

Common Errors in CW2

Results presentation

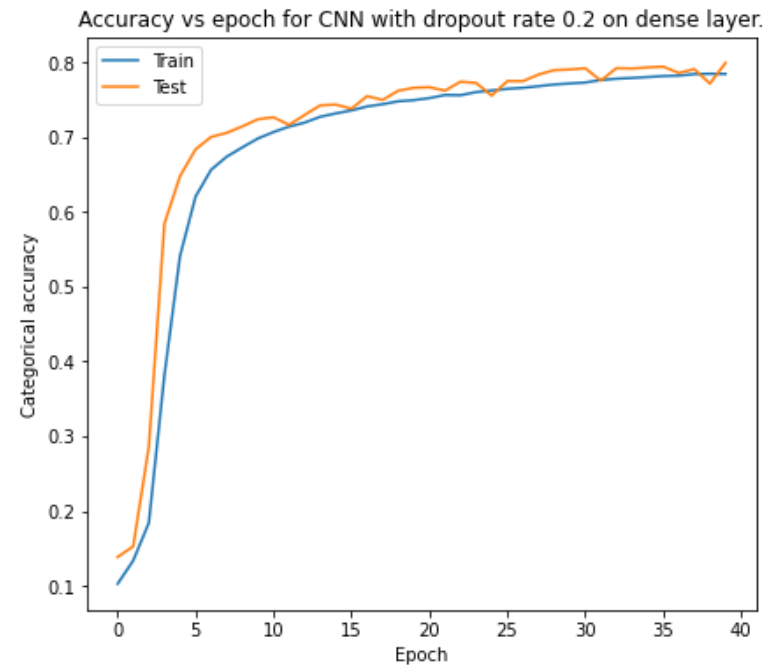
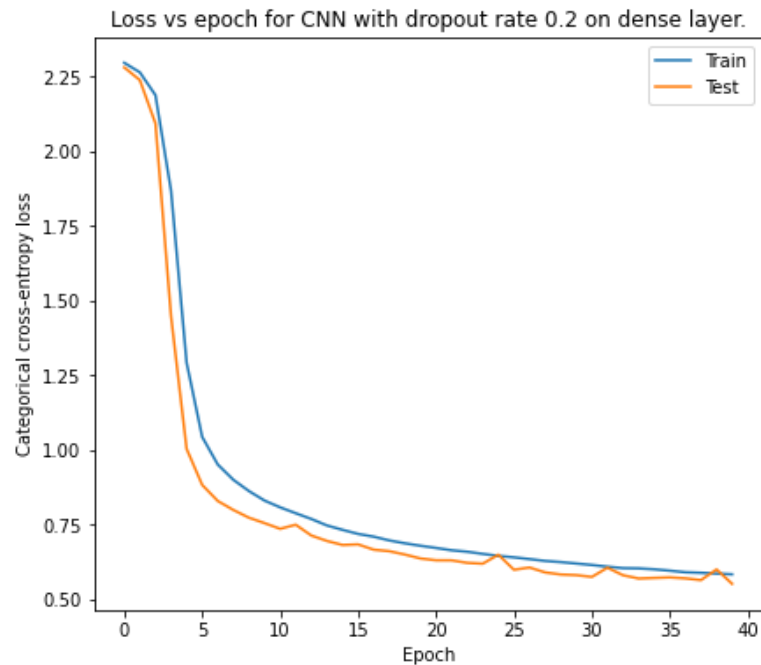
Common errors in presenting the results:

- Missing/incorrect basic plotting elements:
 - plot labels
 - axis labels
 - plot legends
- For plots made for comparison you should:
 - Place side-by-side plots that you are comparing, otherwise comparisons and analysis can be very inconvenient.
 - Efficiently use different colors/styles with employing legends.

