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SPEECH PROCESSING WITH DEEP LEARNING

Barathi Ganesh HB

Resilience Business Grids

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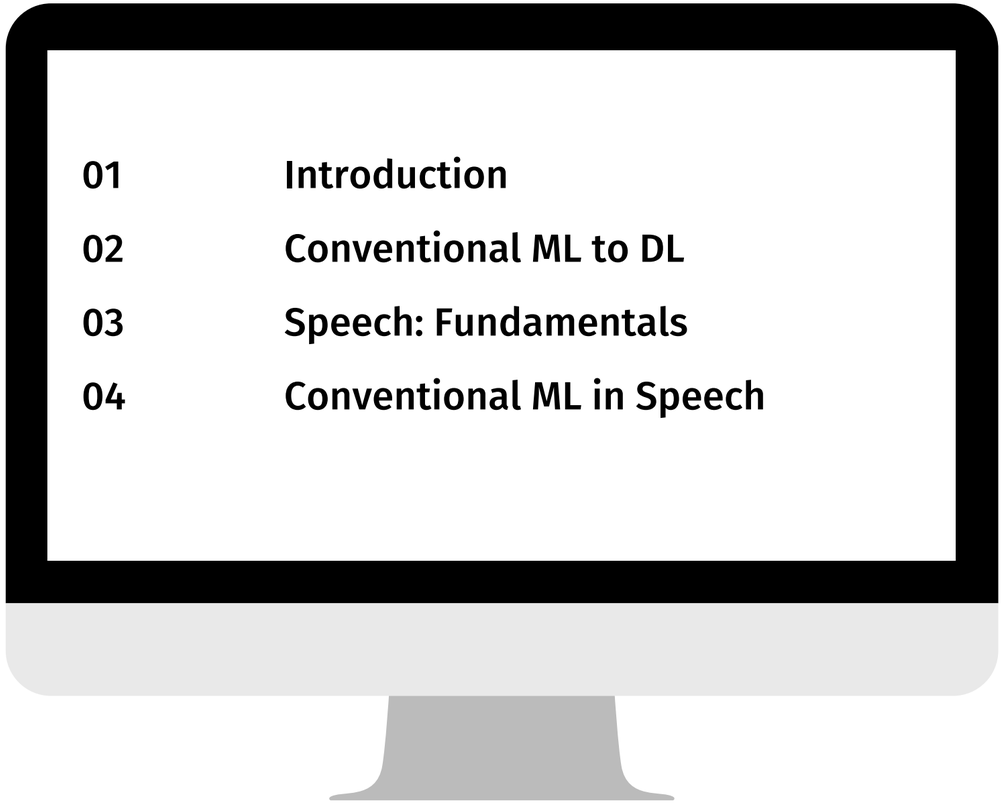

SPEECH PROCESSING - INTRODUCTION

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STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

- Acquisition
- Analysing
- Manipulating
- Storing
- Transferring
- Synthesizing

STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

Acquisition

What?

Analysing

Who?

Manipulating

Storing

How?

Transferring

Synthesizing

STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

Acquisition

Analysing

What?

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STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

Acquisition

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What?

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How?

