

## 0) Overview

Monday, July 10, 2017 9:20 PM

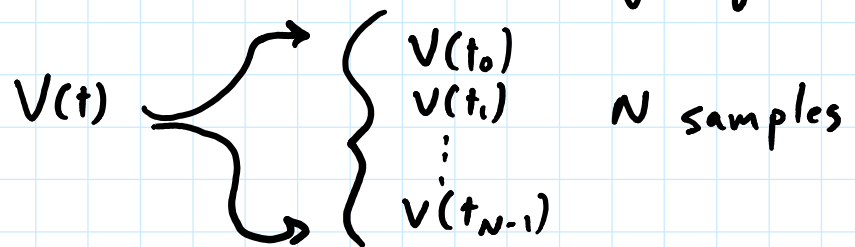
Sound waves are regions of compressed and rarefied air that propagate across space.  $\rightarrow$  fluctuation in pressure

This pressure varies sinusoidally in space + time

Because sound travels at a constant speed, we need only 2 parameters to describe a sound wave: Amplitude + frequency

A microphone does:  $P(t) \rightarrow V(t)$   
 $\uparrow$  pressure  $\uparrow$  voltage

To record the audio, we must sample this voltage signal



Humans hear by discerning: frequency and amplitude of sine-waves

We want to describe audio signals in terms of the **pure notes** that comprise them.

Discrete Fourier Transform (DFT)

$$\{y_n\}_{n=0}^{N-1} \xrightleftharpoons[\text{inverse DFT}]{} \{C_k\}_{k=0}^{N-1}$$

$C_k$ : amplitude of "sinusoidal wave" with frequency  $\frac{2\pi}{L}k$  ( $k=0, 1, \dots, N-1$ )

"Fast Fourier transforms" are ... super fast!