
```

%{
This function performs K-Fold Cross Validation by randomising the
samples then taking sequential folds from the data to build a pattern
recognition network model.
It retrieves the classification accuracy from each fold and finds the
mean accuracy accross all the folds.

Arguments
- `labelledData`      -> the data labelled through one-hot encoding
- `folds`             -> the number of folds required
- `hiddenLayerSize`   -> number of neurons required in the hidden
    layer
- `trainingAlgo`      -> the NN training algorithm to use

Returns
- `meanAccuracy`      -> the average classification accuracy of all
    the models across the N folds.
%}

function [meanAccuracy] = crossValidateNN(labelledData, folds,
    hiddenLayerSize, trainingAlgo)
    % define the number test samples in each fold
    test_element_count = int32(size(labelledData,1)/folds);

    % initialisations
    foldCounter = 1;
    total_accuracy = 0;

    % before running cross validation and splitting into inputs and
    targets shuffle the rows
    random_final_labelled_data =
    labelledData(randperm(size(labelledData, 1)), :);

    for ii=0 : test_element_count : size(random_final_labelled_data,1)
        % make sure there are enough elements to make up the fold
        if ii+test_element_count <=
size(random_final_labelled_data,1)+1
            fprintf("\n*****\nRunning fold %i out of %i
\n",foldCounter, folds)
            % extract the test set
            test_extracted = random_final_labelled_data((ii+1:ii
+test_element_count-1),:);
            % extract the test set (the remaining data), which also
            includes
            % validation data
            train_extracted = random_final_labelled_data;
            train_extracted((ii+1:ii+test_element_count-1),:) = [];

            % Define the input set.
            train_inputs = train_extracted(:,1:end-5)';
            test_inputs= test_extracted(:,1:end-5)';

```

```
% Define the target set
train_targets = train_extracted(:, end-4:end)';
test_targets = test_extracted(:, end-4:end)';

% train the ANN with the extracted data
acc = nn(train_inputs, test_inputs, train_targets,
test_targets, hiddenLayerSize, trainingAlgo);
fprintf("\nAccuracy for this fold is %f\n", acc)

foldCounter = foldCounter+1;
% keep track of all the accuracies to find the mean
total_accuracy = total_accuracy + acc;
end
end

% give a summary of all the folds
meanAccuracy = total_accuracy/folds;
fprintf("\n===== \nAverage accuracy across %i folds:
%f\n===== \n", folds, meanAccuracy);
end
```

Published with MATLAB® R2020a