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APPLICATIONS

Speech-to-Text and Classification

Analysing

APPLICATIONS

STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

Acquisition

Analysing

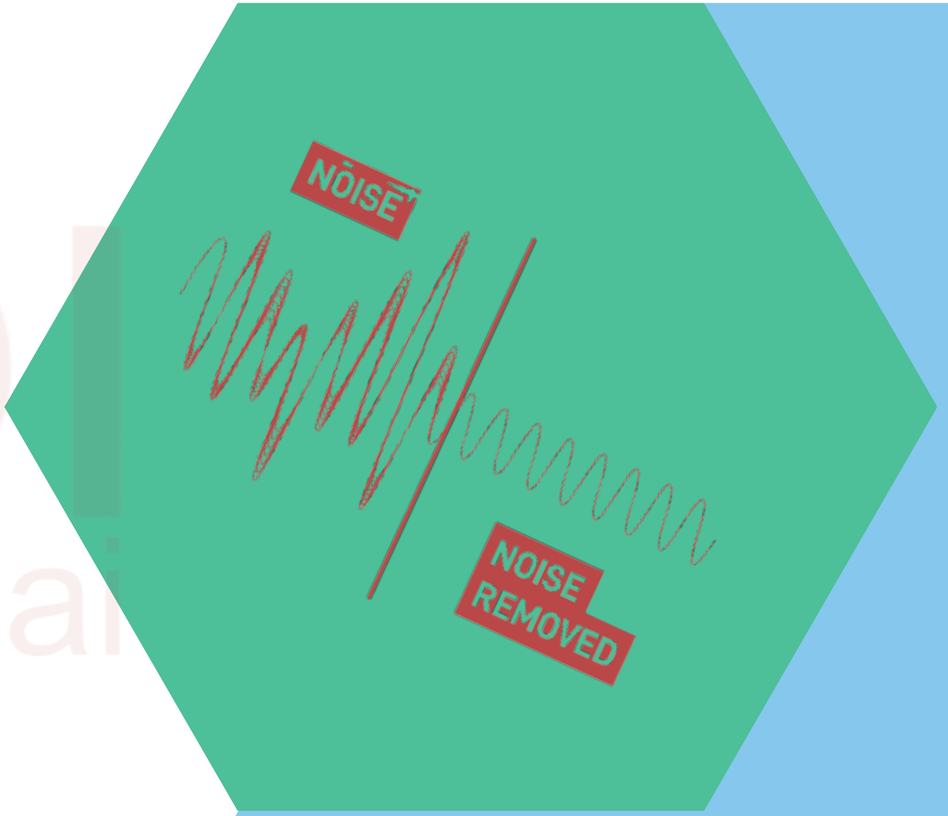
Manipulating

Noise Separation

Storing

Transferring

Synthesizing



APPLICATIONS

STUDY OF SPEECH SIGNALS AND THE PROCESSING METHODS OF SIGNALS

Acquisition

Analysing

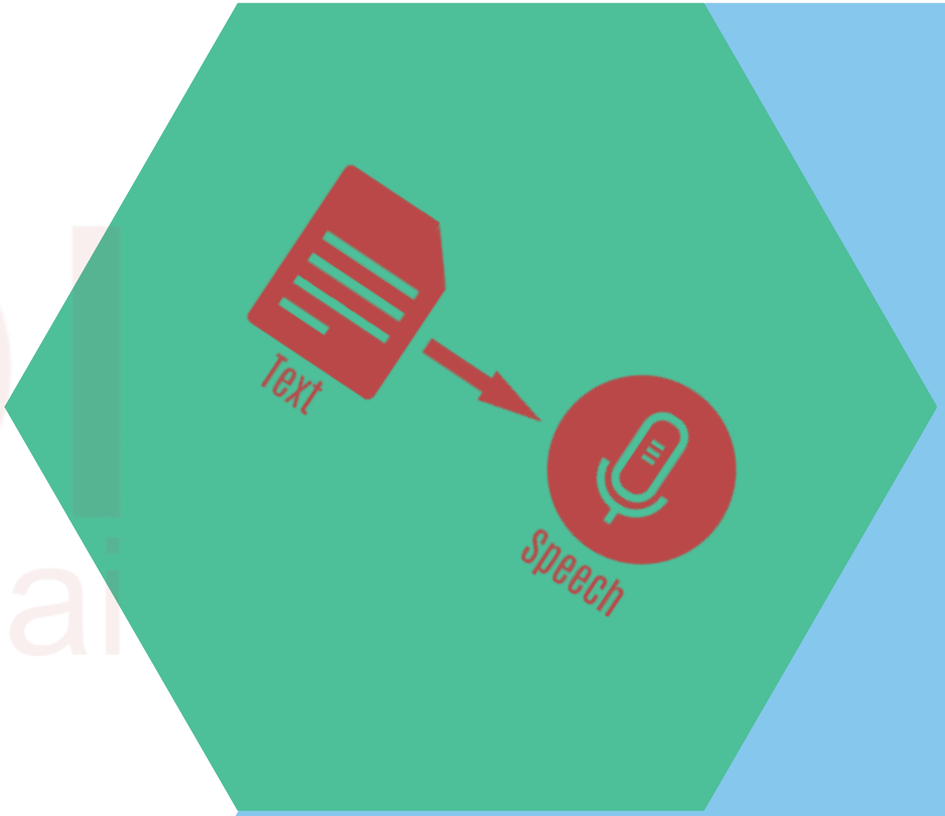
Manipulating

Storing

Transferring

Text-to-Speech

Synthesizing



Conversation

Voice

Enhancer

Transcriber

TEXT

Hello, RBG
Whats Up?