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Results presentation

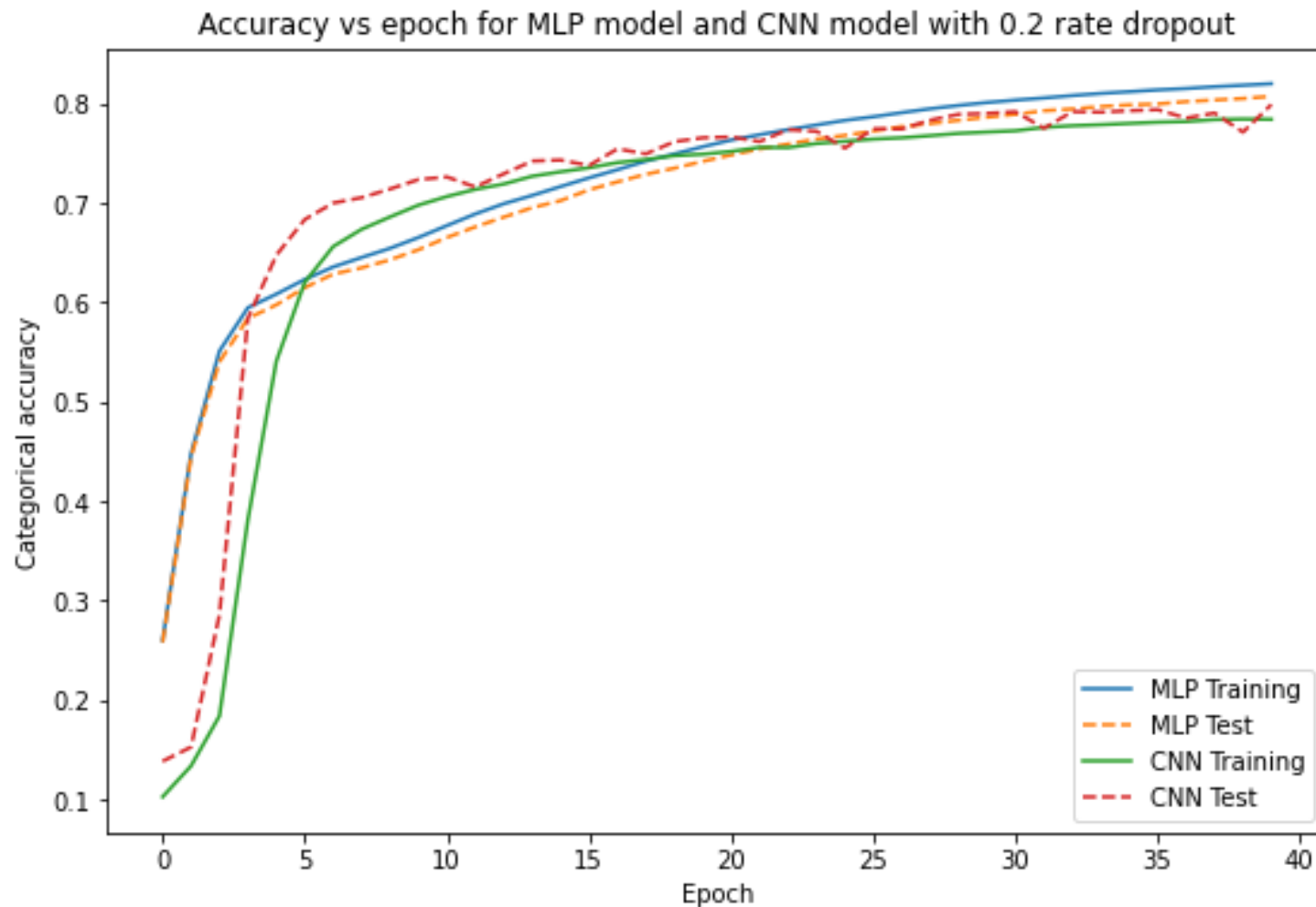
Good examples in presenting the results



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Results presentation

Good examples in presenting the results



Common Errors in CW2

Results presentation

- For **networkx** plots, you should fix the node positions for each plot for the same dataset, otherwise comparison is difficult.

Good example

```
G = nx.Graph(A)
# 'pos' is obtained once, then used multiple times.
pos = nx.spring_layout(G, seed=1)
...
plt.title("Degree centrality")
nx.draw(G, pos, node_color=degree_centrality)
...
plt.title("eigenvector centrality")
nx.draw(G, pos, node_color=eigenvector_centrality)
...
plt.title("Pagerank centrality")
nx.draw(G, pos, node_color=pr_centrality)
```

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- *Although not penalised*, if you are discussing a network in terms of vertices, it would better to visualize the network with labels.

