



Optimization algorithms

Quiz, 10 questions



Congratulations! You passed!

Next Item



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points

1.
Which notation would you use to denote the 3rd layer's activations when the input is the 7th example from the 8th minibatch?

☐ $a^{[8]\{3\}(7)}$

☒ $a^{[3]\{8\}(7)}$



Correct

☐ $a^{[8]\{7\}(3)}$

☐ $a^{[3]\{7\}(8)}$



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

☐ Training one epoch (one pass through the training set) using mini-batch gradient descent is faster than training one epoch using batch gradient descent.

☒ One iteration of mini-batch gradient descent (computing on a single mini-batch) is faster than one iteration of batch gradient descent.



Correct

☐ 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).



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3.
Why is the best mini-batch size usually not 1 and not m, but instead something in-between?

☐ If the mini-batch size is 1, you end up having to process the entire training set before making any progress.



Un-selected is correct



If the mini-batch size is m , you end up with stochastic gradient descent, which is usually slower than mini-batch gradient descent.

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Un-selected is correct



If the mini-batch size is m , you end up with batch gradient descent, which has to process the whole training set before making progress.

Correct



If the mini-batch size is 1, you lose the benefits of vectorization across examples in the mini-batch.

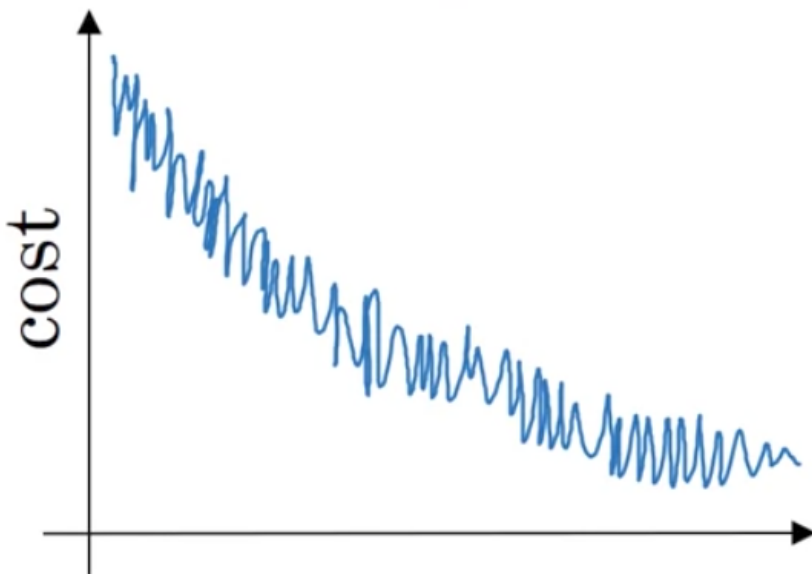
Correct



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points

4.

Suppose your learning algorithm's cost J , plotted as a function of the number of iterations, looks like this:



Which of the following do you agree with?



Whether you're using batch gradient descent or mini-batch gradient descent, something is wrong.



Whether you're using batch gradient descent or mini-batch gradient descent, this looks acceptable.



If you're using mini-batch gradient descent, something is wrong. But if you're using batch gradient descent, this looks acceptable.



If you're using mini-batch gradient descent, this looks acceptable. But if you're using batch gradient descent, something is wrong.

Correct



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5.

Suppose the temperature in Casablanca over the first three days of January are the same:

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

Jan 2nd: $\theta_2 10^\circ C$

(We used Fahrenheit in lecture, so will use Celsius here in honor of the metric world.)

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 $v_2^{\text{corrected}}$ is the value you compute with bias correction. What are these values? (You might be able to do this without a calculator, but you don't actually need one. Remember what is bias correction doing.)

☐ $v_2 = 10, v_2^{\text{corrected}} = 7.5$

☒ $v_2 = 7.5, v_2^{\text{corrected}} = 10$



Correct

☐ $v_2 = 10, v_2^{\text{corrected}} = 10$

☐ $v_2 = 7.5, v_2^{\text{corrected}} = 7.5$



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6.