Sentiment

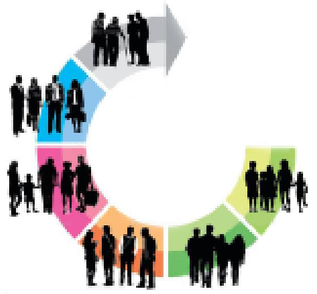
Info Extractor

PROFILER

Sentiment

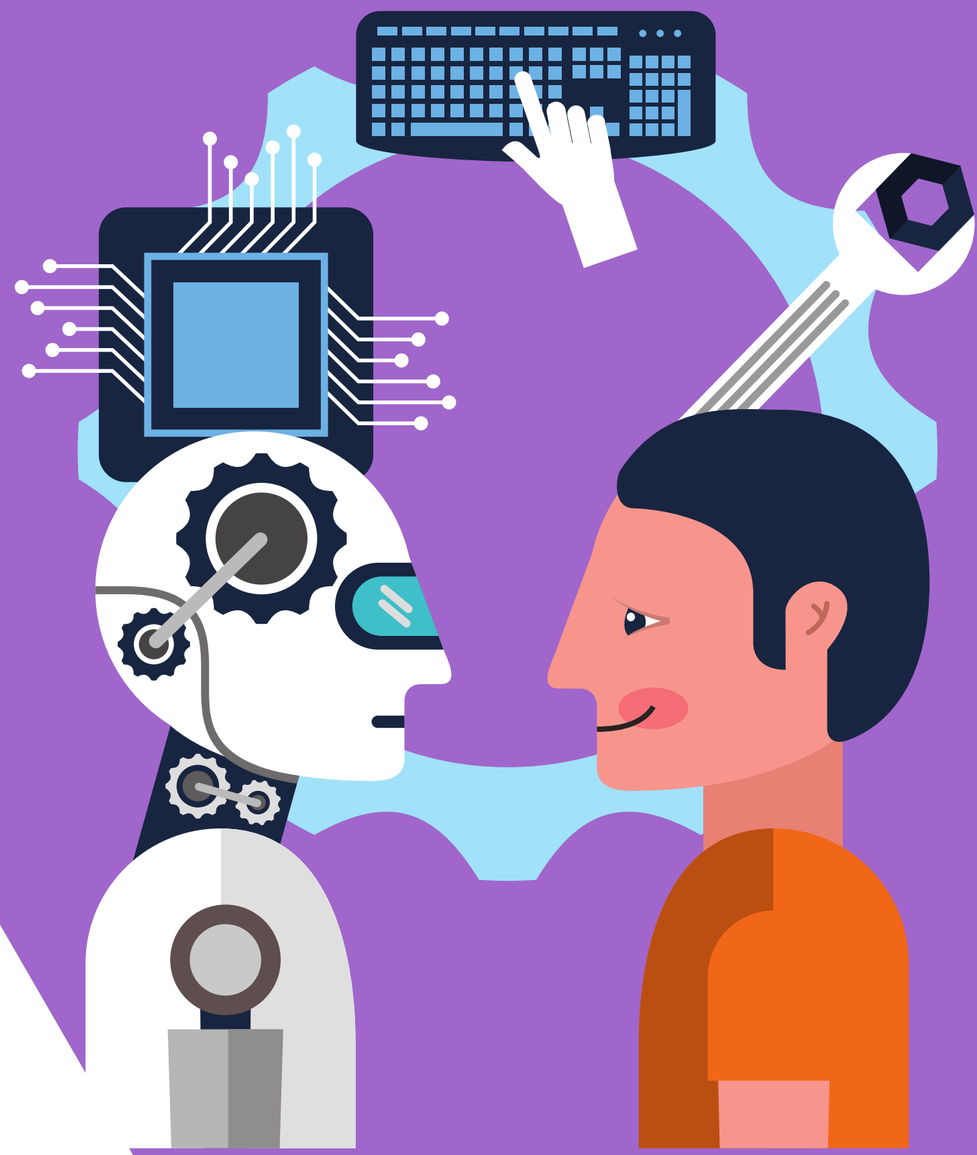
Emotions

Age Group



Gender

CONVENTIONAL MACHINE LEARNING TO DEEP LEARNING



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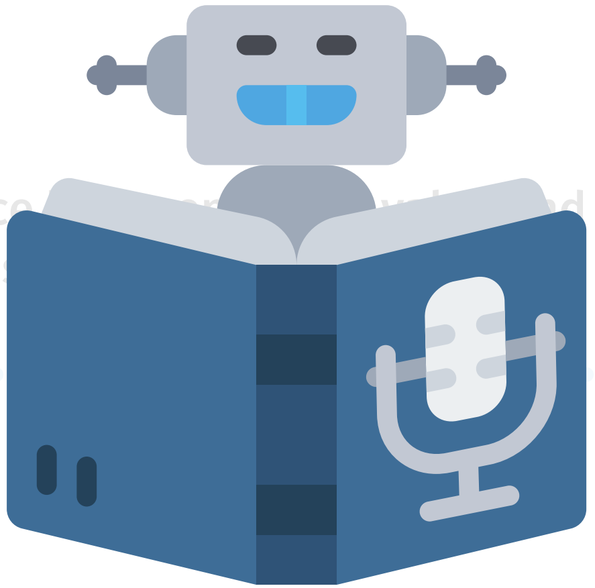
Machine Learning

Computers using data and algorithms to imitate the way that humans learn and gradually improving its accuracy.



Machine Learning

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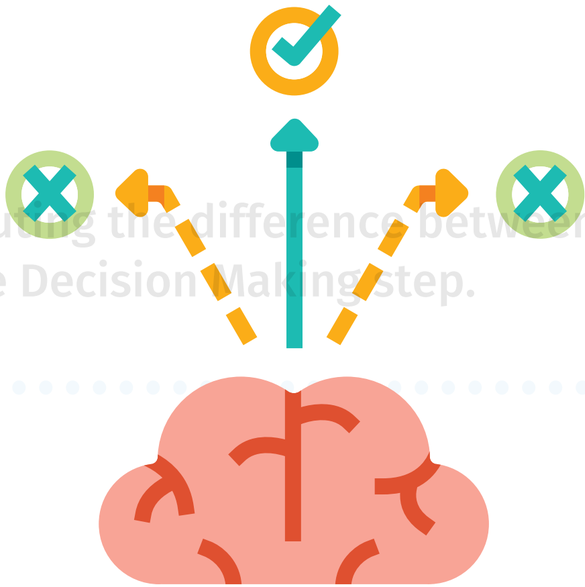
Computers using data and algorithms to imitate the way that humans learn and gradually improving its accuracy.

