

Deep Learning Assignment 1 - Report

Students

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Auxiliary functions

- **split_given_size** - A function to split an array into chunks by size. Receives as input an array to split and size of each chunk. Returns a list of array chunks by size. This function is used to create batches.

Changes to support dropout

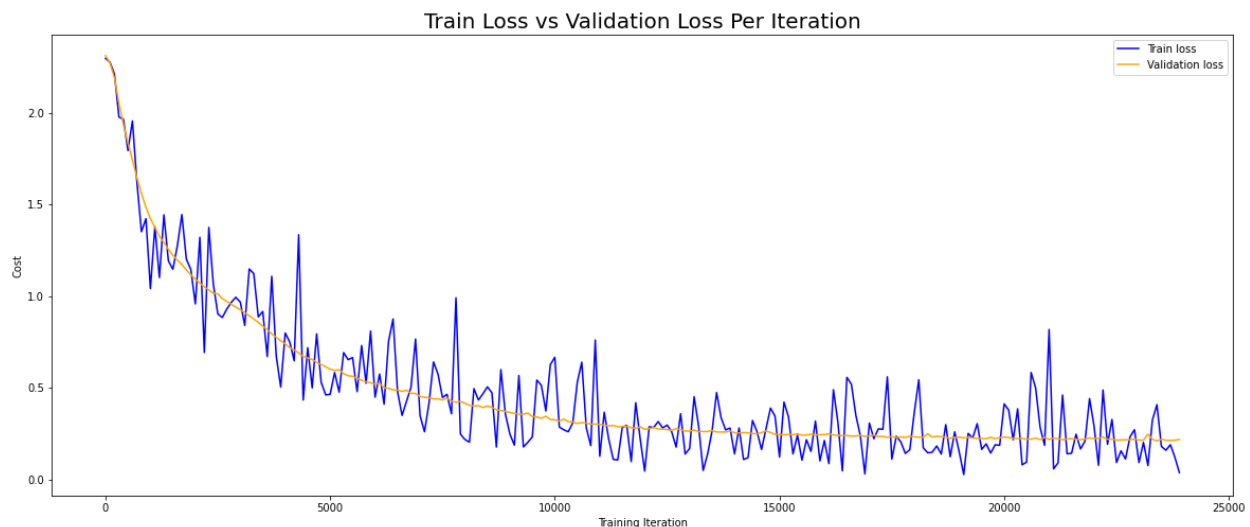
- **Defining KEEP_PROB parameter** - using the following code:
 - `KEEP_PROB = 0.8`
- **L_model_forward** - receive boolean flag “use_dropout” in order to indicate whether to use dropout or not. Also dropout occurs in this function using the following code:
 - if use_dropout:
 - `D = np.random.rand(A.shape[0], A.shape[1]) < KEEP_PROB`
 - `A = np.multiply(A, D)`
 - `A /= KEEP_PROB`

And the D array is added to cache for backpropagation:

- `cache["dropout"] = {"D" : D}`
- **L_model_backward** - receive boolean flag “use_dropout” in order to indicate whether to use dropout or not. Also dropout backpropagation occurs in this function using the following code:
 - if use_dropout:
 - `dA_prev = np.multiply(dA_prev, caches[i]["dropout"]["D"])`
- **L_layer_model** - receive boolean flag “use_dropout” in order to indicate whether to use dropout or not. And pass this flag to L_model_forward and L_model_backward.