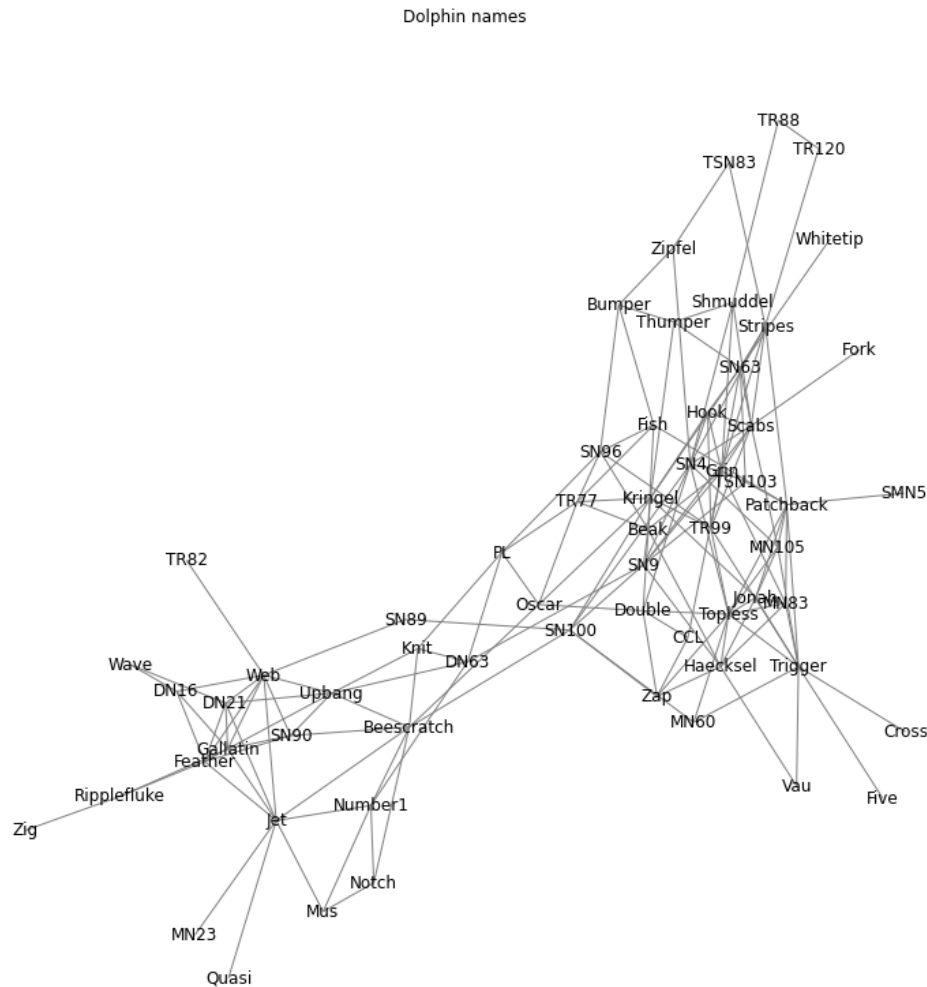
Good example

```
G_labelled = nx.relabel_nodes(G, dict(zip(range(62), names)))  
plt.title("Dolphin names")  
pos_labelled = nx.spring_layout(G_labelled, seed=1)  
nx.draw(G_labelled, pos_labelled, with_labels=True, node_size=0)
```

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Output



Common Errors in CW2

Evaluation of NumPy implementation for Task 1.1

- In Task 1.1, you were required to provide a NumPy implementation for:
 - MLP
 - Backpropagation
 - Stochastic gradient descent
 - Loss and training functions
- You lose the mark of any part in these cases:
 - no attempt.
 - missing lines (incomplete, not-working implementation)
 - your program raises error messages
 - more than one bug in your implementation.
- More marks can be lost for badly written code.

Common Errors in CW2

Task 1.2

- Should select best dropout value based on the **final accuracy**, not mean accuracy over epochs.
- Incorrect number of layers.
- Should not apply activation function on the input.

