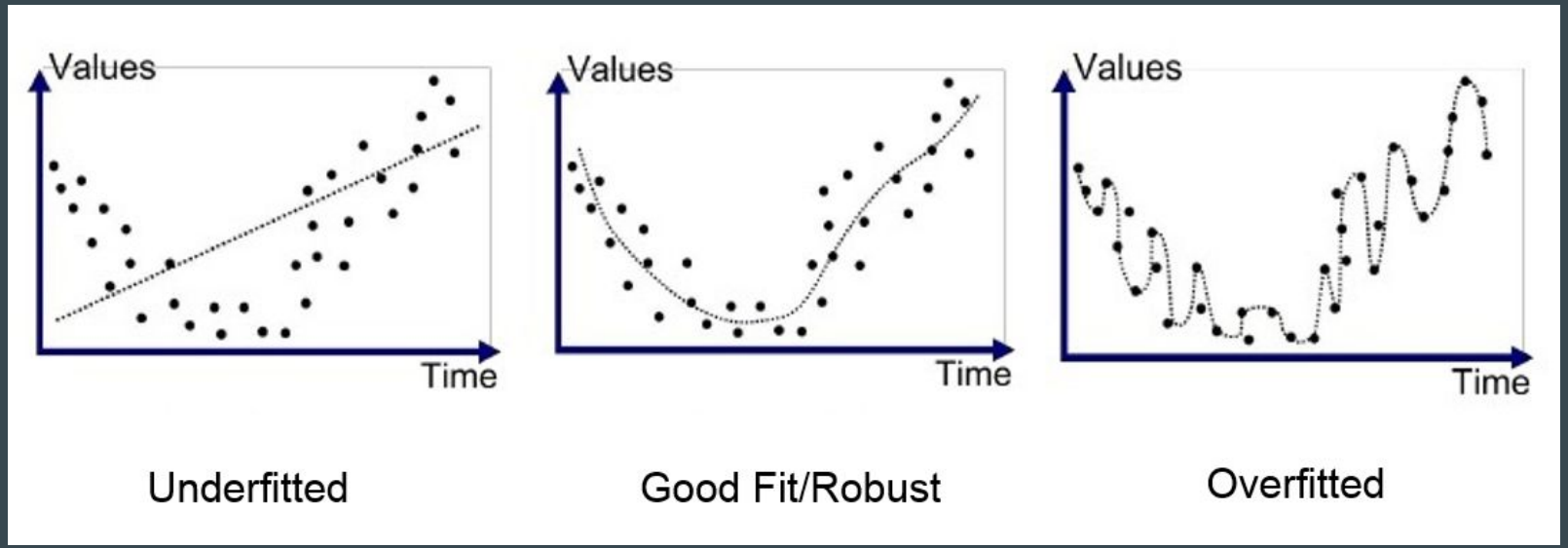
Regularization

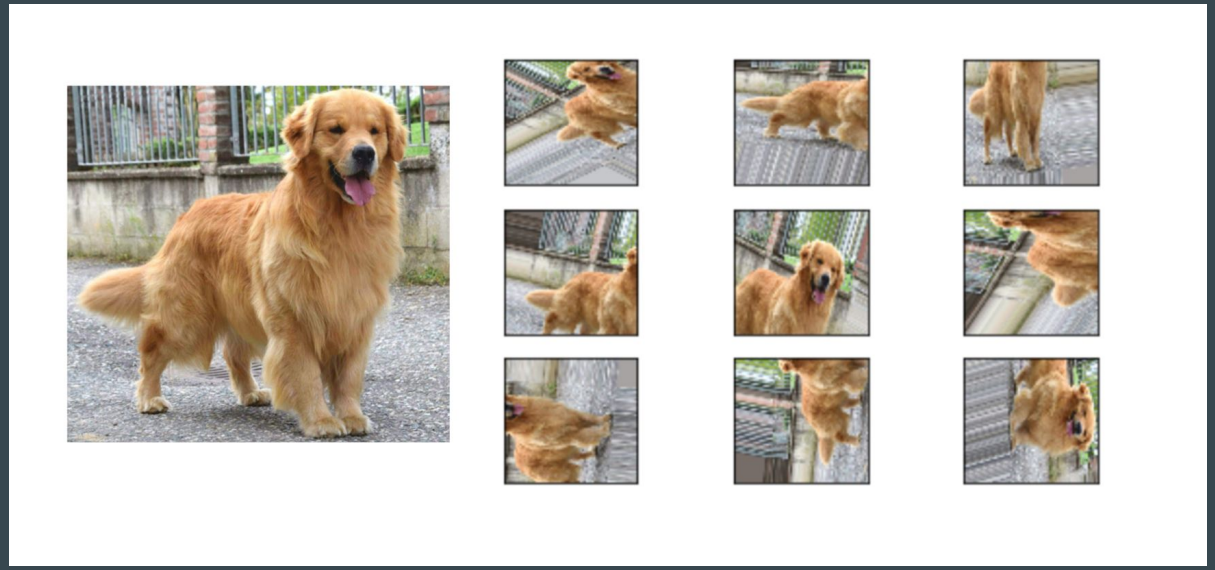
- Discourage learning complex model
- Avoid overfitting



https://medium.com/greyatom/what-is-underfitting-and-overfitting-in-machine-learning-and-how-to-deal-with-it-6803a989c76

Regularization Techniques

- Weight Penalty: prevent large weights
- Data augmentation
- Dropout: drop nodes
- More data!



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Thank You!

We welcome any questions/feedback.

Feedback Form: https://forms.gle/BSokDwZGSocJ2J2o8