

```
In [13]: 'C:/Users/ujjwa/OneDrive - Centennial College/Documents/Semester_3/
Artificial_Intelligence/Assignments/Neural_Network/Assignment#5_Ujjwal/Exercise#5_Ujjwal/
Ujjwal#Ex5.py' = 'C:/Users/ujjwa/OneDrive - Centennial College/Documents/Semester_3/
Artificial_Intelligence/Assignments/Neural_Network/Assignment#5_Ujjwal/Exercise#5_Ujjwal '
```

```
[[-0.3962035  0.453771 -0.4819838 ]
 [-0.09467085 0.54946744 0.03979834]
 [ 0.23025254 -0.22138124 0.22380111]
 [ 0.40155081 -0.57805407 0.30017318]
 [ 0.58663331 0.29779879 -0.26346721]
 [ 0.34713519 -0.47612879 -0.06252777]
 [ 0.4903146 -0.24766302 -0.25466959]
 [-0.44396571 -0.57675965 0.21460264]
 [-0.34604626 -0.28134401 -0.01011221]
 [-0.53596495 0.08894113 -0.42392571]]
[[-0.42441629]
 [ 0.49459493]
 [ 0.23267241]
 [ 0.12366992]
 [ 0.62096488]
 [-0.19152137]
 [-0.01201801]
 [-0.80612272]
 [-0.63750248]
 [-0.87094953]]
```

```
Epoch: 15; Error: 0.024155578331433863;
Epoch: 30; Error: 0.007138133345408161;
Epoch: 45; Error: 0.005890806198315972;
Epoch: 60; Error: 0.0030193437446344373;
Epoch: 75; Error: 0.0009771991658869411;
Epoch: 90; Error: 5.1174086546529595e-05;
The goal of learning is reached
```

```
[[0.43781437]]
[[ 4.51666983e-01  4.73527996e-01 -4.97946946e-01]
 [-5.53134260e-01 -3.96203497e-01  4.53771004e-01]
 [-4.81983799e-01 -9.46708500e-02  5.49467436e-01]
 [ 3.97983420e-02  2.30252537e-01 -2.21381243e-01]
 [ 2.23801113e-01  4.01550806e-01 -5.78054067e-01]
 [ 3.00173178e-01  5.86633307e-01  2.97798785e-01]
 [-2.63467210e-01  3.47135194e-01 -4.76128792e-01]
 [-6.25277686e-02  4.90314604e-01 -2.47663022e-01]
 [-2.54669594e-01 -4.43965713e-01 -5.76759651e-01]
 [ 2.14602640e-01 -3.46046261e-01 -2.81344009e-01]
 [-1.01122089e-02 -5.35964946e-01  8.89411266e-02]
 [-4.23925710e-01  1.07166644e-01  2.39710032e-01]
 [-4.77198685e-01 -1.03132815e-01  2.33280189e-01]
 [-1.02984877e-01 -5.40055849e-01  4.30756871e-02]
 [ 1.96553574e-01  1.78669345e-02  5.33513707e-01]
 [ 1.03866049e-01  4.84082298e-01 -4.35030355e-01]
 [-4.32868383e-01  3.68869546e-01 -1.22787796e-01]
 [-4.01574963e-01  5.13010296e-01 -1.82680968e-01]
 [ 3.00974524e-01  2.71197582e-01  4.59967309e-01]
 [ 1.48406648e-01  3.01130921e-01 -1.81321990e-01]
 [-2.76086530e-01  4.75063462e-01 -8.62905722e-02]]
```

[5.57808057e-01	1.96129797e-01	1.46034864e-01]
[-4.62304832e-01	5.39387110e-01	-6.01054398e-02]
[9.40675373e-02	-1.10235837e-01	-3.15567624e-01]
[4.84055425e-01	8.84153840e-02	-5.96555608e-01]
[1.40573896e-01	-2.08026118e-01	3.24697227e-02]
[4.63130519e-01	-1.71276288e-01	4.90242181e-01]
[1.48032139e-01	-5.81014509e-01	5.15324680e-01]
[2.29076301e-01	5.96787421e-01	-3.93191390e-01]
