

1 -Sound and waveforms

Inteligencia artificial avanzada para la
ciencia de datos I Modulo 5 NLP 1



Tecnológico
de Monterrey

NLP

AI discipline focused in processing methods and the cognitive understanding of humans language...

ML : Machine Learning

DL : Deep Learning

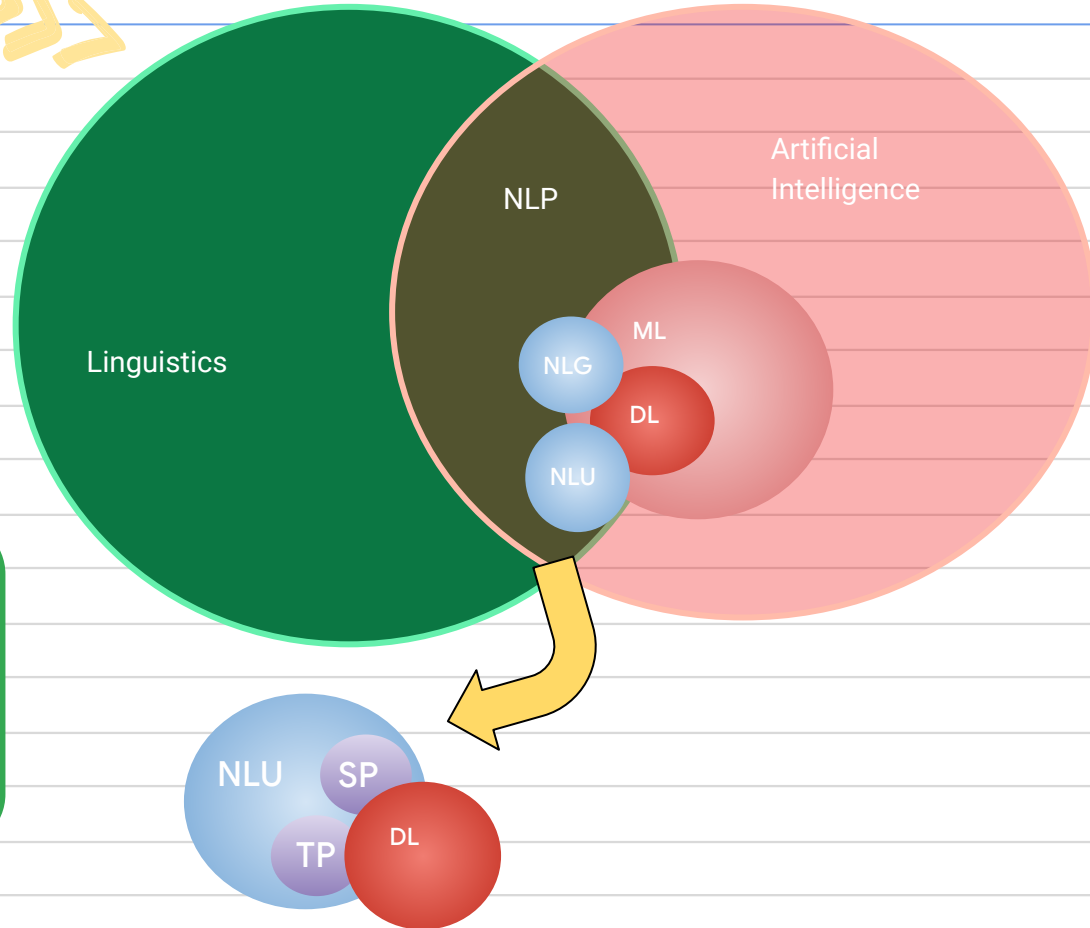
NLP : Natural Language Processing

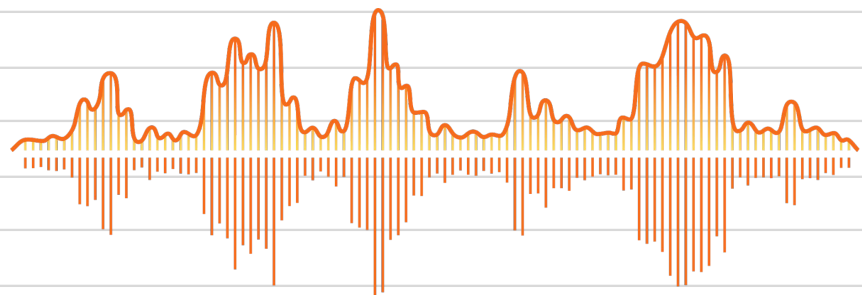
NLU : Natural Language Understanding

NLG : Natural Language Generation

SP: Signal Processing

TP: Text Processing



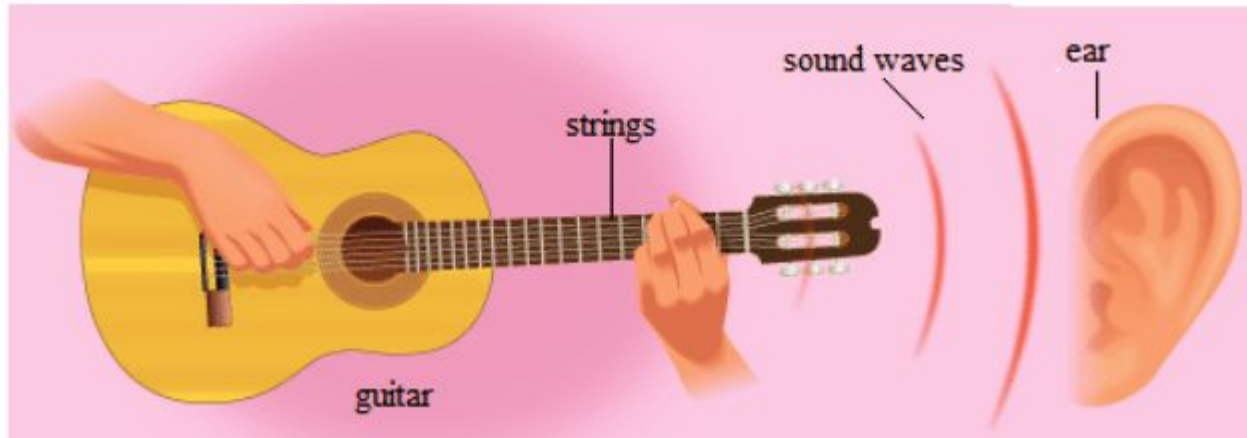


Sound (usually human voices) representations processed for understanding of language.