Decision Making: **Based on some input data, which can be labelled or un-labeled, your algorithm will produce an estimate about a pattern in the data.**



Computing Errors: **Computing the difference between an actual value and estimated value from the Decision Making step.**

Optimizing: **Autonomously adjusting the learnt pattern to reduce the error in Computing Errors step until a threshold of accuracy has been met.**

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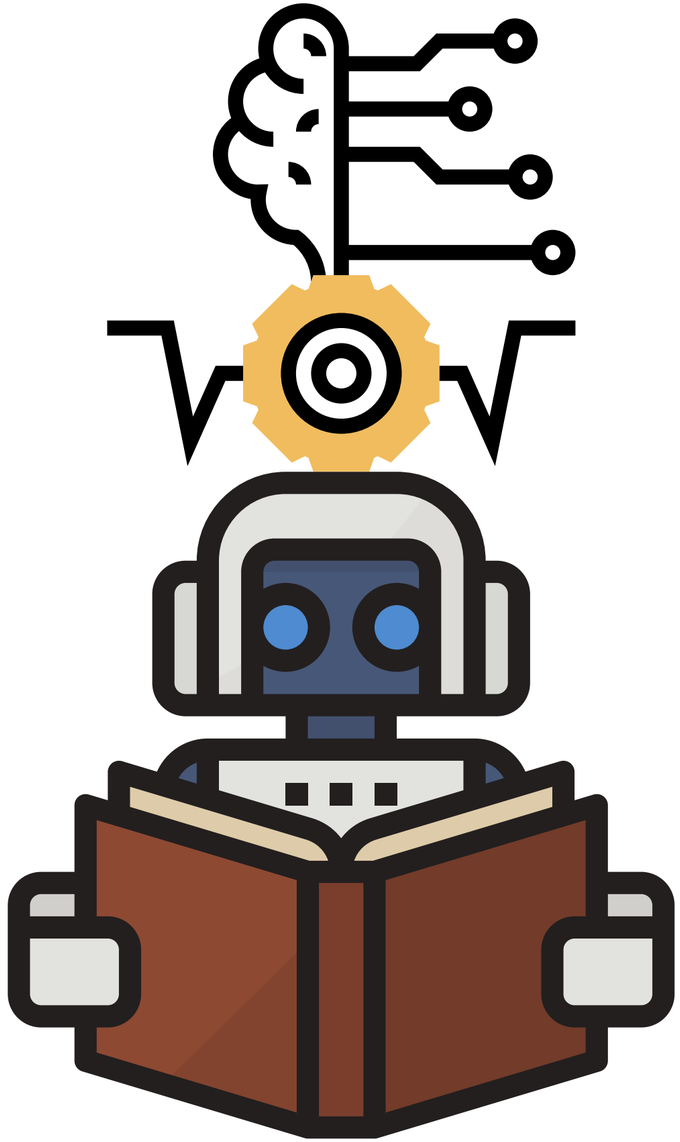
Conventional Machine Learning

Dependent on human intervention to learn. Human experts determine the set of features to understand the differences between data inputs.

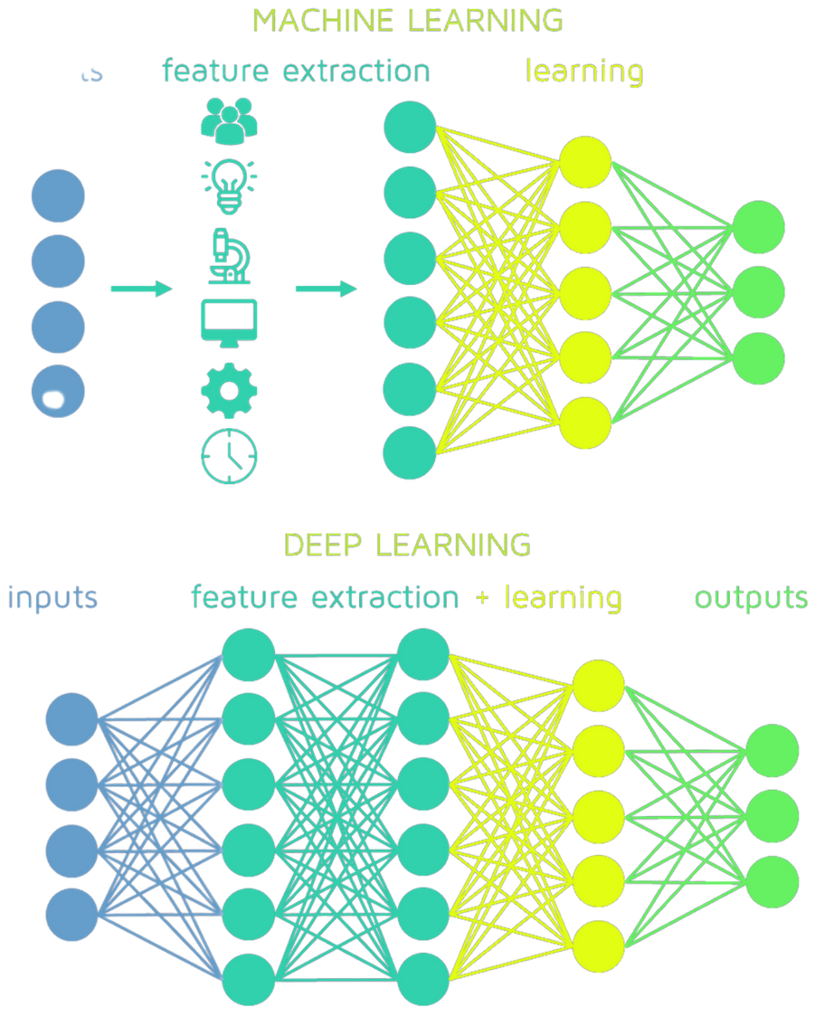
Deep Learning

Automates much of the feature extraction piece of the process. Eliminates some of the manual human intervention required and enabling the use of larger data sets.



