Scalable Machine Learning and Deep Learning - Review Questions 1

Deadline: November 8, 2020

1. **0.5 point.** Which of the following is/are true about *Normal Equation*?
   (a) We don't have to choose the learning rate.
   (b) It becomes slow when number of features is very large.
   (c) No need to iterate.

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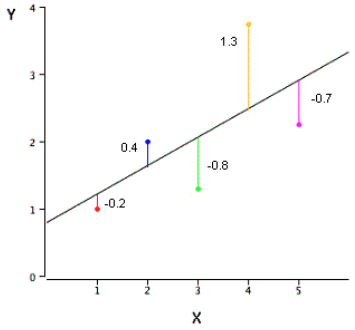
2. **0.5 point.** The following graph represents a regression line predicting `y` from `x`. The values on the graph shows the residuals for each predictions value, i.e., $\hat{y} - y$. Calculate the squared error of the prediction.



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3. **0.5 point.** How does number of observations influence overfitting? Choose the correct answer(s).
   (a) In case of fewer observations, it is easy to overfit the data.
   (b) In case of fewer observations, it is hard to overfit the data.
   (c) In case of more observations, it is easy to overfit the data.
   (d) In case of more observations, it is hard to overfit the data.

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4. **0.5 point.** How many coefficients do you need to estimate in a simple linear regression model (One independent variable)?

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5. **0.5 point.** What is cross validation and how does it work?

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6. **1 point.** Mathematically show that the softmax function with two classes ($k = 2$) is equivalent to the sigmoid function?

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7. **0.5 point.** As you know, in binomial logistic regression the `cost` between the true value `y` and the predicted value $\hat{y}$ is measured as below:

$$\texttt{cost}(\hat{y}, y) = \begin{cases} -\log(\hat{y}) & \text{if } y = 1 \\ -\log(1 - \hat{y}) & \text{if } y = 0 \end{cases}$$

Explain why $-\log$ is a proper function to compute the cost in logistic regression?

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8. **0.5 point.** How are logistic regression cost, cross-entropy, and negative log-likelihood related?

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9. **0.5 point.** Explain how a ROC curve works?