

Model 1 ANN report:

Epoch 1/15

26/26 [=====] - 0s 5ms/step - loss: 8.9997 - accuracy: 0.1044

Epoch 2/15

26/26 [=====] - 0s 6ms/step - loss: 2.4429 - accuracy: 0.1238

Epoch 3/15

26/26 [=====] - 0s 6ms/step - loss: 2.3656 - accuracy: 0.1408

Epoch 4/15

26/26 [=====] - 0s 5ms/step - loss: 2.2423 - accuracy: 0.2002

Epoch 5/15

26/26 [=====] - 0s 5ms/step - loss: 2.1679 - accuracy: 0.2002

Epoch 6/15

26/26 [=====] - 0s 5ms/step - loss: 2.0217 - accuracy: 0.2998

Epoch 7/15

26/26 [=====] - 0s 5ms/step - loss: 1.9101 - accuracy: 0.3240

Epoch 8/15

26/26 [=====] - 0s 5ms/step - loss: 1.7953 - accuracy: 0.3714

Epoch 9/15

26/26 [=====] - 0s 5ms/step - loss: 1.6128 - accuracy: 0.4296

Epoch 10/15

26/26 [=====] - 0s 5ms/step - loss: 1.5462 - accuracy: 0.4381

Epoch 11/15

26/26 [=====] - 0s 5ms/step - loss: 1.4878 - accuracy: 0.4490

Epoch 12/15

26/26 [=====] - 0s 5ms/step - loss: 1.3460 - accuracy: 0.5085

Epoch 13/15

26/26 [=====] - 0s 5ms/step - loss: 1.2964 - accuracy: 0.5255

Epoch 14/15

26/26 [=====] - 0s 5ms/step - loss: 1.2015 - accuracy: 0.5825

Epoch 15/15

26/26 [=====] - 0s 5ms/step - loss: 1.0374 - accuracy: 0.6396

Model Evaluation

26/26 [=====] - 0s 3ms/step - loss: 1.4702 - accuracy: 0.4909

Epoch 1/15

26/26 [=====] - 0s 5ms/step - loss: 1.3612 - accuracy: 0.5152

Epoch 2/15

26/26 [=====] - 0s 5ms/step - loss: 1.3793 - accuracy: 0.4982

Epoch 3/15

26/26 [=====] - 0s 5ms/step - loss: 1.3333 - accuracy: 0.5115

Epoch 4/15

26/26 [=====] - 0s 5ms/step - loss: 1.2187 - accuracy: 0.5564

Epoch 5/15

26/26 [=====] - 0s 5ms/step - loss: 1.1728 - accuracy: 0.5782

Epoch 6/15

26/26 [=====] - 0s 5ms/step - loss: 1.1394 - accuracy: 0.5976

Epoch 7/15

26/26 [=====] - 0s 5ms/step - loss: 1.0484 - accuracy: 0.6279

Epoch 8/15

26/26 [=====] - 0s 5ms/step - loss: 1.0186 - accuracy: 0.6642

Epoch 9/15

26/26 [=====] - 0s 5ms/step - loss: 1.0152 - accuracy: 0.6412

Epoch 10/15

26/26 [=====] - 0s 5ms/step - loss: 0.8234 - accuracy: 0.7152

Epoch 11/15

26/26 [=====] - 0s 5ms/step - loss: 1.1219 - accuracy: 0.6194

Epoch 12/15

26/26 [=====] - 0s 5ms/step - loss: 0.9255 - accuracy: 0.6764

Epoch 13/15

26/26 [=====] - 0s 5ms/step - loss: 0.9480 - accuracy: 0.6545

Epoch 14/15

26/26 [=====] - 0s 5ms/step - loss: 0.8653 - accuracy: 0.6982

Epoch 15/15

26/26 [=====] - 0s 5ms/step - loss: 0.7444 - accuracy: 0.7406

Model Evaluation

26/26 [=====] - 0s 3ms/step - loss: 0.7057 - accuracy: 0.7876

precision	recall	f1-score	support		
	0.0	0.66	0.95	0.78	43
	1.0	0.79	0.75	0.77	40
	2.0	0.83	0.63	0.72	38
	3.0	0.77	0.77	0.77	39
	4.0	0.61	0.64	0.62	44
	5.0	0.58	0.90	0.71	39
	6.0	0.77	0.61	0.68	44
	7.0	0.63	0.68	0.65	40
	8.0	0.69	0.66	0.68	38
	9.0	0.88	0.46	0.60	48
accuracy				0.70	413
macro avg		0.72	0.70	0.70	413
weighted avg		0.72	0.70	0.70	413

Model 2 ANN report:

