

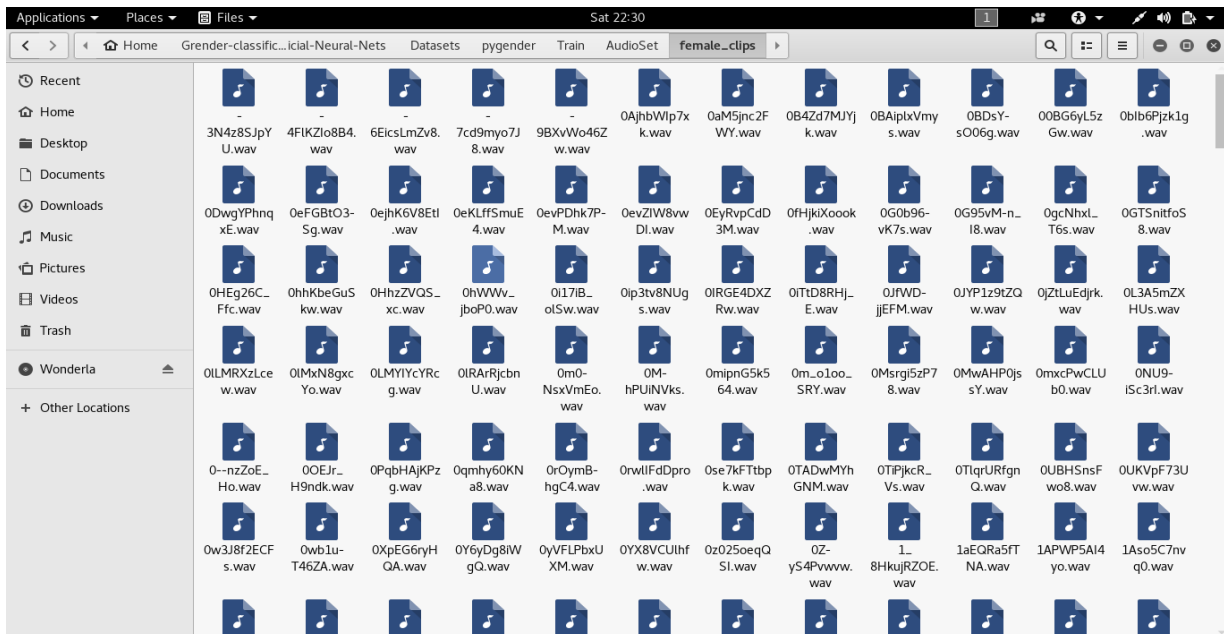
Project Status

Problem Statement:

Gender Recognition system from audio files using FFT with Artificial Neural Networks.

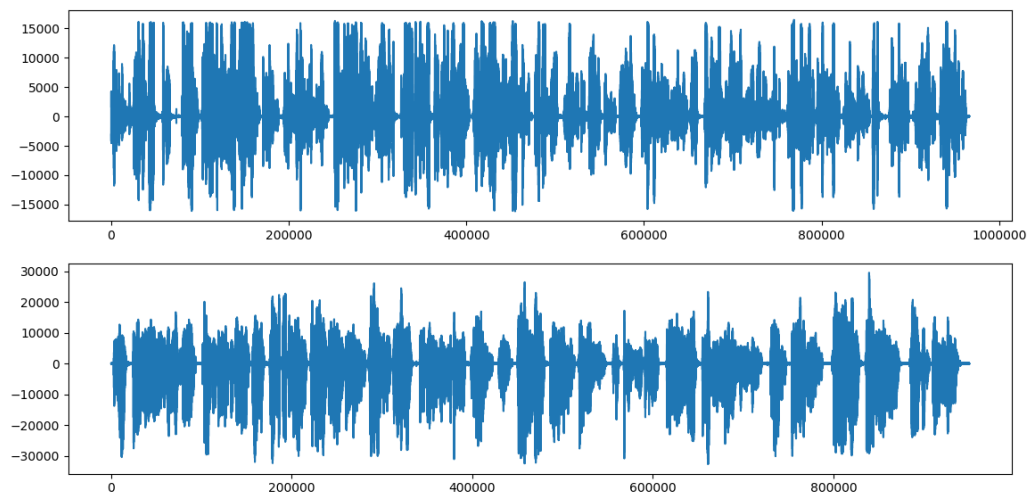
Status:

1.Data loading (Audio Files)



Caption 1: Audio Files

Sample audio Plotting



Caption 2: Female vs Male Audio data

2.FFT Transformation

Q:Why FFT?