Approach 1 - MNIST classification with no batchnorm and no dropout

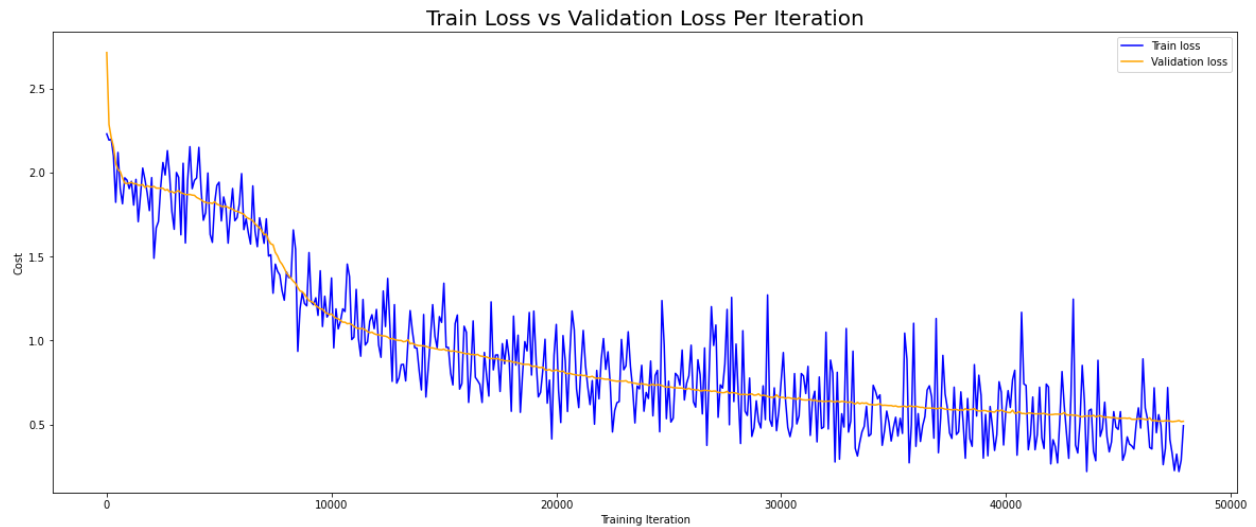
- Batch size - 32
- Number of epochs (training steps) - 16
- Number of iterations - 24000
- Final train accuracy - 94.5958%
- Final validation accuracy - 94.0417%
- Final test accuracy - 93.8500%
- The cost value for each 100 training iterations:



Approach 2 - MNIST classification with batchnorm and no dropout

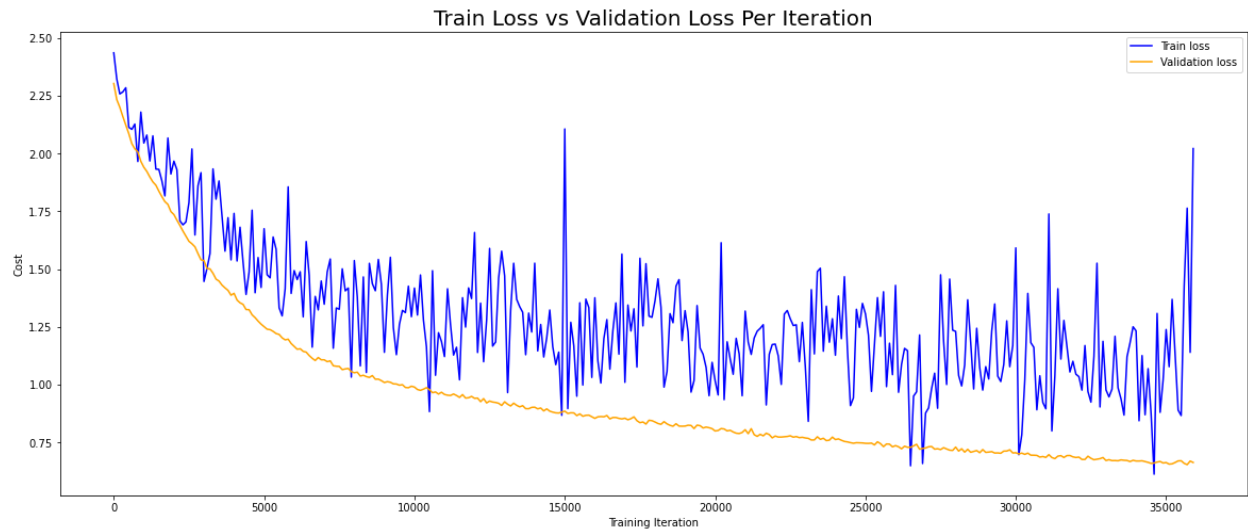
- Batch size - 32
- Number of epochs (training steps) - 32
- Number of iterations - 48000
- Final train accuracy - 87.9417%
- Final validation accuracy - 87.4667%
- Final test accuracy - 87.8500%