[-4.35437100e-01	5.19114556e-01	2.36181794e-01]
[-5.20799793e-01	3.06555663e-01	3.04651426e-01]
[5.07629443e-01	2.53829710e-01	-4.50874846e-01]
[-5.76143839e-01	-5.68546816e-01	-5.66032214e-01]
[-3.04546719e-01	4.32033538e-01	4.65972772e-02]
[6.33863744e-02	4.10437071e-01	-4.50992022e-01]
[-2.64979585e-01	1.02911126e-01	5.63514898e-01]
[7.32362631e-02	-5.77623253e-01	3.60759207e-01]
[-3.20430871e-01	3.68526235e-01	-1.34567227e-01]
[4.36250225e-01	2.96545971e-01	6.74882808e-02]
[-4.36253729e-01	-5.28098773e-01	-4.54387853e-01]
[-5.46537746e-01	-4.71007045e-01	-3.29148794e-01]
[2.55586776e-01	7.16603785e-02	-5.84932824e-01]
[-5.13630864e-01	5.60731596e-01	8.17205543e-02]
[-3.56048118e-01	-2.97209107e-01	2.92591025e-01]
[-3.65484623e-01	9.76307127e-02	5.64023987e-01]
[4.16194562e-01	-3.12182689e-01	-7.47634288e-03]
[1.43946862e-01	3.94777079e-01	-4.11850326e-01]
[-5.77708557e-01	-5.15973428e-01	-1.63858669e-02]
[1.27595354e-01	8.26217245e-02	-2.19165109e-01]
[5.86339385e-01	9.56942631e-02	-1.43830593e-01]
[6.11378629e-02	2.94401317e-01	2.03079472e-01]
[-2.82096531e-01	-5.20398199e-01	-1.55898963e-01]
[1.55661008e-01	-3.47791188e-01	3.03306664e-01]
[-5.20156222e-01	-2.87621882e-01	3.65705476e-01]
[-3.67878861e-01	1.67353057e-01	2.96043709e-02]
[5.09769564e-01	-2.84043875e-01	-5.20846691e-01]
[2.82079156e-01	3.26613635e-01	4.89379023e-01]
[5.18366483e-01	-5.83258112e-01	-3.18765497e-01]
[1.40134028e-01	5.38819585e-01	5.40211343e-01]
[6.79838258e-02	4.98727620e-01	1.69879451e-01]
[-1.31990743e-01	-1.68111995e-02	1.25172580e-01]
[5.94575058e-02	5.11417712e-01	5.02480123e-01]
[-1.26149264e-01	5.55915034e-01	-3.91253200e-01]
[-4.48404577e-01	-4.37905010e-01	6.79459881e-03]
[-5.74170234e-01	5.37564253e-01	3.92538565e-01]
[-5.81977223e-01	-3.88564493e-01	-2.01523711e-01]
[-4.42803786e-01	3.71388831e-01	-1.86316017e-01]
[5.28128979e-01	9.84170159e-02	4.54598381e-01]
[4.13681334e-01	4.86470782e-01	-4.81436810e-02]
[5.56161792e-02	3.58324309e-01	-2.57137378e-01]
[-1.16957729e-02	1.18932369e-01	-5.81360069e-01]
[1.12177690e-01	-7.95883812e-02	3.68832635e-01]
[-2.21706236e-01	4.71466450e-01	9.34286583e-02]
[-3.79187758e-01	3.45515081e-01	1.34437412e-01]
[-5.35308874e-01	-9.57675840e-02	2.14882604e-01]
[5.02322134e-01	-5.99517570e-01	5.72110979e-01]

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[-1.48103622e-01  5.68540246e-01  1.25659321e-01]
[ 3.94614970e-01  8.96538056e-02  1.53691438e-01]
[-2.57308462e-01  1.04200009e-01  3.00026116e-01]
[ 4.29976604e-01  3.06098626e-01  2.37668698e-01]
[ 4.37375316e-01 -2.12782804e-01  2.04946549e-01]
[-5.89512763e-02 -1.41476698e-01 -1.07026380e-01]
[-1.18224500e-01 -2.19139265e-01  1.46303242e-01]