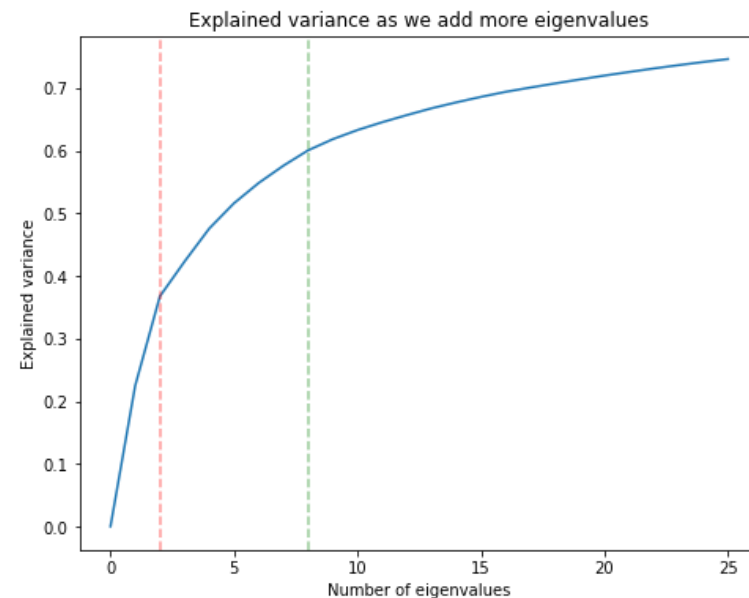
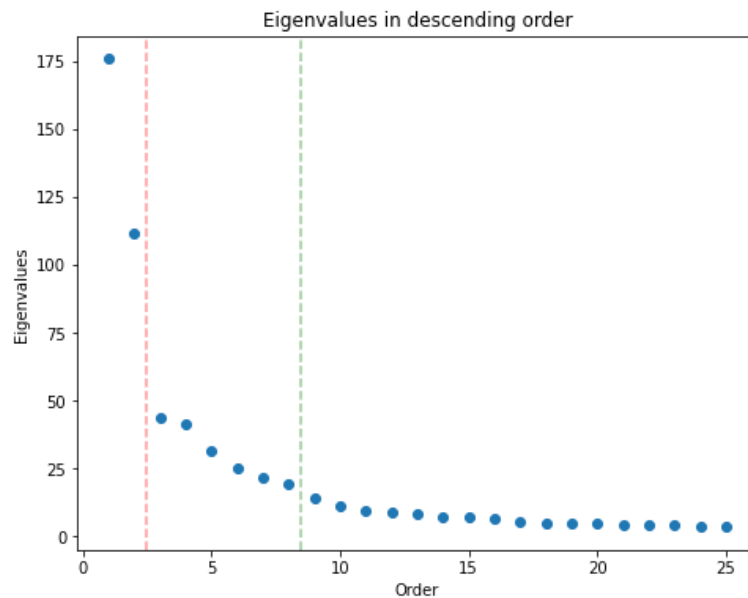
```
model_cnn = Sequential(  
    [  
        InputLayer(input_shape=(28, 28, 1), name="Input"),  
        LeakyReLU(alpha=0.01), # <- Incorrect.  
        Conv2D(8, (3, 3), activation=LeakyReLU(alpha=0.01)),  
        Conv2D(8, (3, 3), activation=LeakyReLU(alpha=0.01)),  
        Conv2D(16, (3, 3), activation=LeakyReLU(alpha=0.01)),  
        Conv2D(16, (3, 3), activation=LeakyReLU(alpha=0.01)),  
        MaxPool2D((2, 2)),  
        Flatten(),  
        Dense(64, activation=LeakyReLU(alpha=0.01)),  
        Dense(10, activation="softmax"),  
    ]  
)
```

Common Errors in CW2

Task 2.1

- Explained variance should be computed **cumulatively**.

Good example



Common Errors in CW2

Task 2.1

- Ground truth classes should not be used to determine optimal k because k-means clustering is an unsupervised algorithm.
- Should comment clearly on the case of $k = 10$ in k-means clustering.

Task 2.2

- Should plot *silhouette* score over the number of clusters.
- Should estimate optimal number of clusters.

Common Errors in CW2

Task 2.3

- Should discuss the meaning of a small Fiedler eigenvalue.
- Should interpret and discuss the first Eigenvector (where Eigenvalue=0).
- Most students either have not commented on the first vector or mentioned that it is a vector of ones (incorrect for normalized Laplacian).

Correct student answer

Smallest eigenvector(v_1)

Our smallest eigenvalue = 0. Note that for a given Laplacian of any undirected graph, a vector of ones is an eigenvector with eigenvalue 0.

$$L\mathbf{1} = 0$$

We will assume that the matrix is connected and we can verify when plotting the graph later on. Thus, we obtain the following expression for v_1 , where λ is a scalar.

$$LD^{-\frac{1}{2}}v_1 = 0$$

$$D^{-\frac{1}{2}}v_1 = \lambda\mathbf{1}$$

We can think of v_1 as a vector of ones under the change of basis. We can verify the expression above by calculating and writing out the first few terms of $D^{-\frac{1}{2}}v_1$

```
(mod_degree@eigenvecs.T[0])[:8]
```

```
array([-0.05607722, -0.05607722, -0.05607722, -0.05607722, -0.05607722,
       -0.05607722, -0.05607722, -0.05607722])
```

Common Errors in CW2

Task 2.3

- The Fiedler eigenvector needs to be binarised for determining the bi-partition.
- Should implement error tolerance in the iterative computation of PageRank.
- The degree centrality needs to be normalised by the number of edges ($2E$).
- Should identify nodes that are 'central' across all three centrality measures.
- (No deduction) Pair-plots or Pearson correlation are not sufficient methods to infer similarity in ranking, Spearman correlation can be used instead.

Common Errors in CW3

Task 3.1

- (No deduction) You should rescale to $[0, 1]$ without standardisation before.

Task 3.2

- Link your discussion about centrality to each centrality metric, because you obtain different results from each.