Conventional Machine Learning vs Deep Learning

Differs is in how each algorithm learns.



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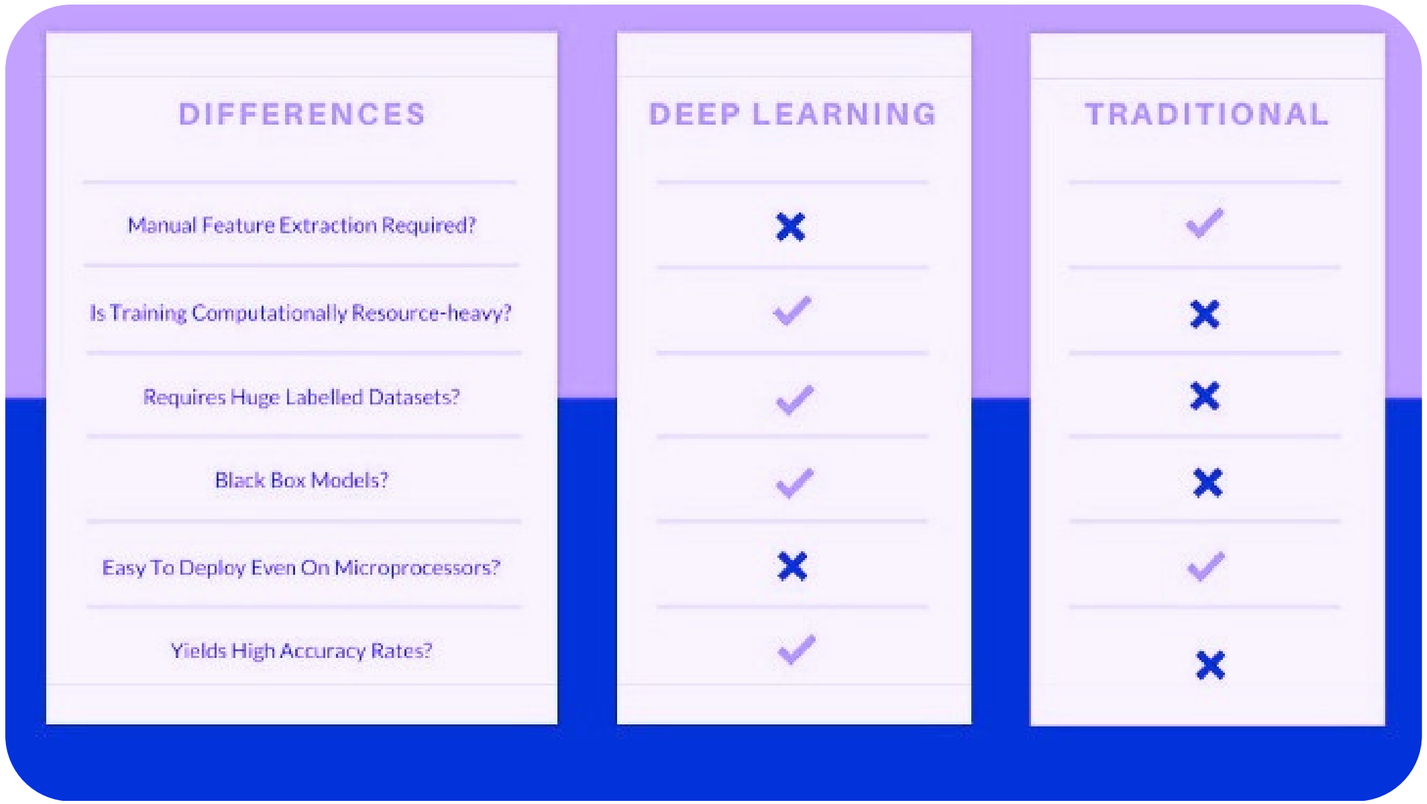
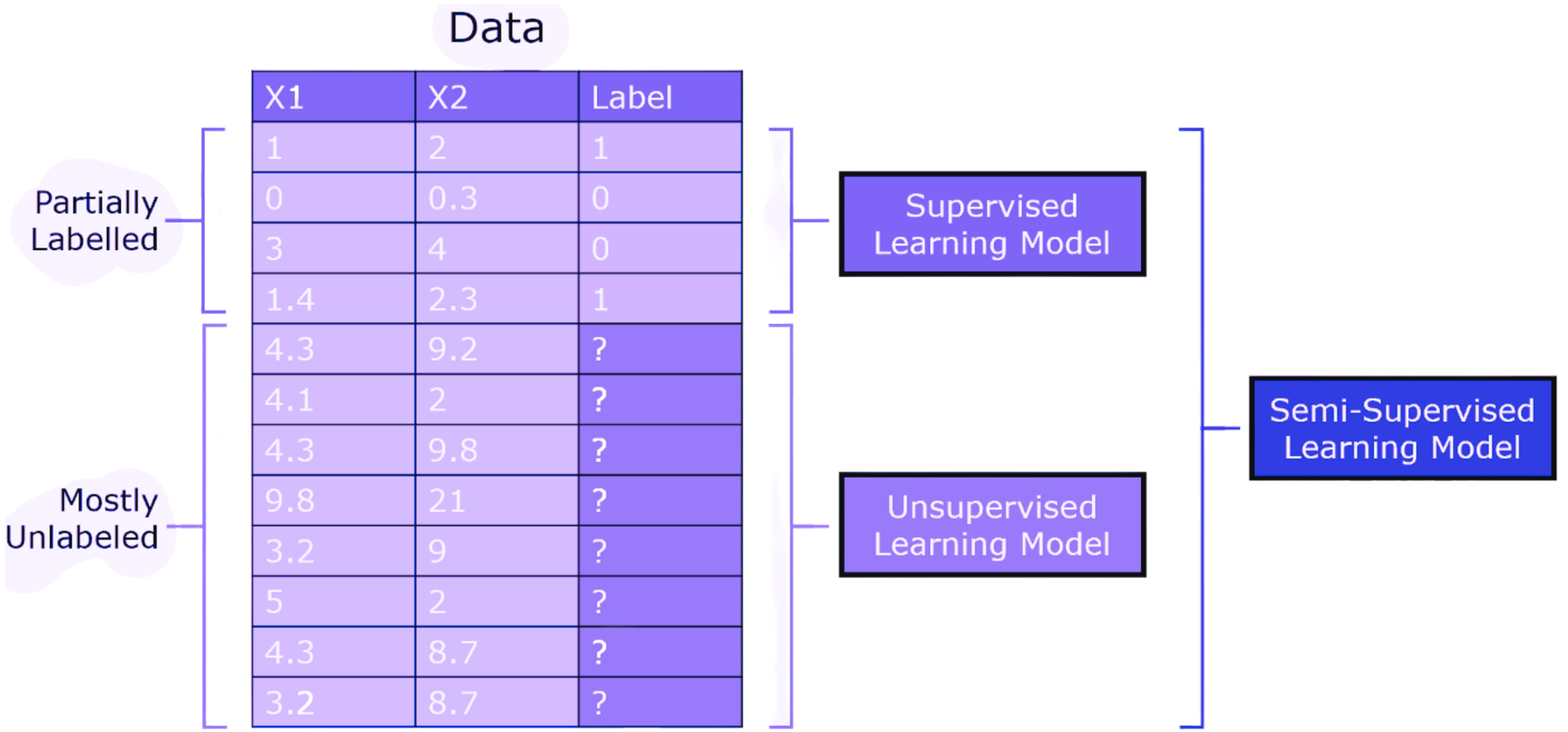


