Assignment: Neural Net - Deep Neural Net

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This assignment is divided into two parts: NN, DNN. You have to write your code in place of ##TODO and run. Pytorch is used to implement neural networks. Starter code for MNIST and SGD scaffolding is given in Colab/Jupyter notebook.

1 Neural Net

Problem 1: Gradient Descent Implement the GD algorithm as a function. Use the GD algorithm to find the optimum of the Rosenbrock (https://en.wikipedia.org/wiki/Rosenbrockfunction)

Problem 2: Logistic Regression Linear regression is suitable for problems. Implement the LR.

Problem 3: Backpropagation through a *tanh* Neuron

Problem 4 : SoftMax Regression Implement SoftMax Regression. Implement SoftMax regression and apply it to the Iris dataset

Problem 5: 2 layer NN The task is to extend the SoftMax regression model to a 2-layer neural net.

Problem 6: XOR, Iris and MNIST

Problem 7: Answer the following: What will happen if for each layer (hidden and output) all w will be initialized to the same values before the training?

Some bonus problems

2 Deep Neural Net/CNN

Implement the following

Problem 1: Stochastic Gradient Descent (SGD), Momentum, Learning rate, Weight decay

Problem 2: Tuning the Network for MNIST.

Problem 3: Dropout.

Problem 4: Data Augmentation.

Problem 5: Batch Normalization.

Bonus problemS: Norm Constraints, Polyak Averaging, Convolutional Network, Hyperparameter tuner.