Epoch 1/15

26/26 [=====] - 0s 5ms/step - loss: 10.4169 - accuracy: 0.1044

Epoch 2/15

26/26 [=====] - 0s 5ms/step - loss: 2.5184 - accuracy: 0.1335

Epoch 3/15

26/26 [=====] - 0s 5ms/step - loss: 2.2559 - accuracy: 0.2039

Epoch 4/15

26/26 [=====] - 0s 5ms/step - loss: 2.1146 - accuracy: 0.2415

Epoch 5/15

26/26 [=====] - 0s 5ms/step - loss: 1.9758 - accuracy: 0.3070

Epoch 6/15

26/26 [=====] - 0s 5ms/step - loss: 1.9172 - accuracy: 0.3362

Epoch 7/15

26/26 [=====] - 0s 5ms/step - loss: 1.7418 - accuracy: 0.4029

Epoch 8/15

26/26 [=====] - 0s 5ms/step - loss: 1.5739 - accuracy: 0.4223

Epoch 9/15

26/26 [=====] - 0s 5ms/step - loss: 1.4718 - accuracy: 0.4915

Epoch 10/15

26/26 [=====] - 0s 5ms/step - loss: 1.2834 - accuracy: 0.5522

Epoch 11/15

26/26 [=====] - 0s 5ms/step - loss: 1.3028 - accuracy: 0.5461

Epoch 12/15

26/26 [=====] - 0s 5ms/step - loss: 1.3164 - accuracy: 0.5449

Epoch 13/15

26/26 [=====] - 0s 5ms/step - loss: 1.1732 - accuracy: 0.6007

Epoch 14/15

26/26 [=====] - 0s 5ms/step - loss: 1.1077 - accuracy: 0.6153

Epoch 15/15

26/26 [=====] - 0s 5ms/step - loss: 1.0585 - accuracy: 0.6238

Model Evaluation

26/26 [=====] - 0s 3ms/step - loss: 1.4163 - accuracy: 0.4861

Epoch 1/15

26/26 [=====] - 0s 5ms/step - loss: 1.2705 - accuracy: 0.5588

Epoch 2/15

26/26 [=====] - 0s 5ms/step - loss: 1.1765 - accuracy: 0.5891

Epoch 3/15

26/26 [=====] - 0s 5ms/step - loss: 1.2446 - accuracy: 0.5527

Epoch 4/15

26/26 [=====] - 0s 5ms/step - loss: 1.0105 - accuracy: 0.6400

Epoch 5/15

26/26 [=====] - 0s 5ms/step - loss: 1.1606 - accuracy: 0.5964

Epoch 6/15

26/26 [=====] - 0s 5ms/step - loss: 1.0406 - accuracy: 0.6291

Epoch 7/15

26/26 [=====] - 0s 5ms/step - loss: 0.9009 - accuracy: 0.6873

Epoch 8/15

26/26 [=====] - 0s 5ms/step - loss: 0.8517 - accuracy: 0.6994

Epoch 9/15

26/26 [=====] - 0s 5ms/step - loss: 0.8278 - accuracy: 0.7224

Epoch 10/15

26/26 [=====] - 0s 5ms/step - loss: 0.9238 - accuracy: 0.6739

Epoch 11/15

26/26 [=====] - 0s 5ms/step - loss: 1.0960 - accuracy: 0.6279

Epoch 12/15

26/26 [=====] - 0s 5ms/step - loss: 1.0421 - accuracy: 0.6339

Epoch 13/15

26/26 [=====] - 0s 5ms/step - loss: 0.9696 - accuracy: 0.6448

Epoch 14/15

26/26 [=====] - 0s 5ms/step - loss: 0.8360 - accuracy: 0.7164

Epoch 15/15

26/26 [=====] - 0s 5ms/step - loss: 0.7606 - accuracy: 0.7418

Model Evaluation

26/26 [=====] - 0s 3ms/step - loss: 0.8048 - accuracy: 0.7451

precision	recall	f1-score	support	
0.0	0.77	0.86	0.81	43
1.0	0.79	0.82	0.80	40
2.0	0.70	0.79	0.74	38
3.0	0.93	0.69	0.79	39
4.0	0.42	0.66	0.51	44
5.0	0.84	0.67	0.74	39
6.0	0.67	0.73	0.70	44
7.0	0.57	0.75	0.65	40
8.0	0.80	0.21	0.33	38
9.0	0.88	0.73	0.80	48
accuracy			0.69	413
macro avg	0.74	0.69	0.69	413
weighted avg	0.73	0.69	0.69	413

Model CNN report:

Epoch 1/15

26/26 [=====] - 1s 17ms/step - loss: 1.6977 - accuracy: 0.4150

Epoch 2/15

26/26 [=====] - 0s 17ms/step - loss: 0.6776 - accuracy: 0.7718

Epoch 3/15

26/26 [=====] - 0s 17ms/step - loss: 0.3307 - accuracy: 0.8981

Epoch 4/15

26/26 [=====] - 0s 17ms/step - loss: 0.1548 - accuracy: 0.9624

Epoch 5/15

26/26 [=====] - 0s 17ms/step - loss: 0.0768 - accuracy: 0.9818

Epoch 6/15

26/26 [=====] - 0s 17ms/step - loss: 0.0425 - accuracy: 0.9927

Epoch 7/15

26/26 [=====] - 0s 17ms/step - loss: 0.0156 - accuracy: 1.0000

Epoch 8/15

26/26 [=====] - 0s 17ms/step - loss: 0.0056 - accuracy: 1.0000

Epoch 9/15

26/26 [=====] - 0s 17ms/step - loss: 0.0034 - accuracy: 1.0000

Epoch 10/15

26/26 [=====] - 0s 17ms/step - loss: 0.0022 - accuracy: 1.0000

Epoch 11/15

26/26 [=====] - 0s 17ms/step - loss: 0.0017 - accuracy: 1.0000

Epoch 12/15

26/26 [=====] - 0s 17ms/step - loss: 0.0015 - accuracy: 1.0000

Epoch 13/15

26/26 [=====] - 0s 17ms/step - loss: 0.0012 - accuracy: 1.0000

Epoch 14/15

26/26 [=====] - 0s 17ms/step - loss: 9.9690e-04 - accuracy: 1.0000

Epoch 15/15

26/26 [=====] - 0s 17ms/step - loss: 8.5240e-04 - accuracy: 1.0000

Model Evaluation

26/26 [=====] - 0s 10ms/step - loss: 0.7949 - accuracy: 0.8376

Epoch 1/15

26/26 [=====] - 0s 17ms/step - loss: 1.0649 - accuracy: 0.7067

Epoch 2/15

26/26 [=====] - 0s 17ms/step - loss: 0.3075 - accuracy: 0.9091

Epoch 3/15

26/26 [=====] - 0s 17ms/step - loss: 0.1012 - accuracy: 0.9758

Epoch 4/15

26/26 [=====] - 0s 17ms/step - loss: 0.0451 - accuracy: 0.9903

Epoch 5/15

26/26 [=====] - 0s 17ms/step - loss: 0.0172 - accuracy: 0.9988

Epoch 6/15

26/26 [=====] - 0s 17ms/step - loss: 0.0072 - accuracy: 1.0000

Epoch 7/15

26/26 [=====] - 0s 17ms/step - loss: 0.0042 - accuracy: 1.0000

Epoch 8/15

26/26 [=====] - 0s 17ms/step - loss: 0.0027 - accuracy: 1.0000

Epoch 9/15

26/26 [=====] - 0s 17ms/step - loss: 0.0021 - accuracy: 1.0000

Epoch 10/15

26/26 [=====] - 0s 17ms/step - loss: 0.0017 - accuracy: 1.0000

Epoch 11/15

26/26 [=====] - 0s 17ms/step - loss: 0.0014 - accuracy: 1.0000

Epoch 12/15

26/26 [=====] - 0s 17ms/step - loss: 0.0012 - accuracy: 1.0000

Epoch 13/15

26/26 [=====] - 0s 17ms/step - loss: 0.0011 - accuracy: 1.0000

Epoch 14/15

26/26 [=====] - 0s 17ms/step - loss: 9.5376e-04 - accuracy: 1.0000

Epoch 15/15

26/26 [=====] - 0s 17ms/step - loss: 8.5235e-04 - accuracy: 1.0000

Model Evaluation

26/26 [=====] - 0s 9ms/step - loss: 0.1898 - accuracy: 0.9454

precision	recall	f1-score	support	
0.0	1.00	0.95	0.98	43
1.0	0.95	0.88	0.91	40
2.0	0.89	0.82	0.85	38
3.0	0.90	0.90	0.90	39
4.0	0.87	0.75	0.80	44
5.0	0.93	0.97	0.95	39
6.0	0.71	0.80	0.75	44
7.0	0.79	0.85	0.82	40
8.0	0.77	0.79	0.78	38
9.0	0.84	0.90	0.87	48
accuracy			0.86	413
macro avg			0.86	413
weighted avg			0.86	413

Model SVM report:

precision	recall	f1-score	support	
0.0	0.89	0.98	0.93	43
1.0	0.97	0.88	0.92	40
2.0	0.84	0.84	0.84	38
3.0	1.00	0.79	0.89	39
4.0	0.73	0.61	0.67	44
5.0	0.86	0.95	0.90	39
6.0	0.74	0.84	0.79	44
7.0	0.68	0.75	0.71	40
8.0	0.82	0.82	0.82	38
9.0	0.84	0.85	0.85	48
accuracy			0.83	413
macro avg			0.83	413
weighted avg			0.83	413