DIFFERENCES	DEEP LEARNING	TRADITIONAL
Manual Feature Extraction Required?	✗	✓
Is Training Computationally Resource-heavy?	✓	✗
Requires Huge Labelled Datasets?	✓	✗
Black Box Models?	✓	✗
Easy To Deploy Even On Microprocessors?	✗	✓
Yields High Accuracy Rates?	✓	✗

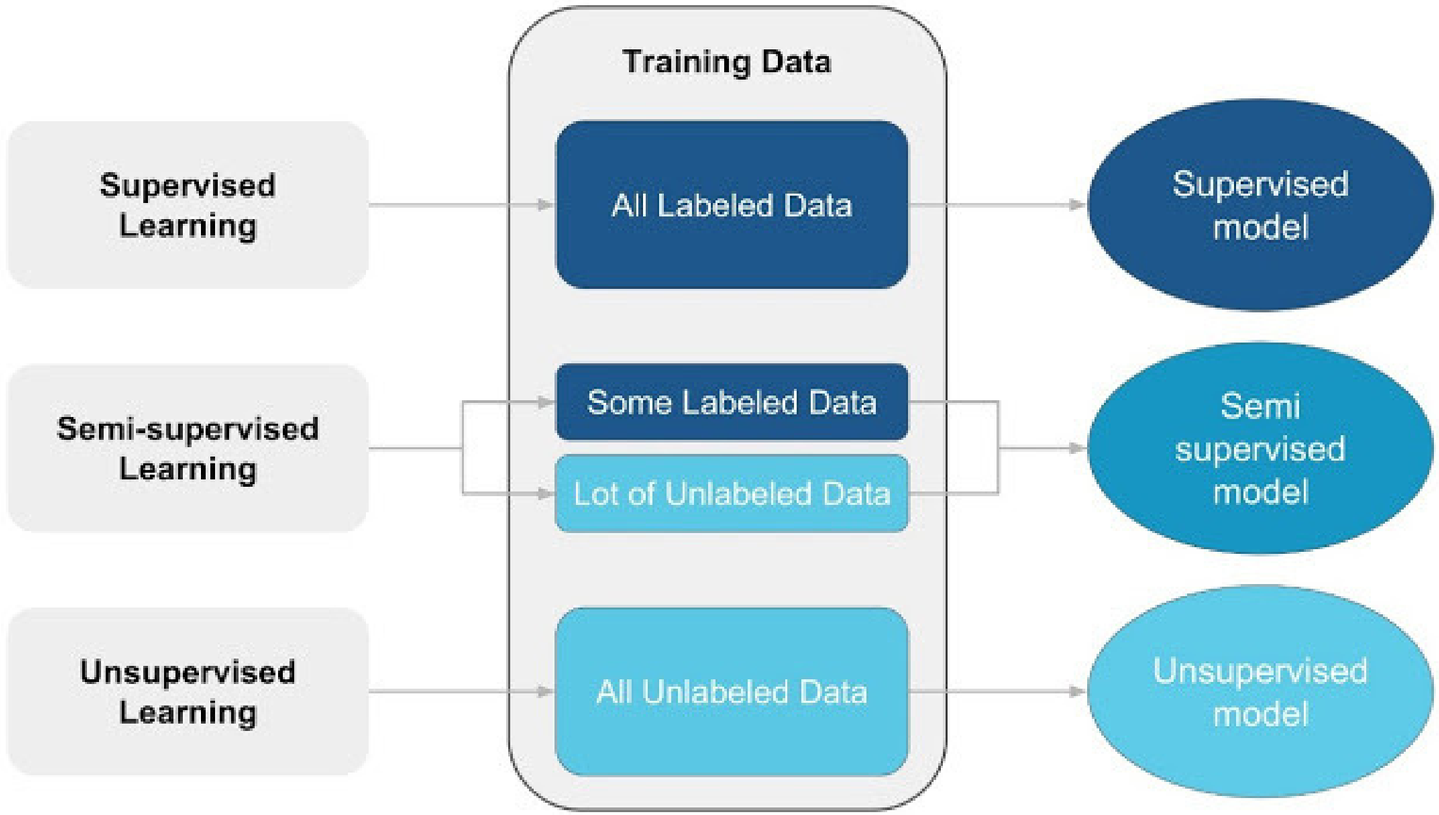
Data Types

Differs in how each algorithm learns.

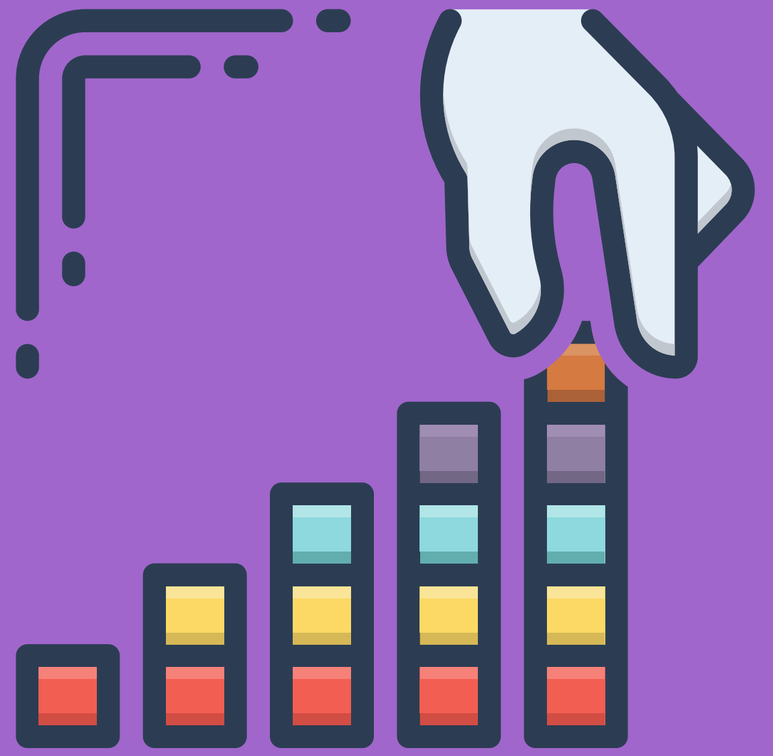


Learning Types

Differs in how each algorithm learns.



