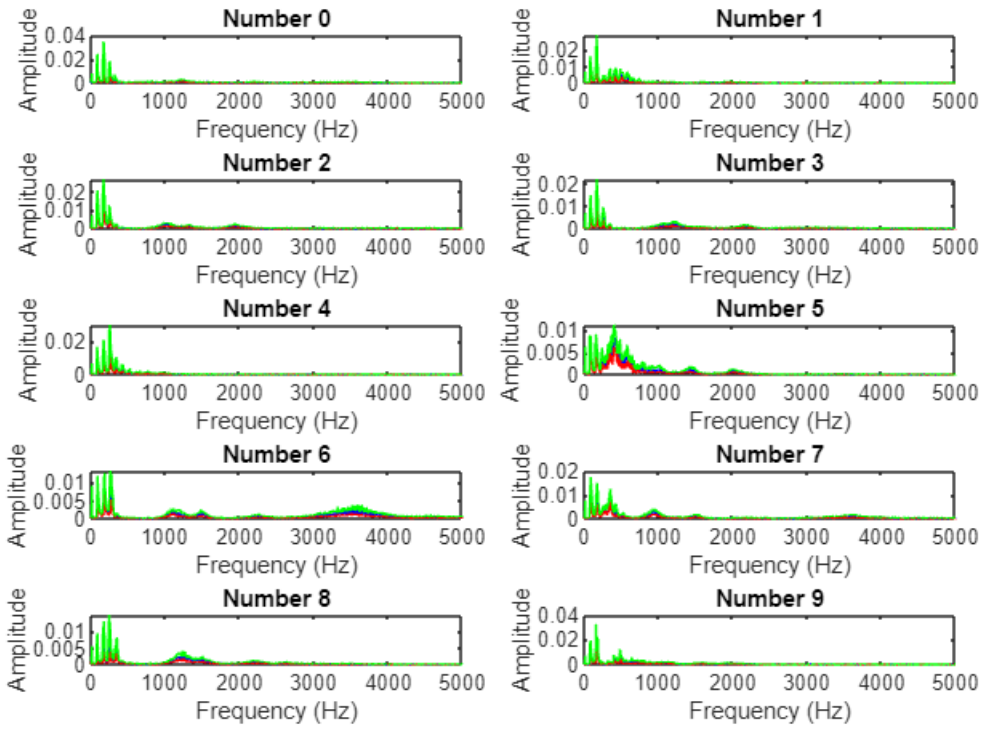
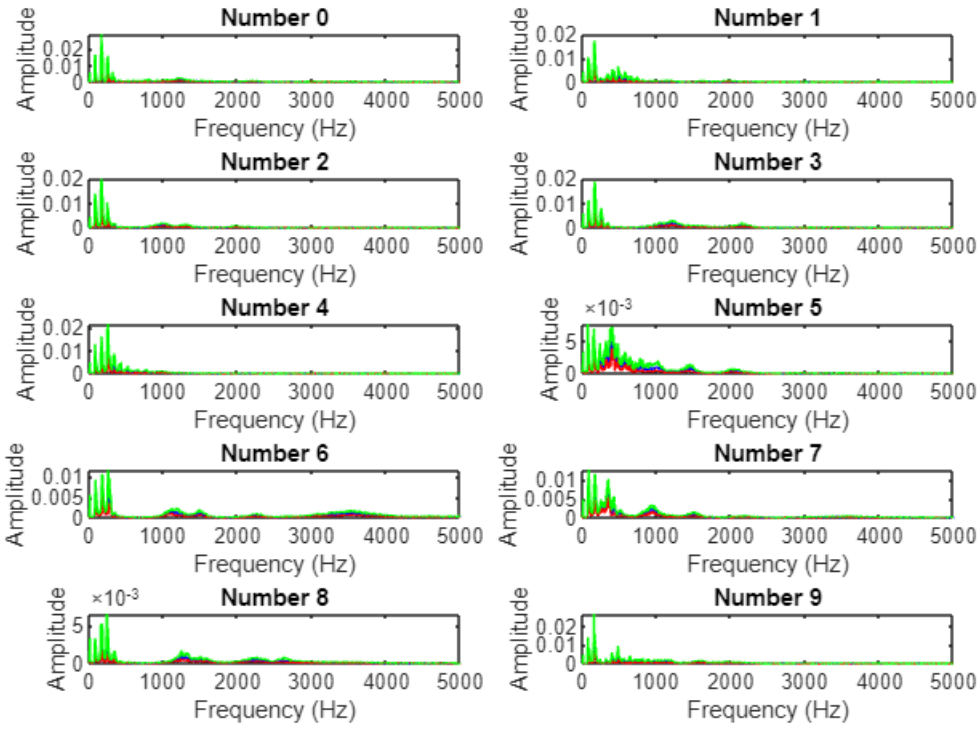
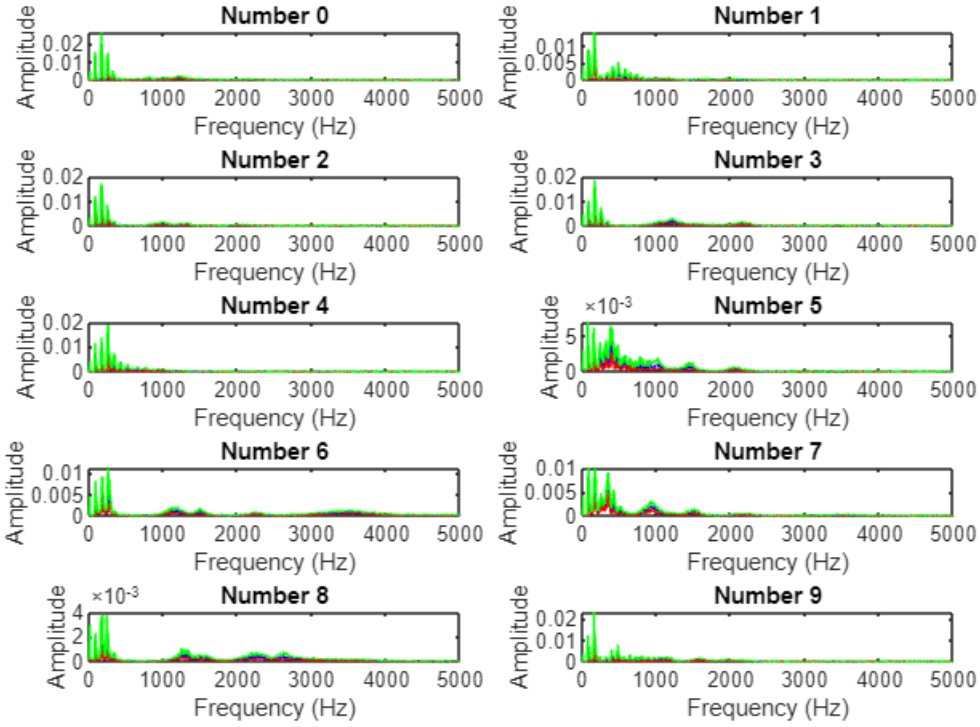
```
%Exercício 5

freqN = 5000;
amplitudes = getDataMatrix('0', freqN);
freq = (0:freqN-1);

figure;
for i=0:9

    %Calcula mediana
    medians = median(amplitudes, 1);


    % The result is a 1xfreqNx10 matrix. To reshape it into a freqNx10 matrix:
    medians = squeeze(medians);

    % Calculate the first and third quartile for each frequency
    first_quartile = quantile(amplitudes(:,:,i+1), 0.25, 1);
    third_quartile = quantile(amplitudes(:,:,i+1), 0.75, 1);

    % Remove singleton dimensions
    first_quartile = squeeze(first_quartile);
    third_quartile = squeeze(third_quartile);

    %Plot
    subplot(5, 2, i+1);
    plot(freq, medians(:,i+1), 'b');
    hold on;
    plot(freq, first_quartile, 'r');
    plot(freq, third_quartile, 'g');
    hold off;
    xlabel('Frequency (Hz)');
    ylabel('Amplitude');
    title(sprintf('Number %d', i));
end
```

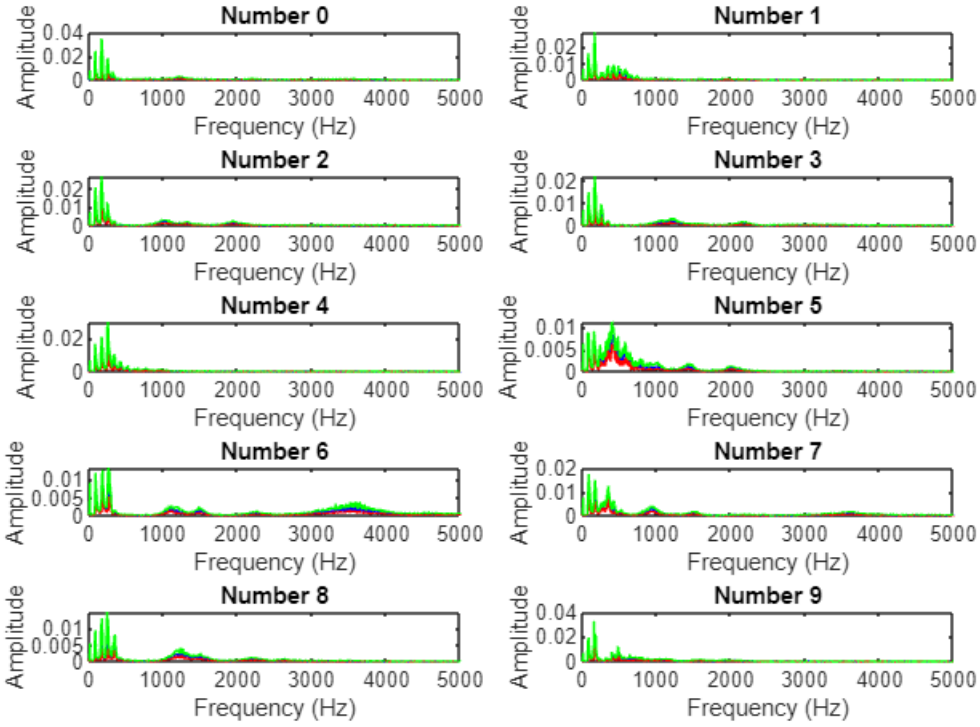



```
%Exercício 6
windowTypes = {'hamming','blackman','rect'};
for k = 1:length(windowTypes)

    windowType = windowTypes{k};
    amplitudes = getDataMatrix(windowType,freqN);
    figure;
    for i=0:9

        %Calcula mediana
        medians = median(amplitudes, 1);


        % The result is a 1xfreqNx10 matrix. To reshape it into a freqNx10 matrix:
        medians = squeeze(medians);

        % Calculate the first and third quartile for each frequency
        first_quartile = quantile(amplitudes(:,:,i+1), 0.25, 1);
        third_quartile = quantile(amplitudes(:,:,i+1), 0.75, 1);

        % Remove singleton dimensions
        first_quartile = squeeze(first_quartile);
        third_quartile = squeeze(third_quartile);
```

```
        %Plot
        subplot(5, 2, i+1);
        plot(freq, medians(:,i+1), 'b');
        hold on;
        plot(freq, first_quartile, 'r');
        plot(freq, third_quartile, 'g');
        hold off;
        xlabel('Frequency (Hz)');
        ylabel('Amplitude');
        title(sprintf('Number %d', i));
    end
end
```




Number 0
Number 1
Number 2
Number 3
Number 4
Number 5
Number 6
Number 7
Number 8
Number 9
Amplitude
Frequency (Hz)
×10-3


Number 0
Number 1
Number 2
Number 3
Number 4
Number 5
Number 6
Number 7
Number 8
Number 9
Amplitude
Frequency (Hz)

```
%Exercício 7
```

```
% Get the Matrix with the frequencies
    amplitudes = getDataMatrix('0',freqN);
    freq = (0:freqN-1);
% Initialize the vectors
    medianPeaks = zeros(50, 10);
    skewnessMatrix = zeros(50,10);
    edgeFreq = zeros(50,10);
    spectralSpread = zeros(50,10);
    spectralCentroid = zeros(50,10);

% Calculate the features

    % Mean amplitude