Ans:-

The advantages of using FFT:

- Fast capture of waveform
- Able to capture non-repetitive events
- Able to analyse signal phase

Implementation of FFT algorithm :

```
#defining omega for FFT
@classmethod
def omega(self,p, q):
    return cmath.exp((2.0 * cmath.pi * 1j * q) / p)

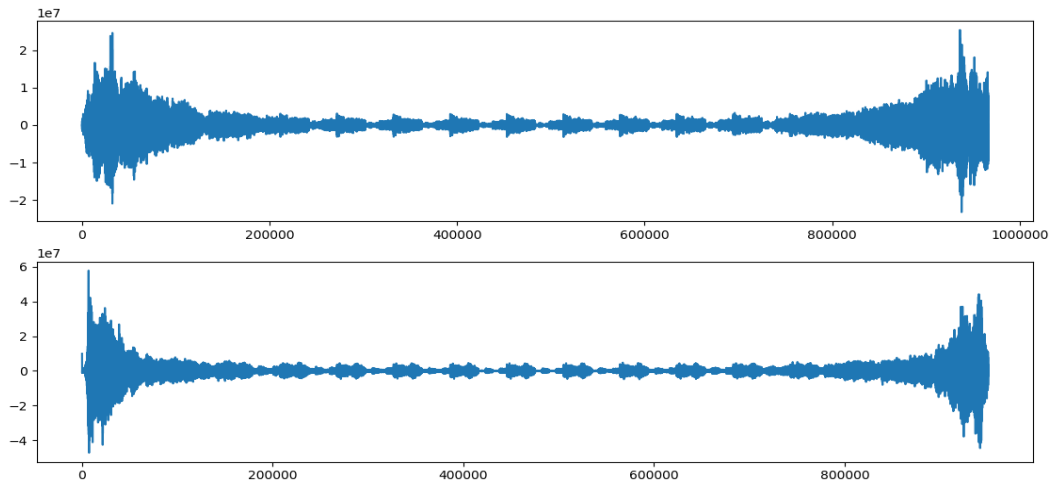
#actual definition for Fast fourier Transformation (FFT)
@classmethod
def fft(self,signal):

    #length of the signal
    n = len(signal)
    if n == 1:
        return signal
    else:
        #splitting into even and odd set
        Feven = self.fft([signal[i] for i in range(0, n, 2)])
        Fodd = self.fft([signal[i] for i in range(1, n, 2)])

        #combining the both list
        combined = [0] * n
        for m in range(n//2):
            combined[m] = Feven[m] + self.omega(n, -m) * Fodd[m]
            combined[m + n//2] = Feven[m] - self.omega(n, -m) * Fodd[m]

        #returning while converting list to numpy array
        return np.array(combined)
```

Data Transformation Plot



Caption3:Female vs Male

3.Features Extraction and Dataset Creation

The List of MFCC Features which i will be using are as follows :

- 1.Mean Frequency
- 2.Standard Deviation
- 3.Median
- 4.Third Quartile (Q75)
- 5.First Quartile(Q25)
- 6.Inter Quartile(IQR)
- 7.Skewness
- 8.Kurtosis
- 9.Spectral Entropy
- 10.Spectral Flatness
- 11.Mode
- 12.Central Frequency

Q.What is MFCC ?

Ans:-

Mel-frequency cepstral coefficients (**MFCCs**) are coefficients that collectively make up an MFC. They are derived from a type of cepstral representation of the audio clip (a nonlinear "spectrum-of-a-spectrum").

References Used :

“The International Arab Journal of Information Technology, Vol. 10, No. 5, September 2013”

Snapshot of Extracted Features:

A	B	C	D	E	F	G	H	I	J	K
0.0500000000000048	1631689.3494797	257595.119785339	0	569691.610688241	111826.865148477	457864.745539764	108.63767495123	7.4547545424243	10.929310480039	0.018220708158674
0.0500000000000048	813602.265908833	156399.237367558	0	447042.106925436	39621.5671678986	407420.539757537	819.03042054245	13.6007675141952	11.0708740662959	0.024388867094521
0.0500000000000048	495739.237165809	35128.7321124104	0	127026.128477644	10846.0358503563	116180.092627288	143.246333604477	6.64023121951153	10.6468754673902	0.005803782668949
0.0500000000000048	1938026.99655643	675640.830433232	0	2106459.54592335	124399.72976284	1982059.81616051	6.25072504354021	2.17263016615601	11.2878909159851	0.043944951963302
0.0500000000000048	653019.5684707	170631.982102102	0	417740.445036063	61349.2399131043	356391.205122958	29.688417721869	4.23216926085726	11.1980756594607	0.044322132477289
0.0500000000000048	46866.9327089689	16474.3116774566	0	39961.0373520594	7463.52094065997	32497.5164113994	2075.80322426429	22.5984161098404	11.3994197173443	0.089125687666217
0.0500000000000048	462342.755533537	51149.4321670386	0	168742.956423805	20612.6177378593	148130.338695945	86.824028948123	6.70417224186434	10.8682922254691	0.015151595122628
0.0500000000000048	693607.567221392	231595.6425894	0	628193.485490068	103259.270718625	524934.214771443	7.7647743769361	2.50585036377209	11.3447042180257	0.081849679043338
0.0500000000000048	1093484.4924722	358889.966638655	0	693498.8289104	189258.705088315	504240.123822085	126.782842289697	7.80271062326402	11.3452560202174	0.082330654648253
0.0500000000000048	96442.1186875755	6987.23260774014	0	104695.635306166	400.463393234185	104295.171912932	8.93081886539957	2.29895548974945	11.0223886354039	0.003801334936044
0.0500000000000048	2503246.05545029	429329.170735918	0	1500331.18980595	12262.7350294135	1489068.45477654	18.5568224243727	3.55921715845733	10.9683945340737	0.005128363949552
0.0500000000000048	940813.763365108	56256.1251623654	0	165597.469977983	21425.8182992002	144171.651678782	33.0760546307518	5.26548590295284	10.4582036908104	0.003958633118466
0.0500000000000048	1075792.46124895	215562.829770272	0	900695.981884356	48318.8332803078	852377.348604049	104.815931657798	5.97912095730343	11.1557544322626	0.02593157048639
0.0500000000000048	379509.988055866	45892.8453471898	0	92958.8237629769	24295.8759212627	68662.9478417142	88.9177633940325	7.37749220826427	10.8126183197394	0.017234714022652
0.0500000000000048	584667.317668505	241242.46599467	0	615790.309165911	74858.4616850151	540931.847480896	27.8673742174694	3.84177984190627	11.3807298302188	0.075452424922476
0.0500000000000048	322350.991154687	78271.3271730438	0	230201.285761361	38531.0152523329	191670.270509028	12.6240611010223	3.12013080539114	11.2366848061514	0.058872735319902
0.0500000000000048	473705.02036647	56682.4678976612	0	250006.02705188	26313.3885410798	223692.6385108	18.0006451286265	3.69629228934577	10.9782909255584	0.021636951628779
0.0500000000000048	463363.669321488	109665.264708364	0	241276.51508608	50183.7293768697	191092.78570921	56.3261405563272	6.1922236397296	11.1740654139836	0.046218350810596
0.0500000000000048	702902.345005321	109635.220779203	0	235439.334681113	60824.8546184583	174614.480062655	18.3187517996173	3.89388172111443	10.9810224789472	0.029219012243063
0.0500000000000048	1198528.86463088	90965.032734454	0	318048.669246938	40264.7505208672	277783.918726071	46.5314411554306	5.51677745342639	10.7122048355395	0.008997179850181
0.0500000000000048	1824505.67905663	485454.84970798	0	1434926.91266331	122280.657738574	1312646.25492473	24.7651339062458	3.96558196971951	11.1794978529157	0.0211267237196
0.0500000000000048	1087515.59983825	71955.0624919678	0	352005.305771607	25387.0383113268	326618.26746028	39.9563539064136	4.45884730111101	10.7115799101394	0.006175492861586
0.0500000000000048	1312927.95076738	151707.743276426	0	335575.088814338	75889.6942012804	259685.394613057	69.6889180088073	7.16333019741131	10.78314003412763	0.015314043196609
0.0500000000000048	1991285.29001898	279969.908244829	0	826268.170118357	134201.185152621	692066.984965735	28.8081966868779	4.56206472470088	10.9751800740409	0.024175622021082
0.0500000000000048	2606089.857708	98132.5175259341	0	1222469.56638123	1237.10737356751	1221232.45900767	34.3833031907284	4.81479122679332	10.6792883103153	0.000198275621267
0.0500000000000048	345436.216033651	29695.8858075818	0	178510.609233126	9708.42889002372	168802.180343102	21.0865884367563	3.93139024522451	10.8744989775483	0.010374653110529
0.0500000000000048	113996.576634688	25970.2719128903	0	66963.0960759056	11451.431289115	55511.6647867905	35.9850263237756	4.57766232693913	11.1821820427885	0.0460456534903986
0.0500000000000048	395643.696819795	96400.7030933664	0	272871.660534542	46858.4269246497	226013.233609892	20.2293757950231	3.78933907417365	11.237362575166	0.058450601324477
0.0500000000000048	228572.873804665	44947.1706063972	0	91226.0442702531	24619.8628990155	66606.1613712376	71.611445028615	6.80218696184843	11.0950905154686	0.039484745231083
0.0500000000000048	1407712.19355212	765315.801929659	0	1286240.94245499	430550.397122105	855690.445322862	24.5262573134273	4.19947639906632	11.5305876172493	0.167128132807934
0.0500000000000048	1212320.38328596	392802.438875507	0	1056037.87753985	173102.12258305	882935.754956795	23.6720062647203	3.85893867314798	11.3403545214236	0.078349342684942
0.0500000000000048	225537.294490719	31583.8157215656	0	61658.2788334069	17416.6650786694	44241.6117547375	41.4755064998251	5.53596538134381	10.8708120473647	0.022104306768581

Caption 4: Sample of extracted features