[-8.37032750e-02  5.68562494e-01  2.13361070e-01]
[-3.61716134e-01 -8.79587888e-02 -1.87984512e-01]
[ 3.57166565e-01  4.55997946e-01  4.84610347e-01]
[ 1.95263775e-01 -2.75750086e-01 -2.97159958e-01]
[ 4.25877531e-01  3.32575756e-02  3.62593301e-01]
[ 8.69862206e-02  2.79771030e-01  2.28139530e-02]
[ 3.25060693e-01  8.26295888e-02 -4.11481457e-02]
[-1.88773310e-01 -5.18148782e-01 -1.46490985e-01]
[-5.04448707e-01  5.79380536e-01 -3.82064578e-01]
[ 3.74230437e-01  4.49953974e-01  2.26095903e-01]
[ 8.33932953e-02 -4.06834276e-01 -3.97439727e-02]
[-1.85793539e-01 -3.29952051e-01  1.11014243e-01]
[-2.25276195e-01  4.99566664e-01  4.91562630e-01]
[-2.91458047e-01 -4.66930439e-01 -3.68444722e-01]
[-4.98995185e-04  2.74302802e-01 -3.50166674e-01]
[-3.02359730e-01  4.22006250e-01 -1.00981538e-01]
[ 1.40022081e-01 -3.19600633e-01 -4.77639289e-01]]
[[ 0.42724803]
[-0.49556675]
[-0.02718721]
[ 0.04866964]
[ 0.04729785]
[ 1.18460527]
[-0.39246081]
[ 0.18012381]
[-1.27539496]
[-0.41278763]
[-0.45713603]
[-0.07704903]
[-0.34705131]
[-0.59996504]
[ 0.74793422]
[ 0.15291799]
[-0.18678663]
[-0.07124564]
[ 1.03213942]
[ 0.26821558]
[ 0.11268636]
[ 0.89997272]
[ 0.01697684]
[-0.33173592]
[-0.0240848 ]
[-0.0349825 ]
[ 0.78209641]
[ 0.08234231]
[ 0.43267233]
[ 0.31985925]
[ 0.0904073 ]

```

[0.31058431]
[-1.71072287]
[0.1740841]
[0.02283142]
[0.40144644]
[-0.14362778]
[-0.08647186]
[0.80028448]
[-1.41874035]
[-1.34669358]
[-0.25768567]
[0.12882129]
[-0.3606662]
[0.29617008]
[0.09653553]
[0.12687362]
[-1.11006785]
[-0.00894803]
[0.53820306]
[0.55861865]
[-0.95839369]
[0.11117648]
[-0.44207263]
[-0.17092143]
[-0.295121]
[1.09807181]
[-0.38365713]
[1.21916496]
[0.7365909]
[-0.02362936]
[1.07335534]
[0.03851257]
[-0.87951499]
[0.35593259]
[-1.17206543]
[-0.25773097]
[1.08114438]
[0.85200844]
[0.15680311]
[-0.47412347]
[0.40142194]
[0.34318887]
[0.10076473]
[-0.41619385]
[0.47491554]
[0.54609594]
[0.63796021]
[0.14691766]
[0.97374393]
[0.42953906]
[-0.30745435]
[-0.19106052]
[0.69822029]
[-0.63765943]
[1.29777486]

```
[-0.37764627]
[ 0.82172841]
[ 0.3895712 ]
[ 0.36654214]
[-0.85341308]
[-0.30713275]
[ 1.05028031]
[-0.36318495]
[-0.40473135]
[ 0.7658531 ]
[-1.12683321]
[-0.07636287]
[ 0.01866498]
[-0.65721784]]
Epoch: 100; Error: 1.9116650975992675;
Epoch: 200; Error: 1.415138889792522;
Epoch: 300; Error: 1.1010837218393295;
Epoch: 400; Error: 0.9538536066178438;
Epoch: 500; Error: 0.8795249083076757;
Epoch: 600; Error: 2.974644225207735;
Epoch: 700; Error: 1.2454030287682334;
Epoch: 800; Error: 1.2172531222541405;
Epoch: 900; Error: 1.2076483510500398;
Epoch: 1000; Error: 1.203793698234653;
The maximum number of train epochs is reached
[[0.59333749]]
```

In [14]: