ECE 421 Programming Assignment Question

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**Part 1B Questions**

1. Parameter tol is the stopping criterion, if it is not none, it will stop training iterations when (loss > previous\_loss – tol) to prevent overfitting.
2. Setting max\_iter = 5000 and tol = 1e-3 does not guarantee the algorithm will pass over the training data 5000 times since whenever tol exceeds 1e-3, training iteration will stop. We could set n\_iter\_no\_change = 5000 to ensure that the algorithm will pass over the training data 5000 times since this is the number of iterations with zero improvement.
3. We could use the class\_weight parameter to set the weights of the model to certain value.
4. NumPy Implementation Confusion Matrix

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted | | |
| Label |  | -1 | +1 |
| -1 | 9 | 2 |
| +1 | 0 | 9 |

Scikit-learn Library Confusion Matrix.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted | | |
| Label |  | -1 | +1 |
| -1 | 9 | 0 |
| +1 | 0 | 11 |

Scikit-learn library resulted in 100% accuracy, while our Numpy implementation only resulted in 90% accuracy, which is also very good.

**Part 2A Questions**

1. The matrix input from function subtestFn() is,

Its transpose is,

The matrix multiplication of X\_train with its own transpose is,

If this square matrix has determinant of zero, then it is a singular matrix,

Thus, indeed the input to the function linalg.inv is a singular matrix according to its defination.

1. The function subtestFn() printed “ERROR” in the terminal.
2. Linalg.inv compute the multiplicative inverse of a matrix and it is computed by finding another matrix (avin) that satisfy the following equation.

Linalg.pinv compute the Moore-Penrose pseudo-inverse of a matrix and it is computed using singular value decomposition (SVD) and including all large singular values.

The model’s weight is the following,