**Lecture 1 – Short Time Fourier Transform**

For audio analysis, the time and frequency domain representations offer little in terms of useful information; the temporal representation does not offer information about the frequency domain and the spectral domain does not provide information about the time domain. For a more useful representation, the time-frequency domain representation is presented. It essentially encompasses the temporal and spectral information in one. To transform a signal to the time-frequency domain, the Short Time Fourier Transform (STFT) can be applied. STFT is an algorithm that essentially applies the Discrete Fourier Transform (DFT) in small consecutive frames of a waveform. This means that inside the frames, temporal information is lost. However, when the frame is small enough, the signal inside a frame is constant enough that sufficient temporal information is retained. The problem of choosing a good frame length is a consideration when defining the parameters of an STFT. Other parameters for the STFT include overlap size (how many samples are common between samples), how long DFT to apply (usually same as window size), and type of window (to reduce spectral leakage).