

CPSC-481 — A.I. — Project 2 — MLP

Project 2 — MLP

Introduction

This project is to build a Multi-Layer Perceptron (MLP) back-propagation network style of artificial neural network classifier. The project will include a Classified Set of feature vectors with more than 2 possible classes. The Training Set will be a percentage of those vectors. A single MLP will be constructed with one hidden layer and one multi-class output layer. Either Lisp or Python can be used to implement the project – there is no visualization component to this project.

Build Details

The project will include an initial Classified Set of 100 pre-classed feature vectors. Each vector will be pre-classed with one of 8 possible classifications. The vectors have attributes/features with values in [0..96]. It might be possible to obtain more pre-classed vectors in case some classes seem to sparsely represented.

You will be responsible for determining the number of hidden layer nodes, but we recommend a dozen or fewer. You will also determine the initial link weight values. You can use the more-forgiving **80%-20% rule** for your back-propagation Target vector.

You should split the Classified Set into a Training Set and a Holdout Set. You may assume that the labels are accurate, though not all the attributes are as effective as one would hope. Here is an example of the format (id (vector) label) of a pre-classed feature vector: (2 (91 25 91 17 60 91 87 93 15 93) 5). You must be able to read a wilder feature vector in the format shown (with parentheses, comma-less) – (eg, you could read in a text file of wilders in the above format and spit out the labeling for each.)

Use the **Logistic Fcn** for calculating the gradient.

Pick your own **Learning Rate** for Back-propagation, and you can alter it dynamically (ie, while you are running epochs and/or running training vectors) – eg, like Simulated Annealing.

You should not use any outside ANN/MLP libraries/code for your project; do it “from scratch”.

Validation

An initial pre-classed Validation Set will be provided at about the half-way point of the project so that you can get an idea of how well your MLP classifier is working.

Output

The project will output 1) the MLP architecture, including initial weights, final weights, and how many epochs you required for the training. (If you try more than one set of initial weights, we just want the ones you used in your final training of the MLP.)

Also 2) the accuracy and various rate results of the final MLP on the Holdout vectors, and on the Validation Set.

Team

The team size and naming style is the same as before, but you can change team members from the previous project if you wish (and you can change the team name).

Project Development Reporting As before.

Readme File As before.

Academic Rules As before.

Submission As before.

Grading As before.

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Below are the initial Classified Set feature vectors.