- The cost value for each 100 training iterations:



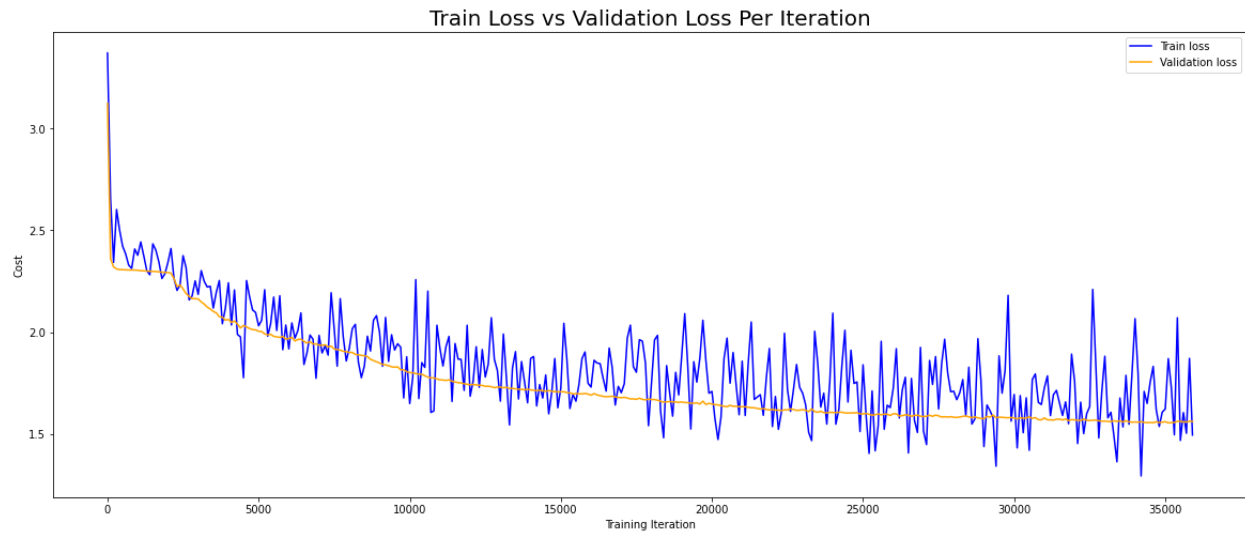
Approach 3 - MNIST classification with no batchnorm and dropout

- Batch size - 32
- Number of epochs (training steps) - 24
- Number of iterations - 36000
- Final train accuracy - 86.4417%
- Final validation accuracy - 85.7500%
- Final test accuracy - 85.8100%
- The cost value for each 100 training iterations:



Approach 4 - MNIST classification with batchnorm and dropout

- Batch size - 32
- Number of epochs (training steps) - 24
- Number of iterations - 36000
- Final train accuracy - 37.8563%
- Final validation accuracy - 37.6667%
- Final test accuracy - 38.6900%
- The cost value for each 100 training iterations:



Comparison

Approach	Performance (accuracy) on train set	Performance (accuracy) on validation set	Performance (accuracy) on test set	Epochs (training steps)	Number of iterations
1	94.5958%	94.0417%	93.8500%	16	24000
2	87.9417%	87.4667%	87.8500%	32	48000
3	86.4417%	85.7500%	85.8100%	24	36000
4	37.8563%	37.6667%	38.6900%	24	36000