```
nsegments_in = 5; % select number of segments to process for testing

input_type = 1;
```

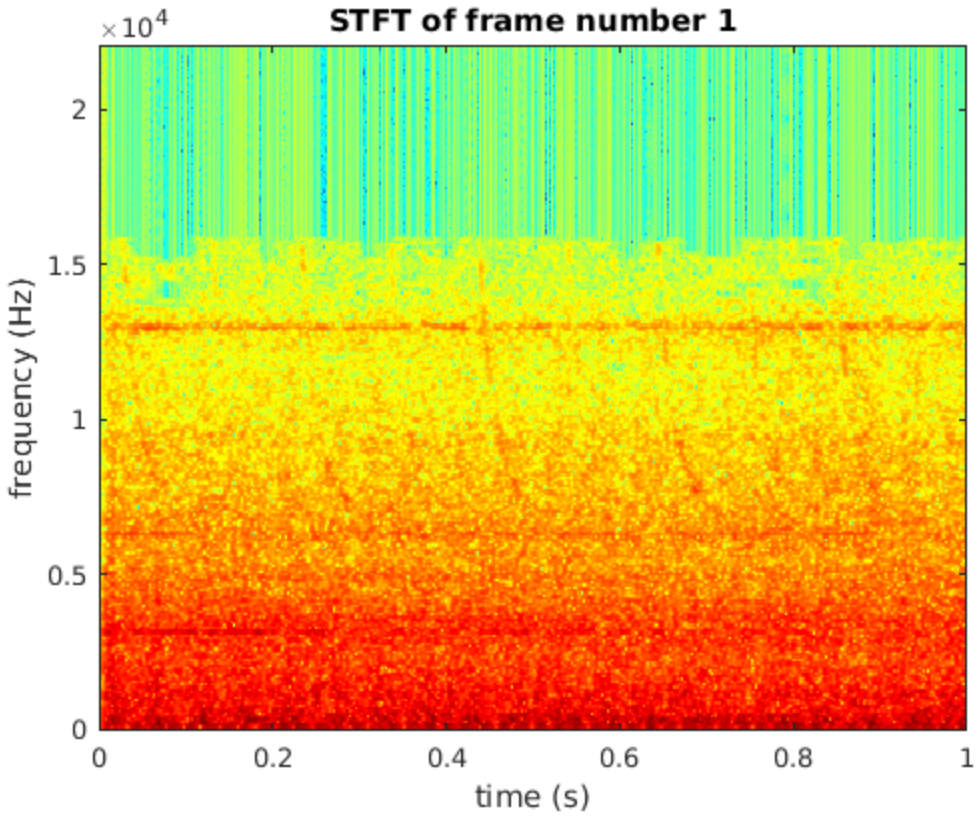
Import data

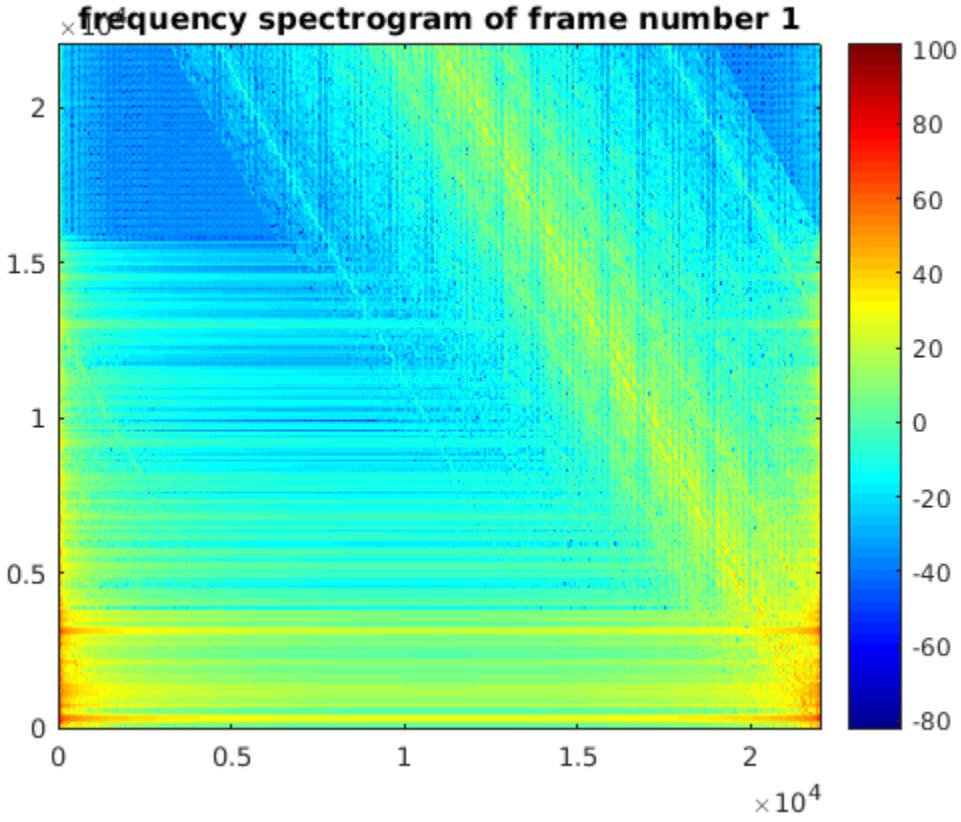
```
if (input_type == 1)
    [x, fs] = audioread('resources/heli_and_boat_short/
heli6_short.wav'); %assume 44.1kHz
    x = mean(x,2);% col vector
    % Resample to around 8KHz
%     x = resample(x,2,11);
%     fs = fs*2/11;
    xlen = length(x);
elseif (input_type == 2)
    [x, fs] = audioread('resources/Cessna.wav');
    x = mean(x,2);% col vector
    start_pos = 1;
    count_frames = 10*fs;
    x = x(start_pos:start_pos+count_frames);

    % Resample to around 8KHz
    x = resample(x,2,11);
    fs = fs*2/11;
    xlen = length(x);
elseif (input_type == 3)
    %load train;
    load speech_dft;
    x = y;
    xlen = length(x);
end
```

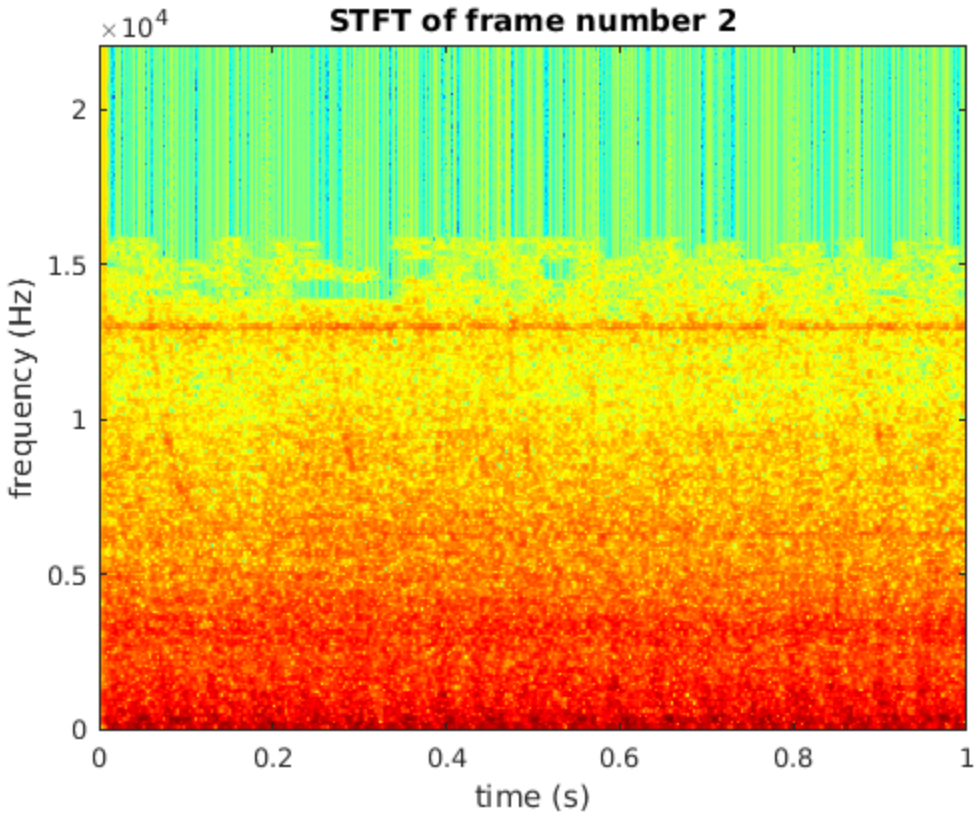
Plot spectrogram

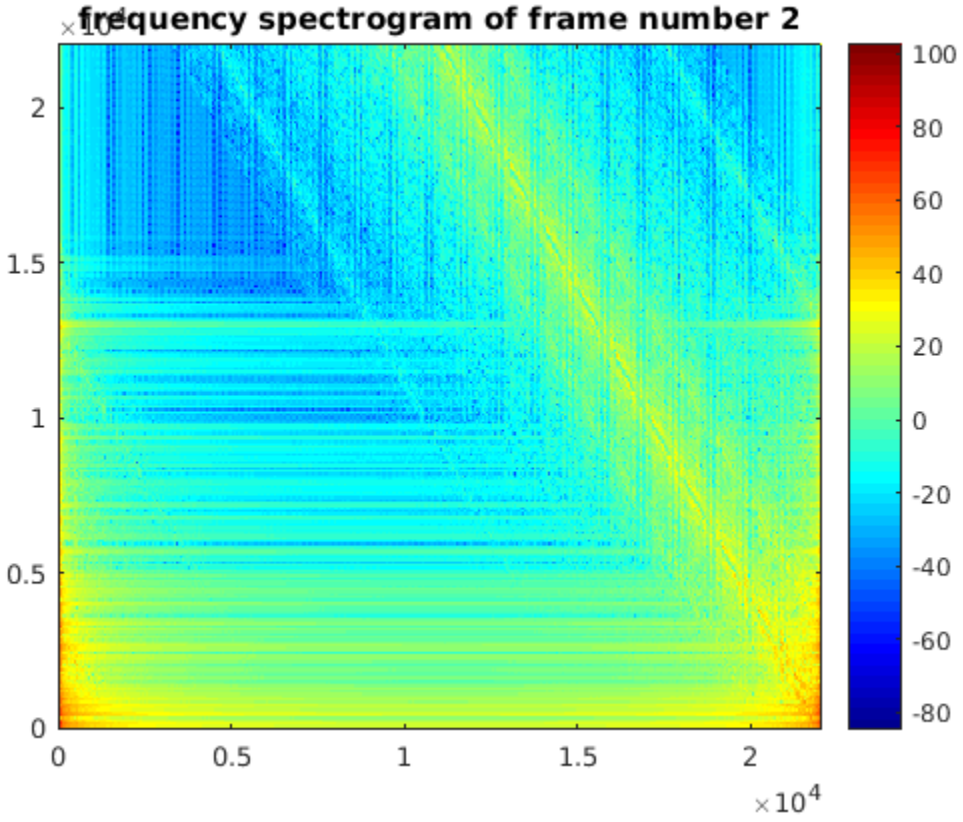
```
segduration = 1; %1 second
seglen = segduration*fs;
nseg = min(nsegments_in, floor(xlen/seglen));

Nw = 512;
start_ind = 1;
for n = 1:nseg
    end_ind = start_ind + seglen;
    xseg = x(start_ind:end_ind);
    x_specgram_temp = FBS_Analysis(xseg.',fs,Nw,0,0);
        title(['STFT of frame number ' num2str(n)]);
    x_specgram(:,:,n) = x_specgram_temp;
    start_ind = start_ind + seglen;

    % Do frequency analysis
    freq_specgram_len = 8019;
```

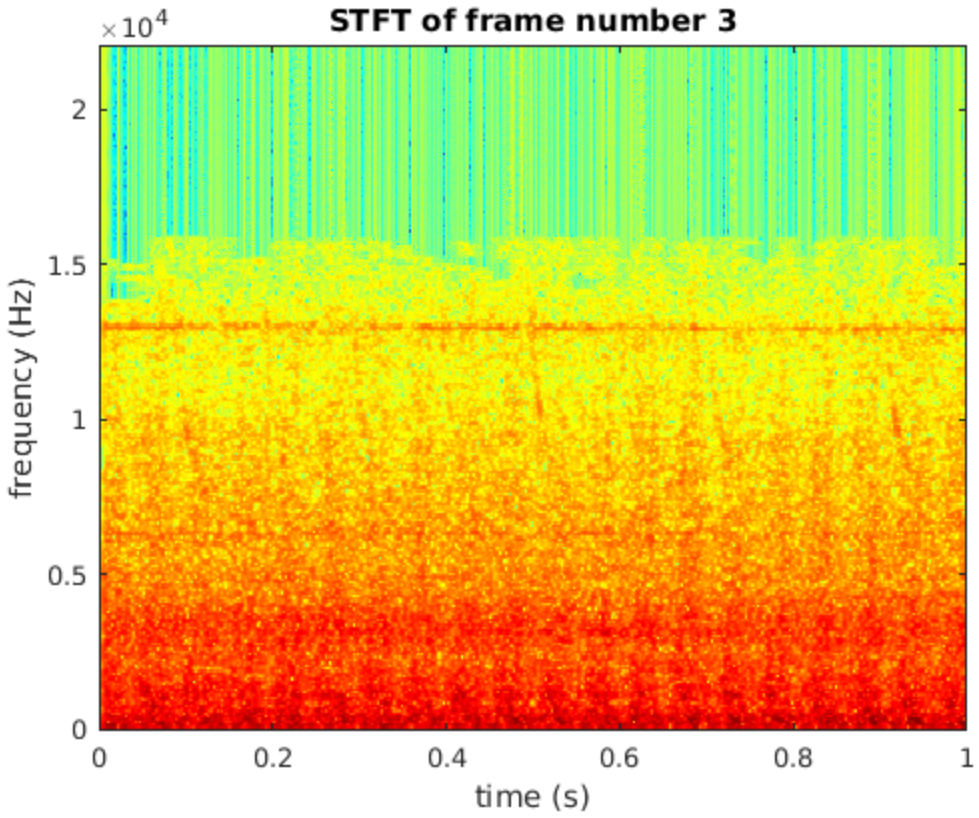
```
    x_freq_specgram(:,:,n) =
 fft(x_specgram_temp,freq_specgram_len,2); %8019 =
 size(fft(x_specgram_temp),2)

    % Plot ffts as images
    f_vert = linspace(0,1,Nw/2)*(fs/2); % actual frequency axis in Hz
    f_hori = fs*(0:(freq_specgram_len/2)) /freq_specgram_len;
    figure;
    imagesc(f_vert,f_hori, 20*log10(abs(x_freq_specgram(:,:,n))));
    axis xy; colormap(jet); colorbar;
    title(['frequency spectrogram of frame number ' num2str(n)]);

end

% pick a frequency row to plot magnitude and fourier transform
 magnitude
f = linspace(0,1,Nw/2)*(fs/2); % actual frequency axis in Hz
k_vect = 50:50:250;
for k_ind = 1:length(k_vect)
    k = k_vect(k_ind);

    figure;
    plot(abs(x_specgram(k,:,3)));
    title(['for all frames: magnitude of row ' num2str(k) ', freq = '
 num2str(f(k)) ' Hz']);

    figure;
    plot(20*log10(abs(x_freq_specgram(k,:,3))));
    title(['for all frames: fft of magnitude of row ' num2str(k) ',
 freq = ' num2str(f(k)) ' Hz']);

end
```

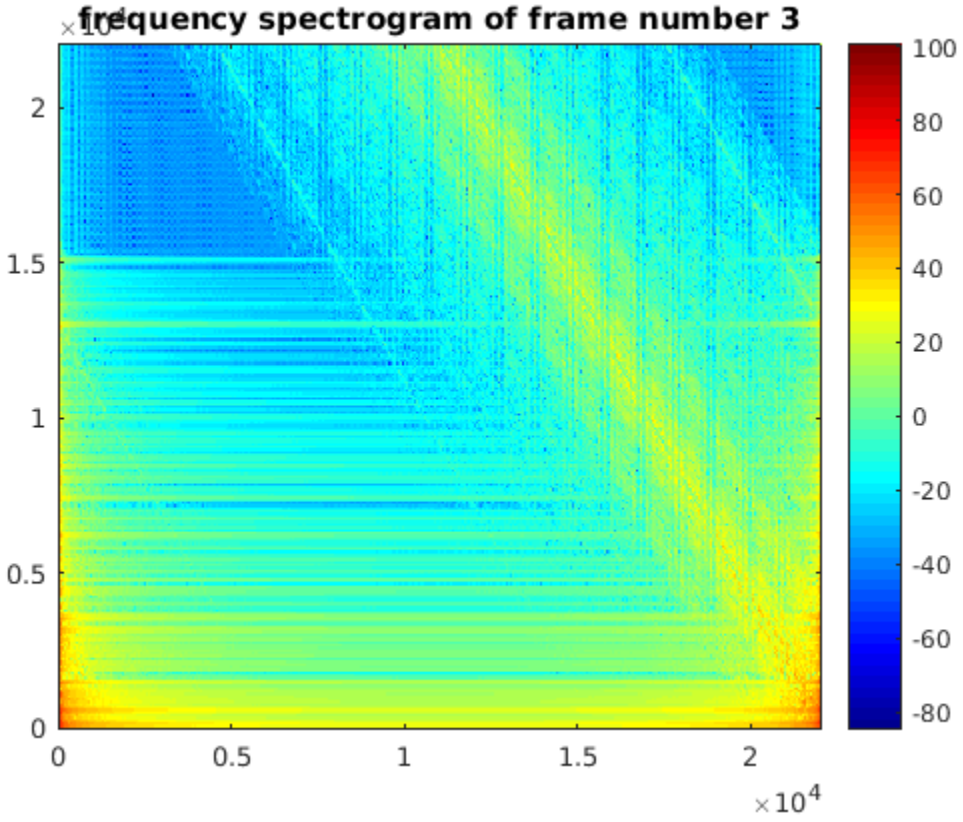

STFT of frame number 1
×10^4
2
1.5
1
0.5
0
frequency (Hz)
0
0.2
0.4
0.6
0.8
1
time (s)

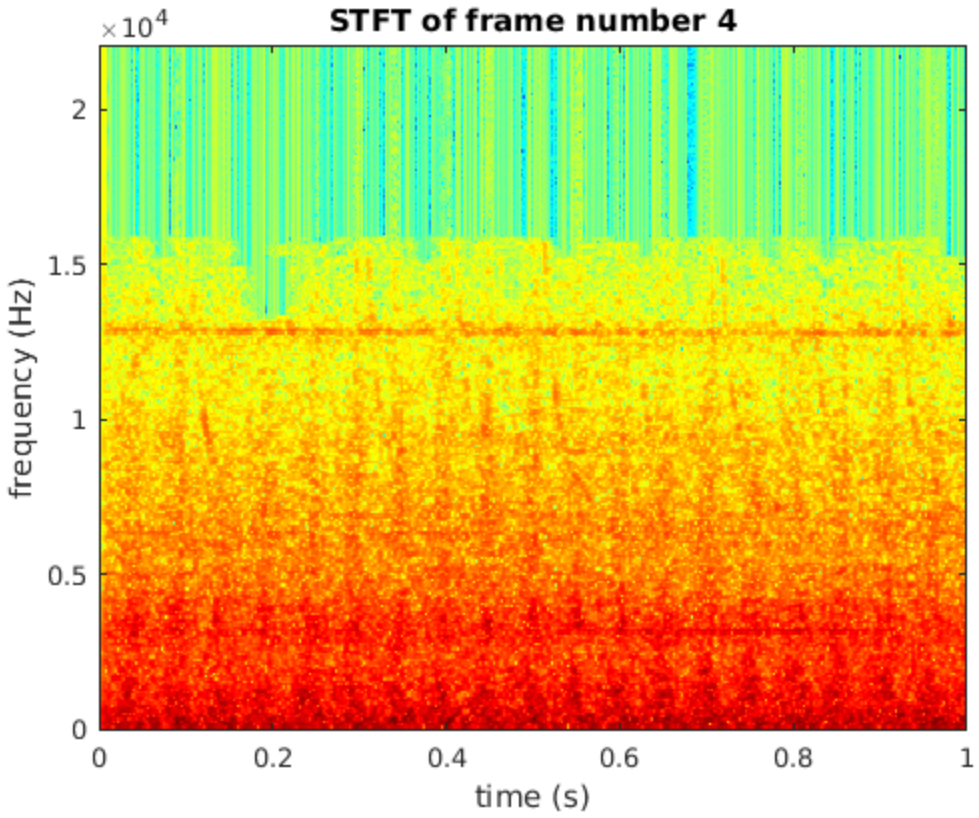

frequency spectrogram of frame number 1
×10^4
2
1.5
1
0.5
0
0
0.5
1
1.5
2
×10^4
100
80
60
40
20
0
-20
-40
-60
-80

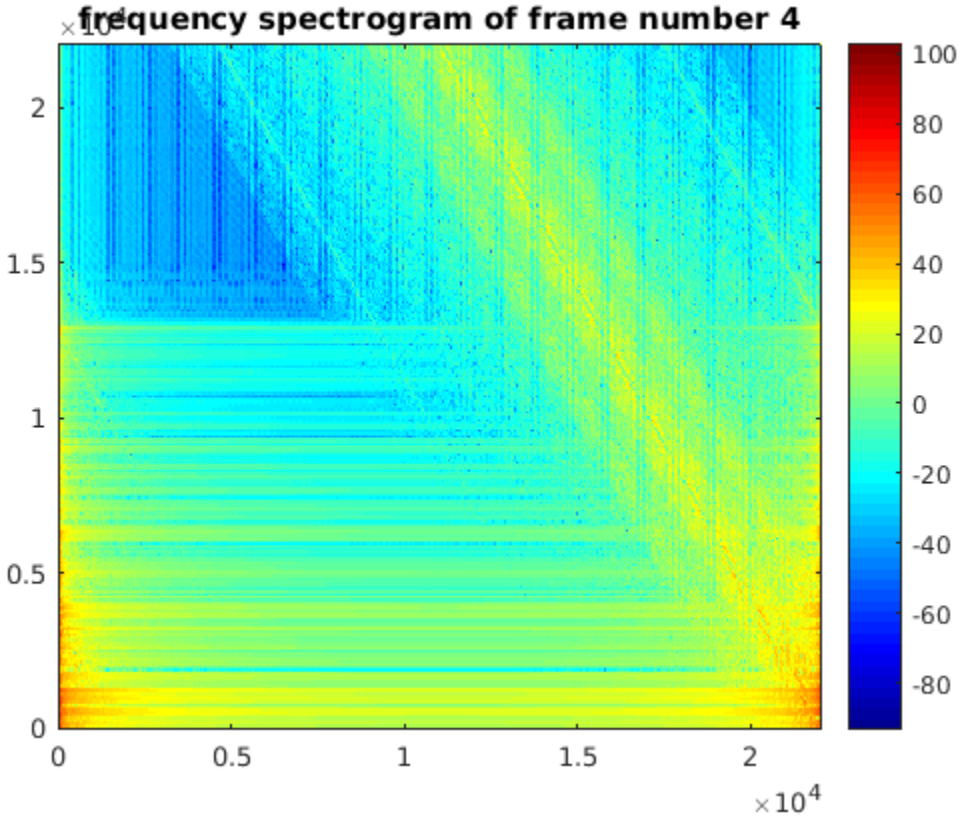

STFT of frame number 2
×10^4
2
1.5
1
0.5
0
frequency (Hz)
0
0.2
0.4
0.6
0.8
1
time (s)

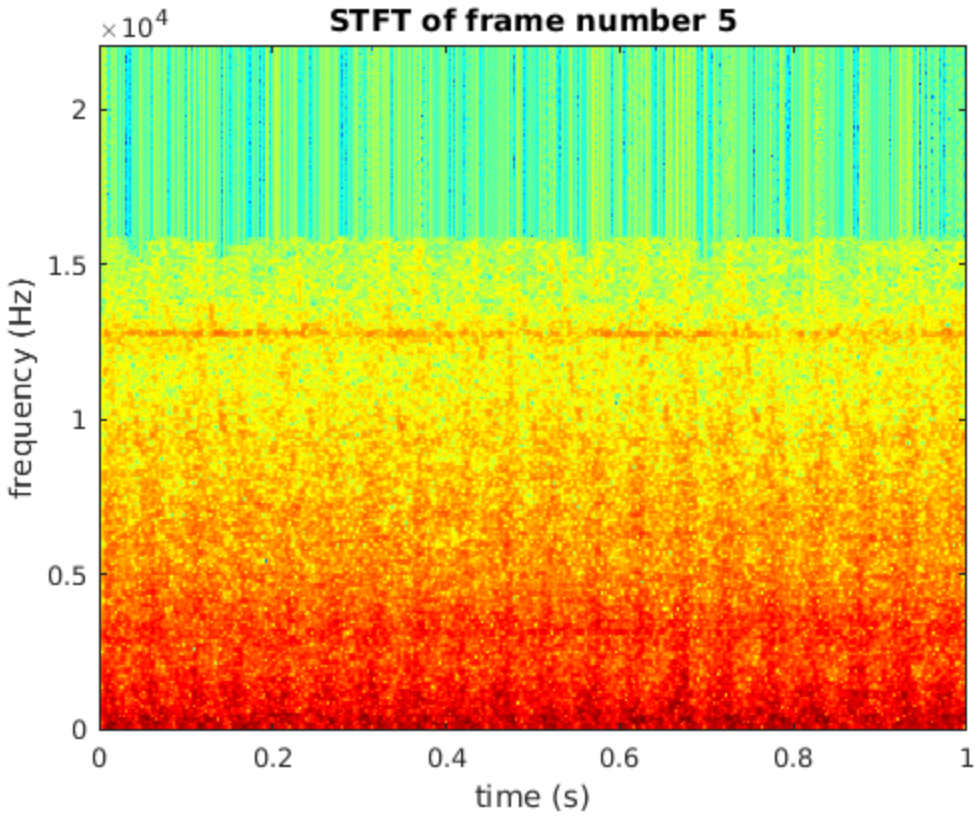

frequency spectrogram of frame number 2
×10^4
2
1.5
1
0.5
0
0
0.5
1
1.5
2
×10^4
100
80
60
40
20
0
-20
-40
-60
-80

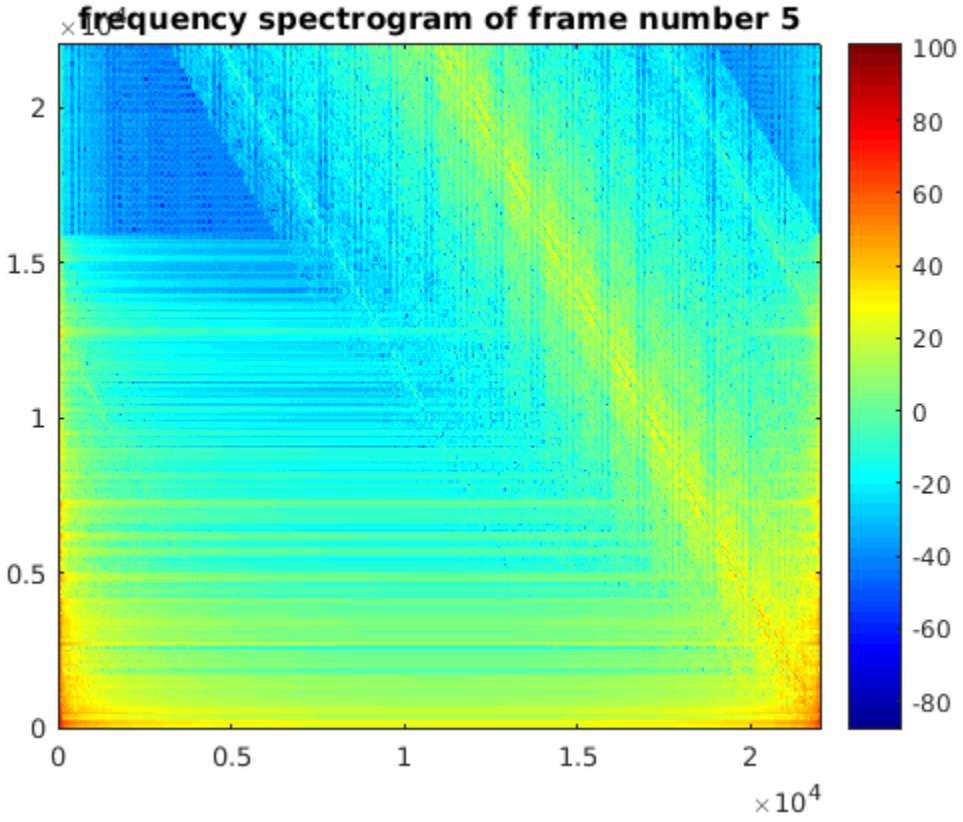

STFT of frame number 3
×10^4
2
1.5
1
0.5
0
frequency (Hz)
0
0.2
0.4
0.6
0.8
1
time (s)

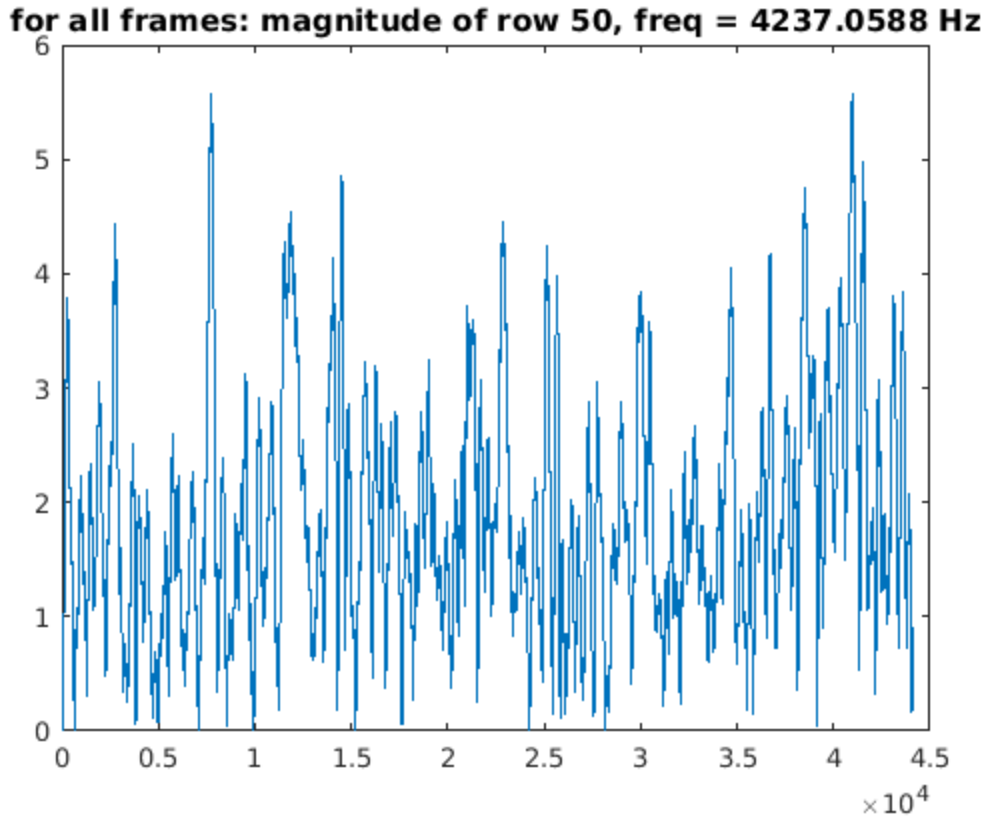

frequency spectrogram of frame number 3
×10^4
2
1.5
1
0.5
0
0
0.5
1
1.5
2
×10^4
100
80
60
40
20
0
-20
-40
-60
-80

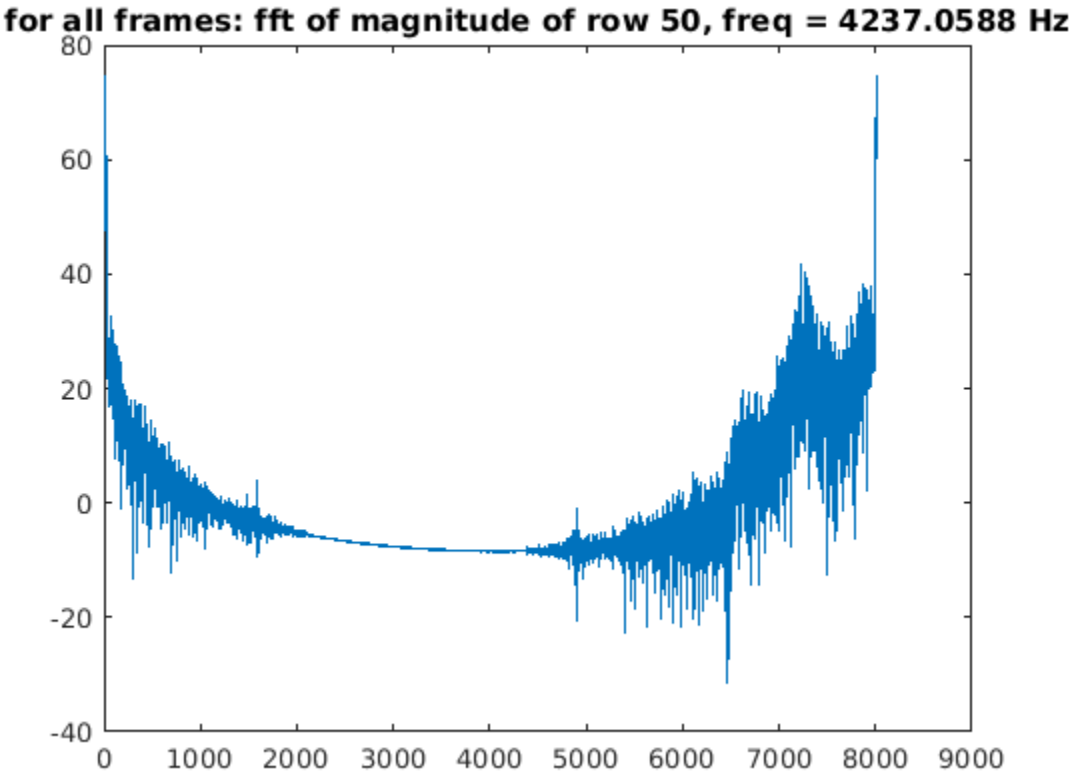

STFT of frame number 4
×10^4
2
1.5
1
0.5
0
frequency (Hz)
0
0.2
0.4
0.6
0.8
1
time (s)

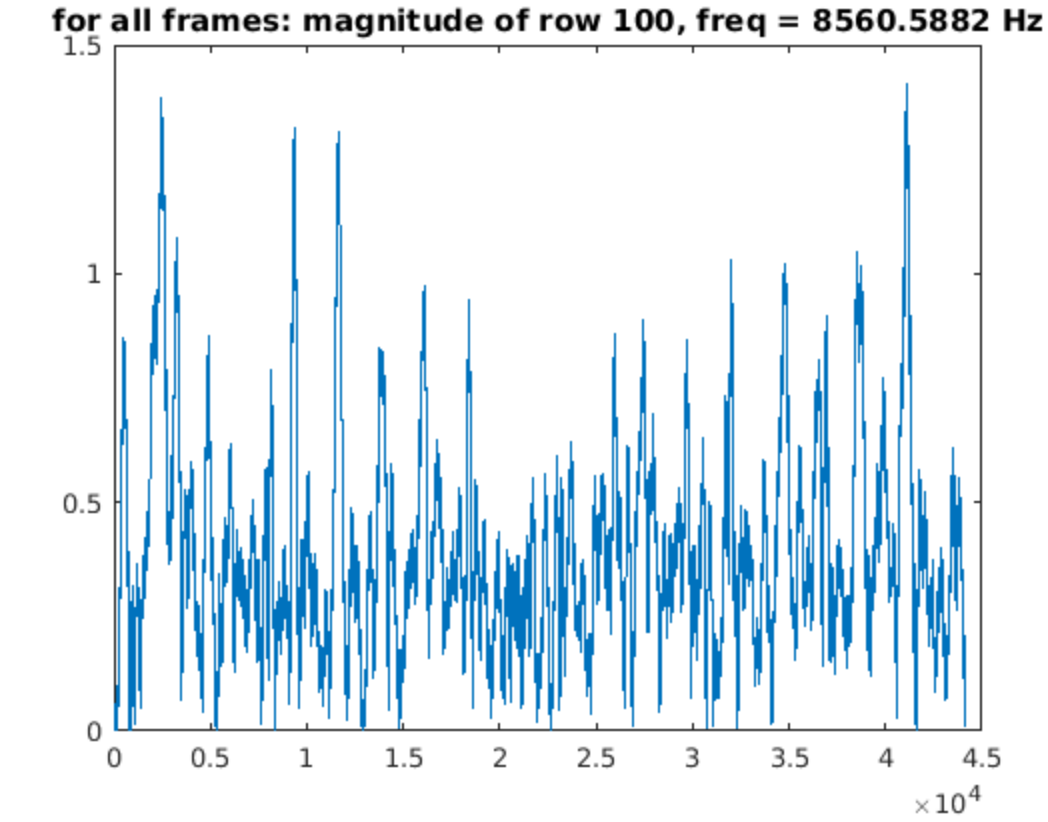

frequency spectrogram of frame number 4
×10^4
2
1.5
1
0.5
0
0
0.5
1
1.5
2
×10^4
100
80
60
40
20
0
-20
-40
-60
-80

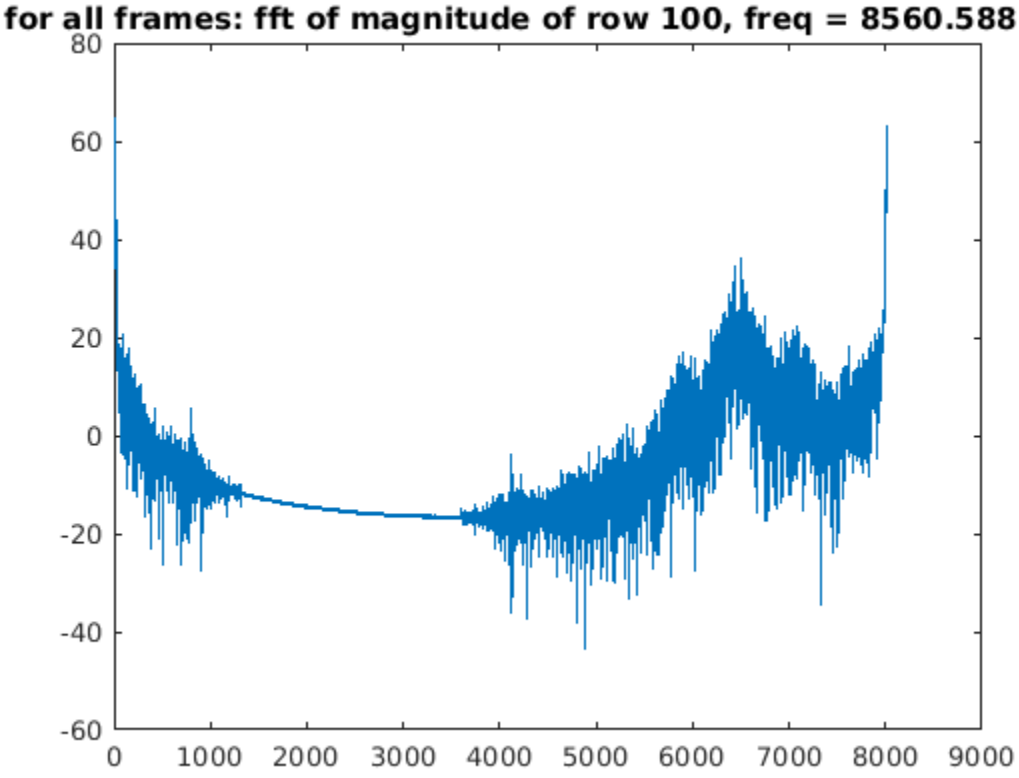

STFT of frame number 5
×10^4
2
1.5
1
0.5
0
frequency (Hz)
0
0.2
0.4
0.6
0.8
1
time (s)

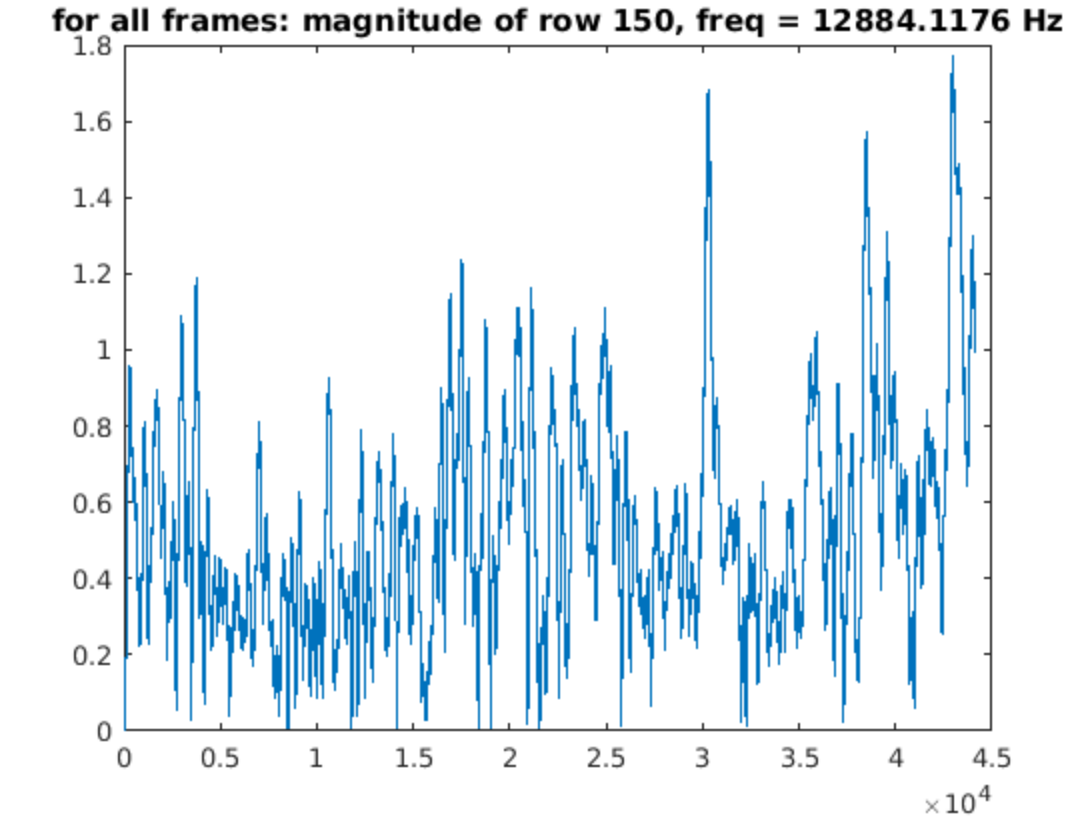

frequency spectrogram of frame number 5
×10^4
2
1.5
1
0.5
0
0
0.5
1
1.5
2
×10^4
100
80
60
40
20
0
-20
-40
-60
-80

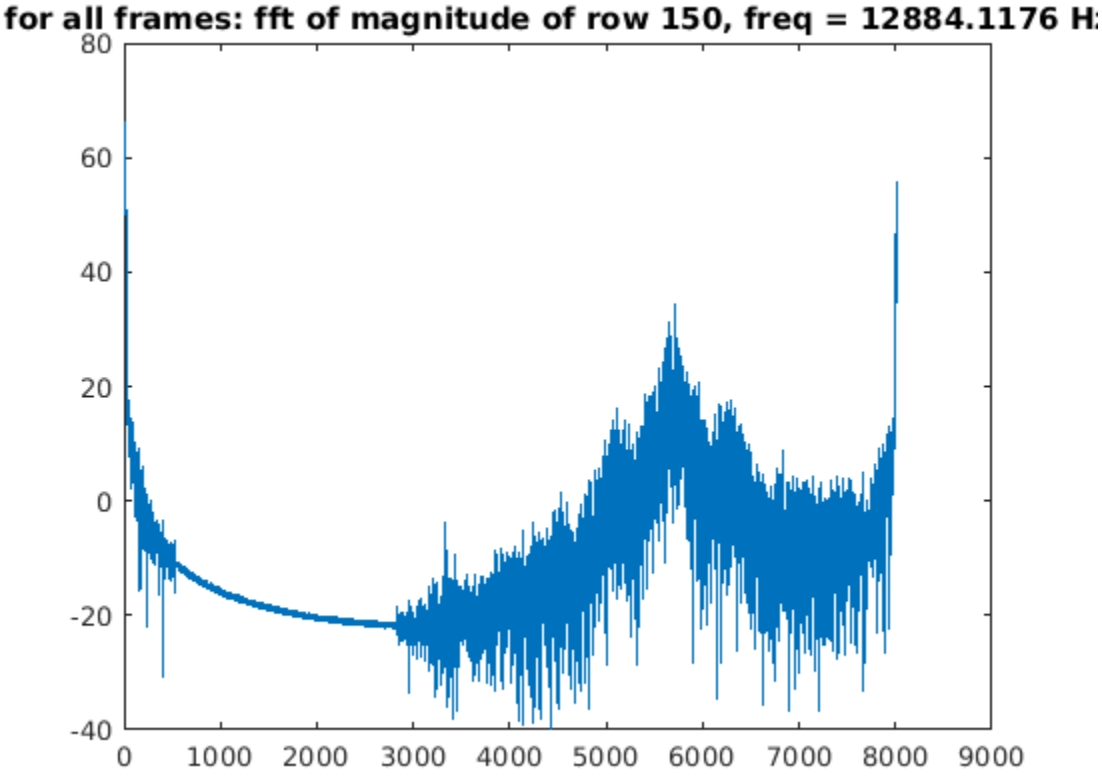

for all frames: magnitude of row 50, freq = 4237.0588 Hz
6
5
4
3
2
1
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^4

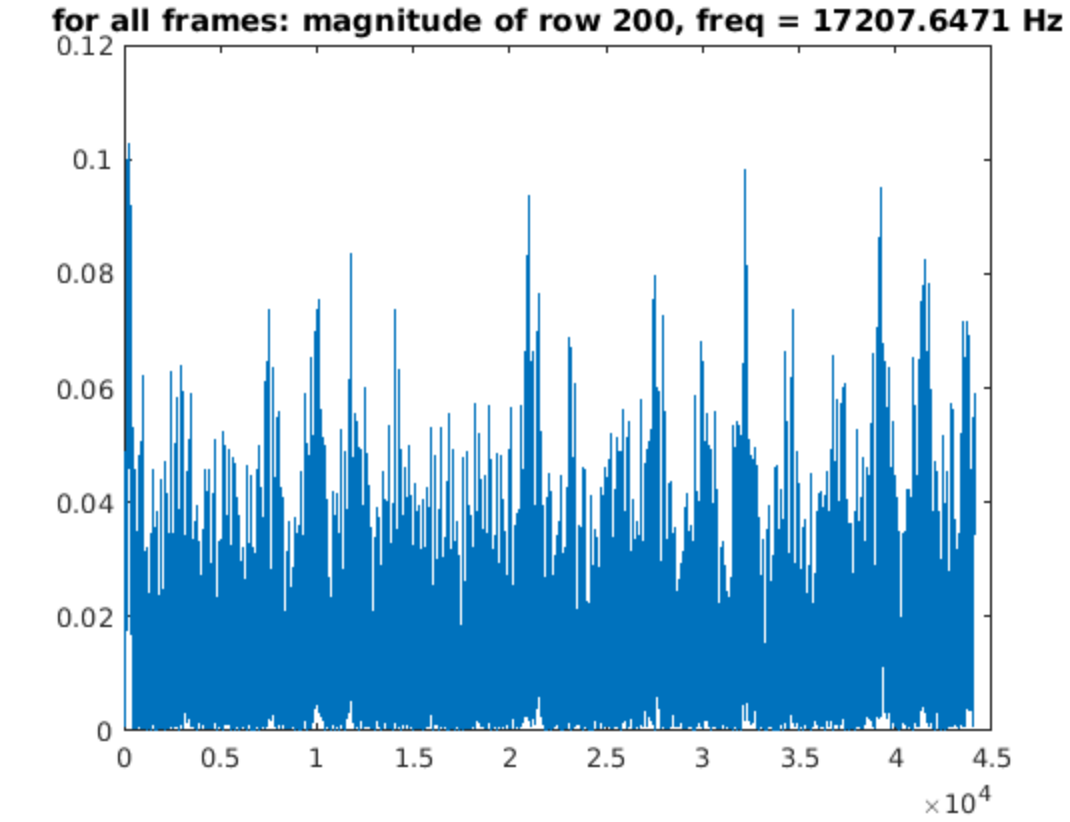

for all frames: fft of magnitude of row 50, freq = 4237.0588 Hz
80
60
40
20
0
-20
-40
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

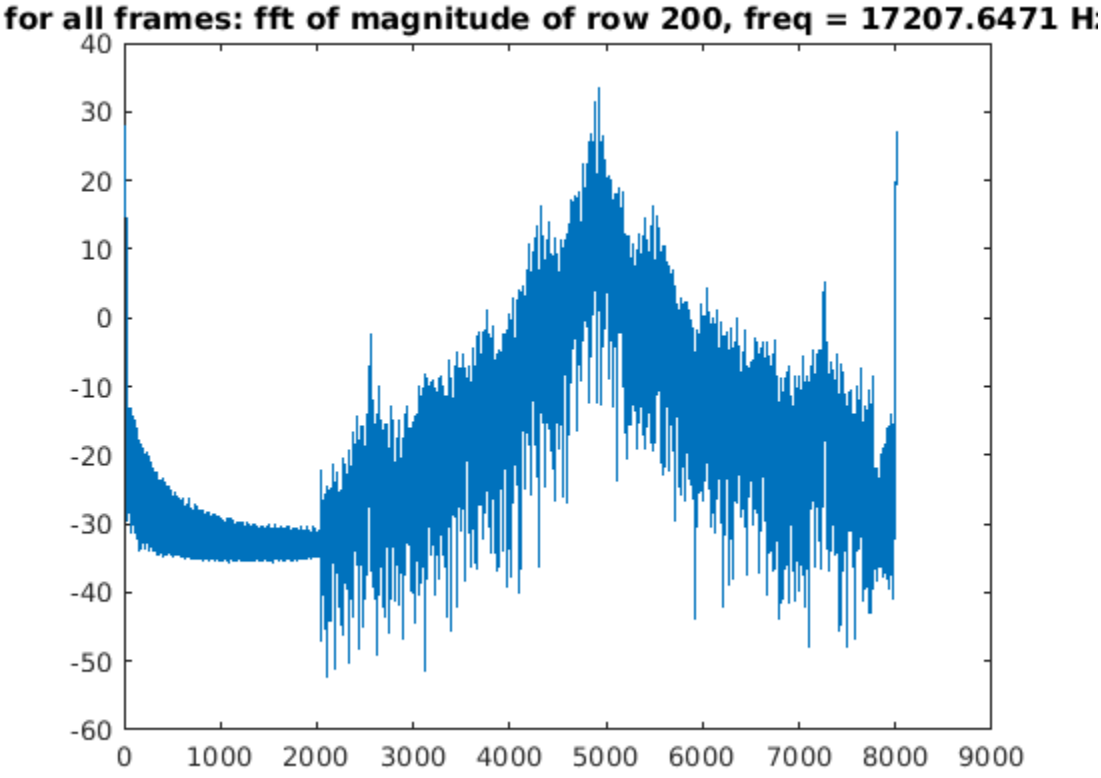

for all frames: magnitude of row 100, freq = 8560.5882 Hz
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^4

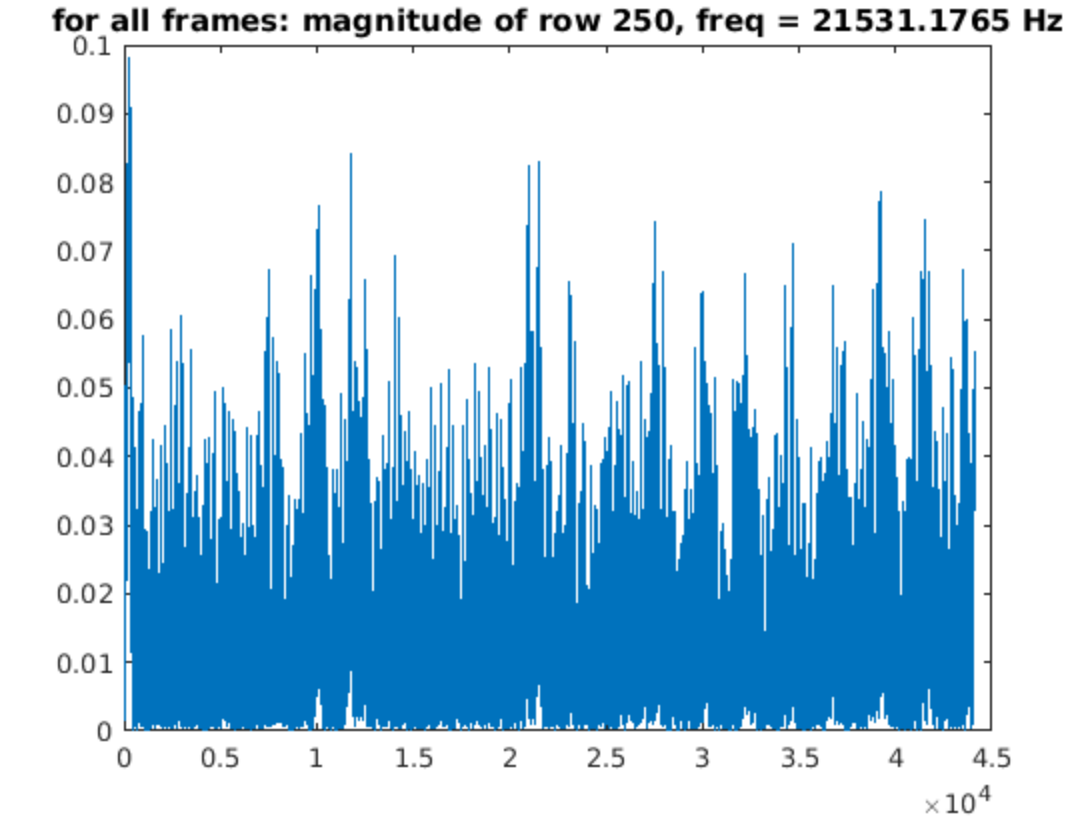

for all frames: fft of magnitude of row 100, freq = 8560.5882 Hz
80
60
40
20
0
-20
-40
-60
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

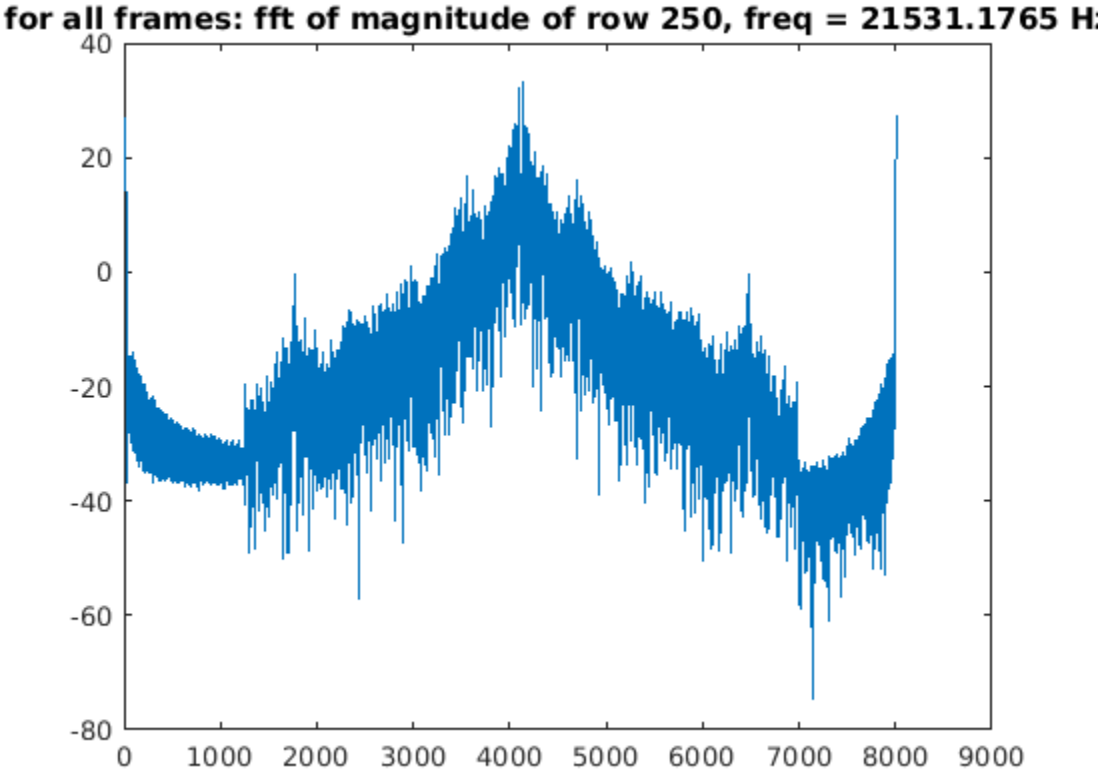

for all frames: magnitude of row 150, freq = 12884.1176 Hz
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^4


for all frames: fft of magnitude of row 150, freq = 12884.1176 H
80
60
40
20
0
-20
-40
0
1000
2000
3000
4000
5000
6000
7000
8000
9000


for all frames: magnitude of row 200, freq = 17207.6471 Hz
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^4


for all frames: fft of magnitude of row 200, freq = 17207.6471 H
40
30
20
10
0
-10
-20
-30
-40
-50
-60
0
1000
2000
3000
4000
5000
6000
7000
8000
9000


for all frames: magnitude of row 250, freq = 21531.1765 Hz
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^4


for all frames: fft of magnitude of row 250, freq = 21531.1765 H
40
20
0
-20
-40
-60
-80
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

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