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

☐ $\alpha = 0.95^t \alpha_0$

☐ $\alpha = \frac{1}{\sqrt{t}} \alpha_0$

☐ $\alpha = \frac{1}{1+2*t} \alpha_0$

☒ $\alpha = e^t \alpha_0$



Correct

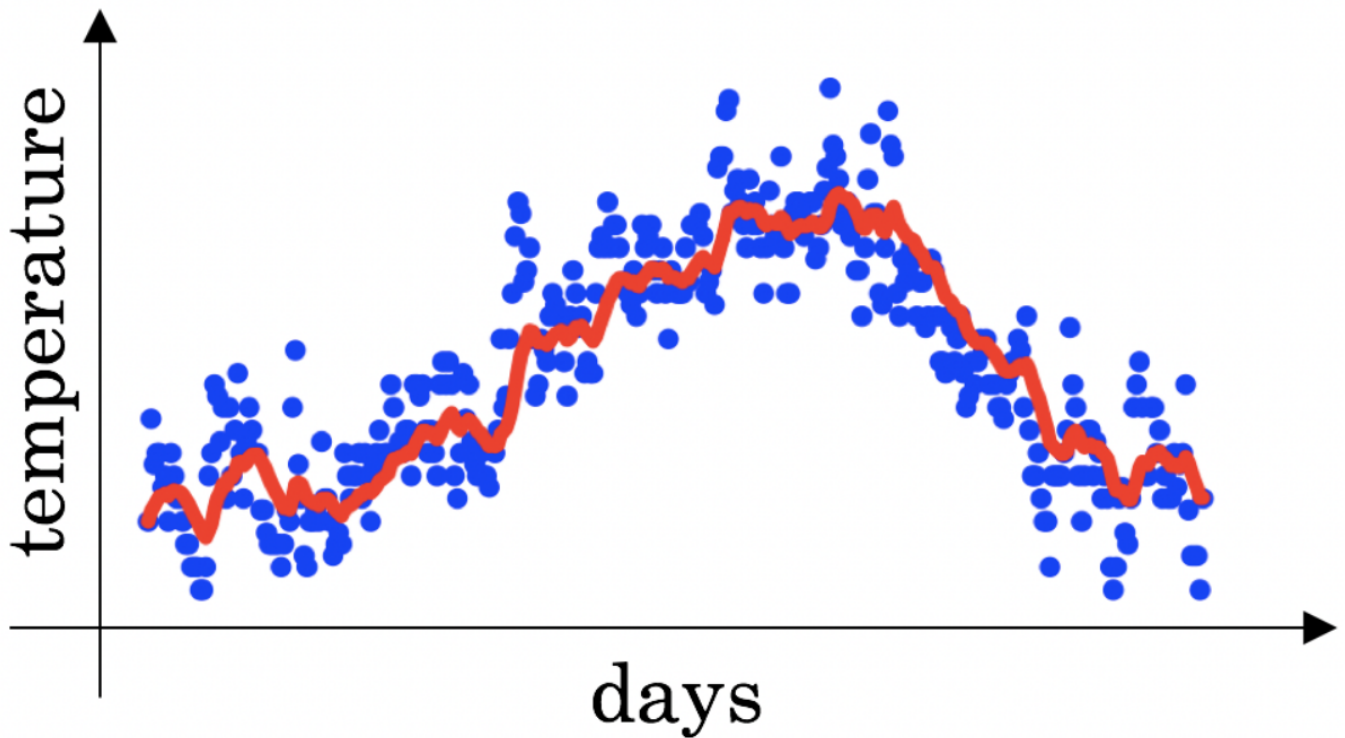


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points

7.

You use an exponentially weighted average on the London temperature dataset. You use the following to track the temperature:

$$\hat{v}_t = \beta v_t + (1 - \beta) \hat{v}_{t-1}$$
 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)



☐ Decreasing β will shift the red line slightly to the right.



Un-selected is correct

☐ Increasing β will shift the red line slightly to the right.