        amplitudeMeans = squeeze(mean(amplitudes, 2)); % calculate the means of the
freqN values for each audio, get a matrix 50x10

    % All the other features go through the nested loop
        for i = 1:50
            for j = 1:10
                medianPeaks(i, j) = median_peaks(amplitudes(i, :, j));      %
Median Spectral Peaks
                skewnessMatrix(i, j) = spectral_skewness(amplitudes(i, :, j));
%Spectral Skewness
                edgeFreq(i, j) = spectral_edge_frequency(amplitudes(i, :, j),
44100, 0.9);      %Spectral Edge Frequency
                spectralSpread(i, j) = spectral_spread(amplitudes(i, :, j),
freq);      %Spectral Spread
                spectralCentroid(i,j) = sum(freq .* abs(amplitudes(i,:,j))) /
sum(abs(amplitudes(i,:,j)));      %Spectral Centroid
            end
        end



matrices = {amplitudeMeans,medianPeaks,skewnessMatrix, edgeFreq,spectralSpread,
spectralCentroid};
labels = {"Spectral Mean","Median Spectral Peaks", "Spectral Skewness", "Spectral
Edge Frequency", "Spectral Spread", "Spectral Centroid"};

%Plot the features using boxplot
plotBoxplots(matrices,labels);
plotScatterplots(matrices,labels);
% adicionar plot3d !!! no 3 tambem


figure;

% Create the 3D scatter plot
scatter3(amplitudeMeans, spectralSpread, skewnessMatrix)
xlabel('Amplitude Means');
```

```
ylabel('Spectral Spread');
zlabel('Spectral Skewness');
title('Features Escolhidas');
```