% 6. Refer to the Bag of Features example MATLAB

% source code provided in the classroom’s classwork

% page. In your homework, pick an object category

% that would be commonly seen in any household

% (e.g. cutlery) and pick 5 object types (e.g.

% for cutlery pick spoon, fork, butter knife,

% cutting knife, ladle). Present your performance

% evaluation.

%% Load Image Dataset

imds=imageDatastore('./q7\_image/office\_images','IncludeSubfolders',true,'LabelSource','foldernames');

% inspect the number of images per category, as well as category labels

tbl=countEachLabel(imds)

% visualization

figure

montage(imds.Files(1:16:end))

%% Prepare Training and Validation Image Sets

[trainingSet, validationSet] = splitEachLabel(imds, 0.6, 'randomize');

%% Create a Visual Vocabulary and Train an Image Category Classifier

% Creating Bag-Of-Features.

bag = bagOfFeatures(trainingSet);

% Encoding images using Bag-Of-Features.

img = readimage(imds, 1);

featureVector = encode(bag, img);

% Plot the histogram of visual word occurrences

figure

bar(featureVector)

title('Visual word occurrences')

xlabel('Visual word index')

ylabel('Frequency of occurrence')

%% Training an image category classifier for 5 categories.

categoryClassifier = trainImageCategoryClassifier(trainingSet, bag);

%% Evaluate Classifier Performance

% on training set

confMatrix = evaluate(categoryClassifier, trainingSet);

% on validation set

confMatrix\_val = evaluate(categoryClassifier, validationSet);

% Compute average accuracy

avg\_acc = mean(diag(confMatrix\_val));

%% show example

% read an image

img = imread(fullfile('./q7\_image/office\_images','backpack','frame\_0001.jpg'));

figure

imshow(img)

% run classification

[labelIdx, scores] = predict(categoryClassifier, img);

labelName = categoryClassifier.Labels(labelIdx);

disp(labelName)