Audio Signals Processing

What is sound?

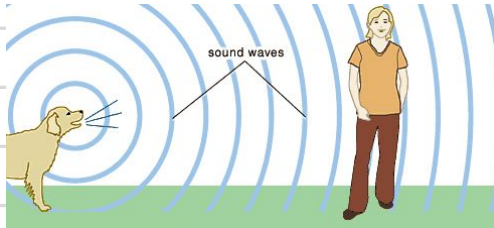
- Is the result of vibrations (very convenient human ear may detect it)
- Vibration causes air molecules to vibrate
- Air molecules modify pressure and creates waves



Mechanical Wave

Space

Any oscillation traveling through space (needs a medium to travel)



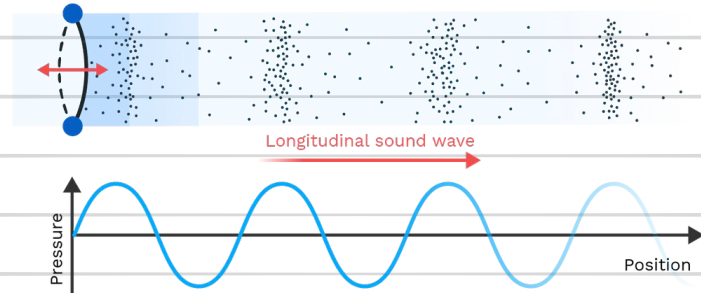
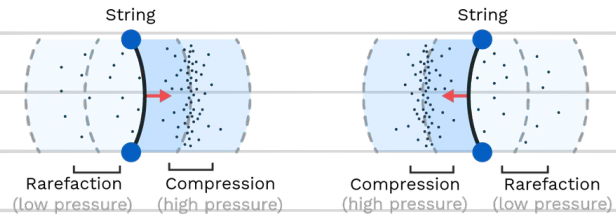
Energy

Waves are indeed an energy manifestation, deforms the space

Sound Wave

Mechanical

Sound is a mechanical wave, usually medium is air





Waveforms!