Correct

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

☐ 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.



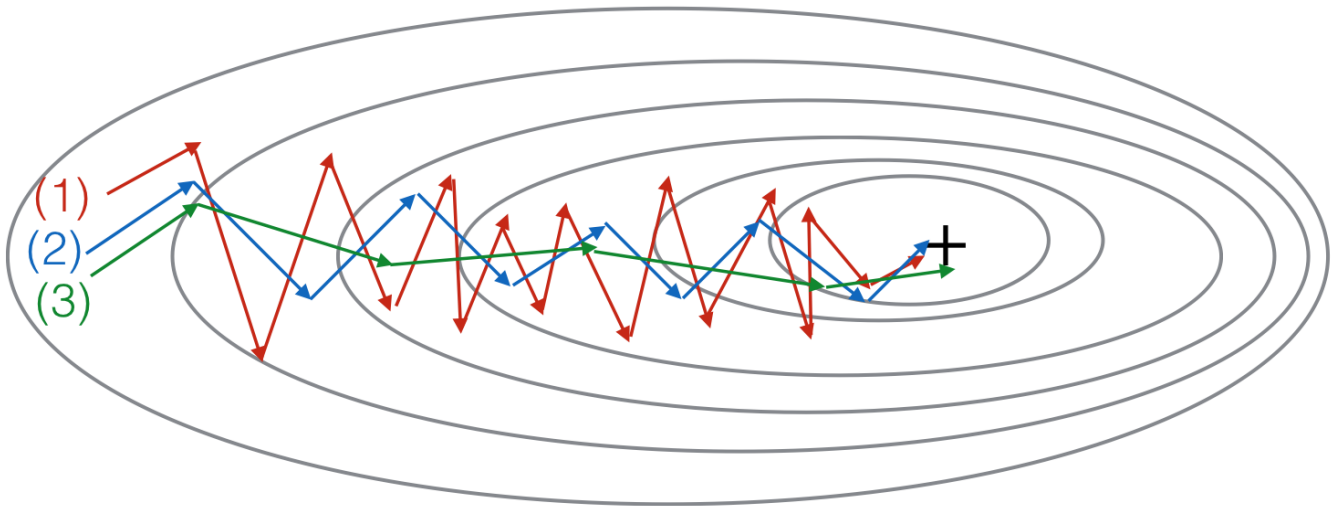
Un-selected is correct



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8. Optimization algorithms

Consider this figure:
Quiz, 10 questions



These plots were generated with gradient descent; with gradient descent with momentum ($\beta = 0.5$) and gradient descent with momentum ($\beta = 0.9$). Which curve corresponds to which algorithm?

☒ (1) is gradient descent. (2) is gradient descent with momentum (small β). (3) is gradient descent with momentum (large β)



Correct

☐ (1) is gradient descent with momentum (small β), (2) is gradient descent with momentum (small β), (3) is gradient descent

☐ (1) is gradient descent with momentum (small β). (2) is gradient descent. (3) is gradient descent with momentum (large β)

☐ (1) is gradient descent. (2) is gradient descent with momentum (large β) . (3) is gradient descent with momentum (small β)



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points

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 $\mathcal{J}(W^{[1]}, b^{[1]}, \dots, W^{[L]}, b^{[L]})$. Which of the following techniques could help find parameter values that attain a small value for \mathcal{J} ? (Check all that apply)



Try tuning the learning rate α



Correct



Try using Adam



Correct



Try mini-batch gradient descent



Correct



☐ Try initializing all the weights to zero

Un-selected is correct

✓ 1 / 1
points

10.

Which of the following statements about Adam is False?

- ☐ The learning rate hyperparameter α in Adam usually needs to be tuned.
- ☒ Adam should be used with batch gradient computations, not with mini-batches.

Correct

- ☐ Adam combines the advantages of RMSProp and momentum
- ☐ We usually use "default" values for the hyperparameters β_1, β_2 and ε in Adam ($\beta_1 = 0.9, \beta_2 = 0.999, \varepsilon = 10^{-8}$)

