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Go to next item

1. Which notation would you use to denote the 4th layer's activations when the input is the 7th example from the 3rd mini-batch? 1 / 1 point

- $a^{[4](3)(7)}$
- $a^{[3](7)(4)}$
- $a^{[7](3)(4)}$

Correct
Yes. In general $a^{[l](t)(k)}$ denotes the activation of the layer l when the input is the example k from the mini-batch t.

2. Which of these statements about mini-batch gradient descent do you agree with? 1 / 1 point

- Training one epoch (one pass through the training set) using mini-batch gradient descent is faster than training one epoch using batch gradient descent.
- You should implement mini-batch gradient descent without an explicit for-loop over different mini-batches so that the algorithm processes all mini-batches at the same time (vectorization).
- When the mini-batch size is the same as the training size, mini-batch gradient descent is equivalent to batch gradient descent.

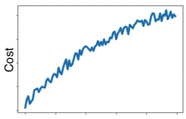
Correct
Correct. Batch gradient descent uses all the examples at each iteration, this is equivalent to having only one mini-batch of the size of the complete training set in mini-batch gradient descent.

3. We usually choose a mini-batch size greater than 1 and less than m, because that way we make use of vectorization but not fall into the slower case of batch gradient descent. 1 / 1 point

- False
- True

Correct
Correct. Precisely by choosing a batch size greater than one we can use vectorization; but we choose a value less than m so we won't end up using batch gradient descent.

4. While using mini-batch gradient descent with a batch size larger than 1 but less than m the plot of the cost function J looks like this: 1 / 1 point



Which of the following do you agree with?

- If you are using mini-batch gradient descent or batch gradient descent this looks acceptable.
- If you are using batch gradient descent, this looks acceptable. But if you're using mini-batch gradient descent, something is wrong.
- No matter if using mini-batch gradient descent or batch gradient descent something is wrong.
- If you are using mini-batch gradient descent, this looks acceptable. But if you're using batch gradient descent, something is wrong.

Correct
Yes. The cost is larger than when the process started, this is not right at all.

5. Suppose the temperature in Casablanca over the first two days of March are the following: 1 / 1 point

March 1st: $\theta_1 = 10^\circ$ C

March 2nd: $\theta_2 = 25^\circ$ C

Say you use an exponentially weighted average with $\beta = 0.5$ to track the temperature: $v_0 = 0, v_t = \beta v_{t-1} + (1-\beta)\,\theta_t$. If v_2 is the value computed after day 2 without bias correction, and $v_2^{corrected}$ is the value you compute with bias correction. What are these values?

- $v_2 = 15, v_2^{corrected} = 15.$
- $v_2 = 15, v_2^{corrected} = 20.$
- $v_2 = 20, v_2^{corrected} = 20.$
- $v_2 = 20, v_2^{corrected} = 15.$

Correct
Correct. $v_2 = \beta v_{t-1} + (1-\beta)\,\theta_t$ thus $v_1 = 5, v_2 = 15$. Using the bias correction $\frac{v_t}{1-\beta^t}$ we get $\frac{15}{1-(0.5)^2} = 20.$

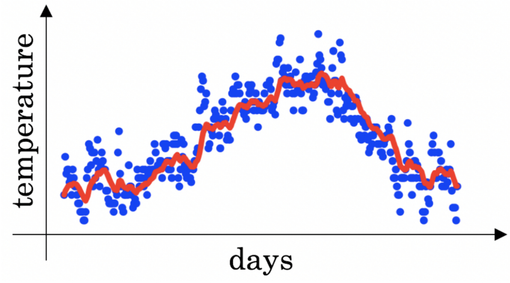
6. 0 / 1 point

Which of these is NOT a good learning rate decay scheme? Here, t is the epoch number.

- $\alpha = \frac{\alpha_0}{\sqrt{t+1}}.$
- $\alpha = e^{-0.01\,t}\,\alpha_0.$
- $\alpha = 1.01^t\,\alpha_0$
- $\alpha = \frac{\alpha_0}{1+3\,t}$

Incorrect
Incorrect. This is a good learning rate decay since it is a decreasing function of t.

7. You use an exponentially weighted average on the London temperature dataset. You use the following to track the temperature: $v_t = \beta v_{t-1} + (1-\beta)\theta_t$. The red line below was computed using $\beta = 0.9$. What would happen to your red curve as you vary β? (Check the two that apply) 1 / 1 point



- [ ] Decreasing β will shift the red line slightly to the right.
- [x] Increasing β will shift the red line slightly to the right.

Correct
True, remember that the red line corresponds to $\beta = 0.9$. In the lecture we had a green line $\beta = 0.98$ that is slightly shifted to the right.

- [x] Decreasing β will create more oscillation within the red line.

Correct
True, remember that the red line corresponds to $\beta = 0.9$. In lecture we had a yellow line $\beta = 0.98$ that had a lot of oscillations.

- [ ] Increasing β will create more oscillations within the red line.

8. Which of the following are true about gradient descent with momentum? 1 / 1 point

- [x] It generates faster learning by reducing the oscillation of the gradient descent process.

Correct
Correct. The use of momentum makes each step of the gradient descent more efficient by reducing oscillations.

- [x] Gradient descent with momentum makes use of moving averages.

Correct
Correct. Gradient descent with momentum makes use of moving averages, which smooths out the gradient descent process.

- [ ] It decreases the learning rate as the number of epochs increases.
- [x] Increasing the hyperparameter β smooths out the process of gradient descent.

Correct
Correct. Gradient descent with momentum makes use of moving averages, which smooths out the gradient descent process.

9. Suppose batch gradient descent in a deep network is taking excessively long to find a value of the parameters that achieves a small value for the cost function $\mathcal{J}(W^{[1]}, b^{[1]}, ..., W^{[L]}, b^{[L]})$. Which of the following techniques could help find parameter values that attain a small value for $\mathcal{J}$? (Check all that apply) 1 / 1 point

- [x] Try better random initialization for the weights

Correct

- [x] Try tuning the learning rate α

Correct

- [ ] Try initializing all the weights to zero
- [x] Try using Adam

Correct

- [x] Try mini-batch gradient descent

Correct

10. Which of the following statements about Adam is ***False***? 1 / 1 point

- The learning rate hyperparameter α in Adam usually needs to be tuned.
- Adam should be used with batch gradient computations, not with mini-batches.
- We usually use "default" values for the hyperparameters β_1, β_2 and ε in Adam ($\beta_1 = 0.9, \beta_2 = 0.999, \varepsilon = 10^{-8}$)
- Adam combines the advantages of RMSProp and momentum

Correct