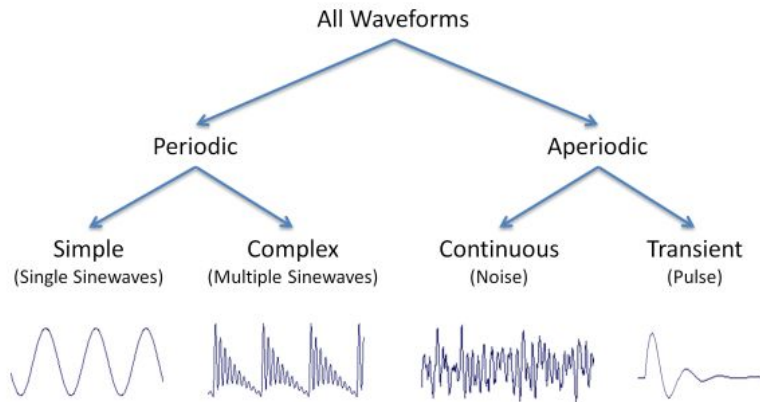
Periodic

Sound waves with periodic (pattern) behaviour, easier to represent with a function



Aperiodic

Waves without a pattern in its shape, hard to represent with functions.

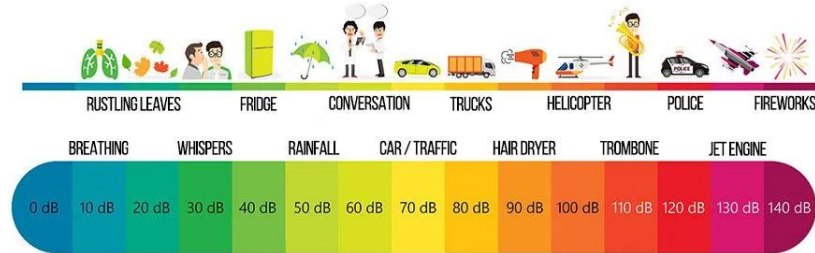
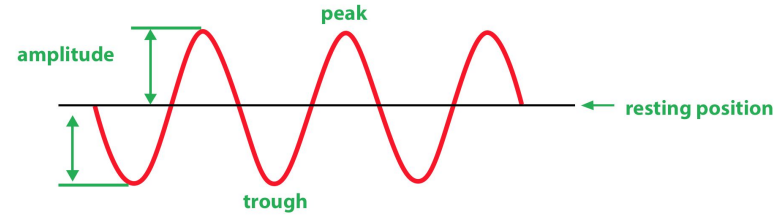


Audio information inside Sound waves

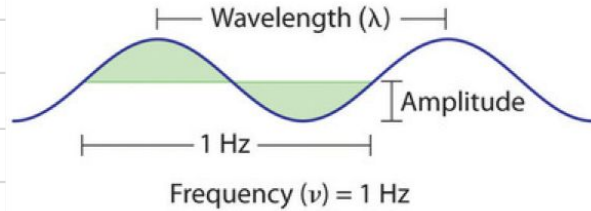
Amplitude

How “high” is the
perturbation in
the air pressure.

The higher the
amplitude of the
wave, the louder
we will hear it.



Audio information inside Sound waves



High / Low

In terms of sound, higher frequencies represents “higher” sounds



Frequency

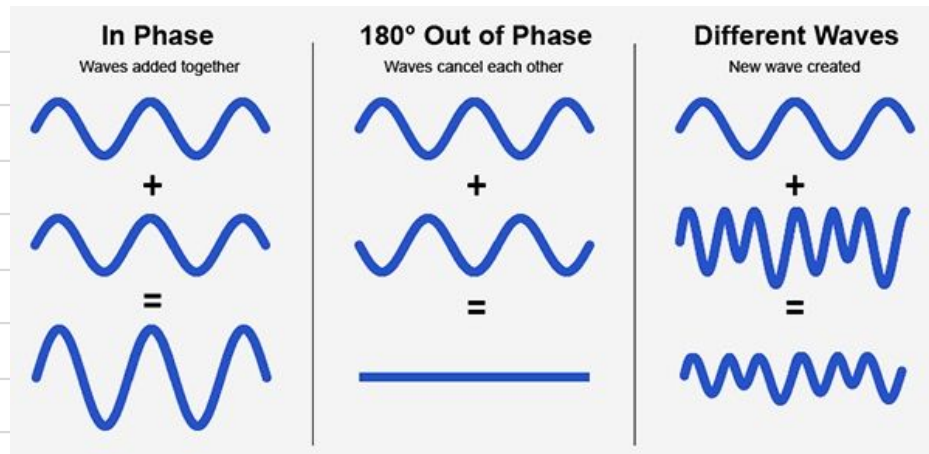
The time the air pressure takes from peak to peak.