(1 (17 13 74 63 78 12 22 82 55 15) 5)	(51 (23 76 5 5 31 18 11 56 2 17) 5)
(2 (91 25 91 17 60 91 87 93 15 93) 5)	(52 (81 91 25 91 29 17 91 87 93 15) 5)
(3 (74 9 77 92 33 62 54 58 51 10) 4)	(53 (18 11 56 2 87 17 13 74 63 12) 6)
(4 (3 20 19 26 67 18 70 18 59 56) 5)	(54 (17 51 54 53 68 69 43 86 0 57) 4)
(5 (85 26 24 81 42 8 14 75 83 92) 3)	(55 (83 92 11 67 5 96 21 29 59 89) 3)
(6 (38 23 76 5 28 5 18 11 56 2) 1)	(56 (18 59 56 5 1 80 63 36 74 9) 5)
(7 (93 15 93 45 60 17 51 54 53 69) 3)	(57 (17 51 54 53 60 69 43 86 0 57) 4)
(8 (26 18 70 18 76 59 56 5 80 63) 4)	(58 (89 27 81 91 9 25 91 17 91 87) 5)
(9 (5 5 18 11 64 56 2 17 13 74) 7)	(59 (5 80 63 36 57 74 9 77 92 62) 6)
(10 (63 36 74 9 16 77 92 62 54 58) 3)	(60 (18 70 18 59 40 56 5 80 63 36) 2)
(11 (59 56 5 80 37 63 36 74 9 77) 4)	(61 (74 63 12 22 11 82 55 15 85 26) 0)
(12 (11 56 2 17 96 13 74 63 12 22) 2)	(62 (14 75 83 92 31 11 67 96 21 29) 3)
(13 (17 51 54 53 72 69 43 86 0 57) 4)	(63 (96 21 29 59 89 89 27 81 91 25) 3)
(14 (72 89 61 51 57 36 8 3 20 19) 2)	(64 (55 15 85 26 40 24 81 8 14 75) 3)
(15 (13 74 63 12 19 22 82 55 15 85) 2)	(65 (91 25 91 17 82 91 87 93 15 93) 5)
(16 (81 91 25 91 52 17 91 87 93 15) 5)	(66 (93 45 17 51 34 54 53 69 43 86) 0)
(17 (96 21 29 59 23 89 27 81 91 25) 3)	(67 (86 0 57 12 67 52 44 74 64 70) 4)
(18 (36 74 9 77 34 92 62 54 58 51) 2)	(68 (25 91 17 91 71 87 93 15 93 45) 1)
(19 (61 51 36 8 27 3 20 19 26 18) 6)	(69 (91 17 91 87 31 93 15 93 45 17) 3)
(20 (51 36 8 3 46 20 19 26 18 70) 2)	(70 (85 26 24 81 37 8 14 75 83 92) 3)
(21 (64 70 84 39 69 70 50 72 89 61) 3)	(71 (62 54 58 51 93 10 44 72 59 12) 6)
(22 (89 61 51 36 46 8 3 20 19 26) 2)	(72 (14 75 83 92 71 11 67 96 21 29) 3)
(23 (93 45 17 51 26 54 53 69 43 86) 0)	(73 (70 18 59 56 80 5 80 63 36 74) 1)
(24 (22 82 55 15 47 85 26 24 81 8) 6)	(74 (18 70 18 59 57 56 5 80 63 36) 2)
(25 (89 61 51 36 54 8 3 20 19 26) 2)	(75 (54 53 69 43 90 86 0 57 12 52) 4)
(26 (74 64 70 84 93 39 70 50 72 89) 5)	(76 (75 83 92 11 7 67 96 21 29 59) 1)
(27 (38 23 76 5 92 5 18 11 56 2) 1)	(77 (44 72 59 12 18 38 23 76 5 5) 2)
(28 (36 74 9 77 56 92 62 54 58 51) 2)	(78 (14 75 83 92 82 11 67 96 21 29) 3)
(29 (25 91 17 91 64 87 93 15 93 45) 1)	(79 (5 18 11 56 71 2 17 13 74 63) 4)
(30 (17 91 87 93 50 15 93 45 17 51) 6)	(80 (36 74 9 77 53 92 62 54 58 51) 2)
(31 (92 11 67 96 4 21 29 59 89 27) 1)	(81 (36 8 3 20 51 19 26 18 70 18) 3)
(32 (53 69 43 86 83 0 57 12 52 44) 2)	(82 (21 29 59 89 51 27 81 91 25 91) 1)
(33 (17 13 74 63 21 12 22 82 55 15) 5)	(83 (92 11 67 96 16 21 29 59 89 27) 1)
(34 (74 64 70 84 32 39 70 50 72 89) 5)	(84 (18 70 18 59 76 56 5 80 63 36) 2)
(35 (63 12 22 82 86 55 15 85 26 24) 1)	(85 (56 5 80 63 95 36 74 9 77 92) 6)
(36 (81 91 25 91 27 17 91 87 93 15) 5)	(86 (74 64 70 84 21 39 70 50 72 89) 5)
(37 (10 44 72 59 43 12 38 23 76 5) 5)	(87 (12 38 23 76 39 5 5 18 11 56) 2)
(38 (43 86 0 57 81 12 52 44 74 64) 6)	(88 (96 21 29 59 2 89 27 81 91 25) 3)
(39 (44 74 64 70 27 84 39 70 50 72) 1)	(89 (15 85 26 24 47 81 8 14 75 83) 4)
(40 (20 19 26 18 40 70 18 59 56 5) 0)	(90 (54 53 69 43 45 86 0 57 12 52) 4)
(41 (54 58 51 10 36 44 72 59 12 38) 7)	(91 (45 17 51 54 78 53 69 43 86 0) 1)
(42 (27 81 91 25 39 91 17 91 87 93) 7)	(92 (84 39 70 50 79 72 89 61 51 36) 0)
(43 (93 15 93 45 14 17 51 54 53 69) 3)	(93 (70 84 39 70 49 50 72 89 61 51) 4)
(44 (36 8 3 20 15 19 26 18 70 18) 3)	(94 (22 82 55 15 54 85 26 24 81 8) 6)
(45 (51 54 53 69 51 43 86 0 57 12) 4)	(95 (12 38 23 76 63 5 5 18 11 56) 2)
(46 (29 59 89 27 14 81 91 25 91 17) 3)	(96 (51 36 8 3 83 20 19 26 18 70) 2)
(47 (17 51 54 53 31 69 43 86 0 57) 4)	(97 (57 12 52 44 77 74 64 70 84 39) 6)
(48 (63 36 74 9 48 77 92 62 54 58) 3)	(98 (29 59 89 27 24 81 91 25 91 17) 3)
(49 (81 91 25 91 72 17 91 87 93 15) 5)	(99 (81 91 25 91 83 17 91 87 93 15) 5)
(50 (72 89 61 51 62 36 8 3 20 19) 2)	(100 (53 69 43 86 63 0 57 12 52 44) 2)