# Appendix C Notes

- Virtually any signal can be decomposed into a collection of sine waves. (Any function Y(t) can be written as the sum of sine waves)
- Where Y(t) is a function in the time domain, and its Fourier Transform Y(f) exists in the frequency domain.
- The transform takes function in one direction and its inverse takes functions in the opposite direction.
- A forward transform followed by a backwards transform returns the original function.
- Fourier Transforms can be useful in a multitude of problems, such as waves on a string, Qantum mechanics, and heat flow.
- The highest frequency independent Fourier component is Y(N/2-1). Which corresponds to f = ½ (delta t) for large N. This is the Nyquist frequency.
- If a signal is measured at time intervals spaced by delta t, the spectral components recovered with a Fourier transform are those with frequences below the Nyquist frequency.

FFT algorithm:

- Read in data
- Find the power p where N = 2^p
- Bit reverse the indices of the index array
- Outer loop through levels i = 1, 2, ..., p of even-odd decompositions
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- In practice it is best to set the Nyquist frequency to be higher than any of the Fourier components that are expected to be present in the signal. This can also be achieved using a low-pass filter.