Each time the wave reaches a peak its called a period.

The time it takes to complete a period per second its measured by Hertz

$$f=1/t$$

Audio information inside Sound waves



Phase

Indicates the position of the wave at time "zero".
Useful for complex audio waves analysis (two or more waves together)

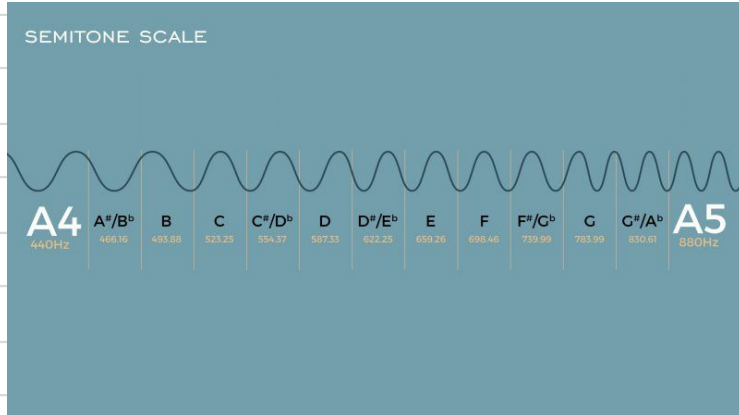
Pitch

Some frequencies might sound “similar” but “Higher”.

This means both sound waves have the same “pitch”.



In terms of music, this is called an octave.

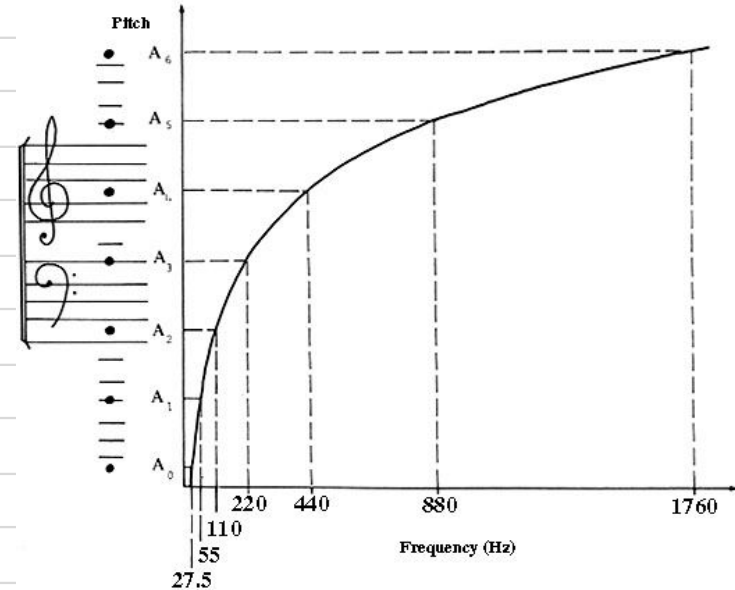


A4 to A5 is an octave,
Look how A5 has 2
times the A4
frequency

Pitch chart

In fact, the perception of sound works in a logarithmic Manner.

Tho sound waves sound similar if they differ by a power of 2



Quick exercise

1) Download the app



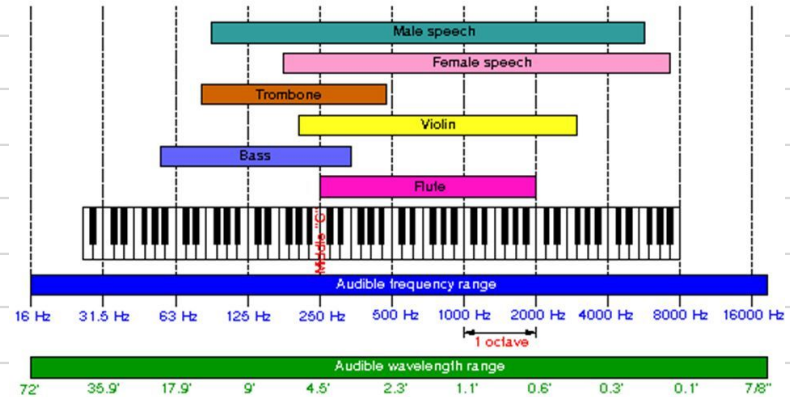
ios



android

2) Analyze your voice frequency

Range of Some Common Sounds





Thanks!

Do you have any questions?

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Slack #module-5-nlp-1

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