SPEECH PROCESSING - FUNDAMENTALS



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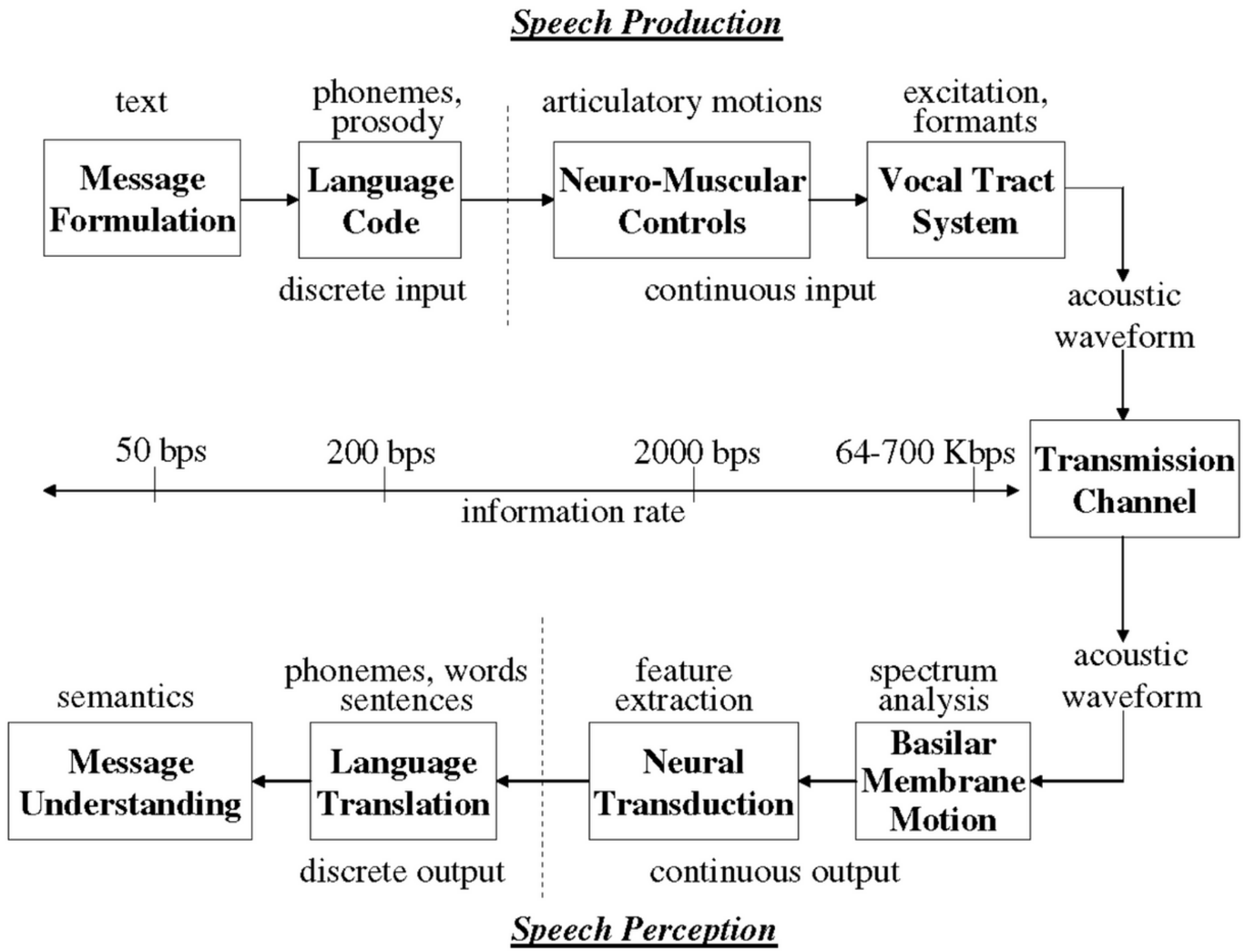
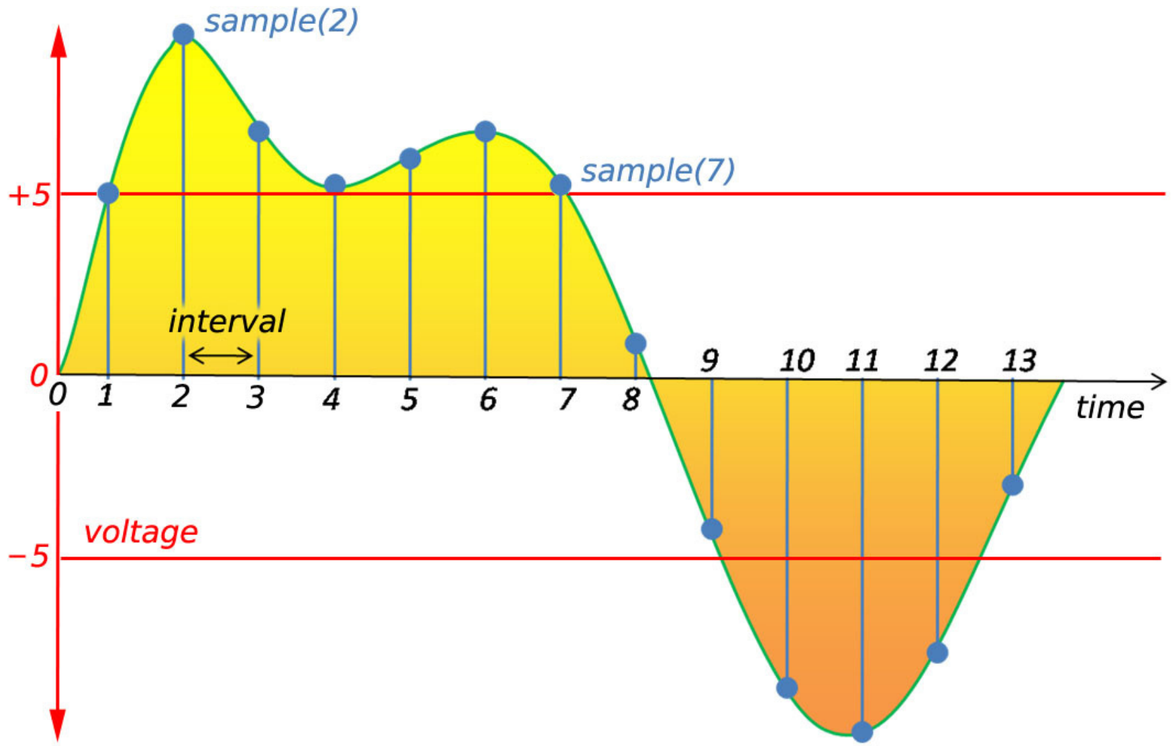
Speech Chain

Producing and perceiving speech from the formulation of a message in the brain of a talker, to the creation of the speech signal, and finally to the understanding of the message by a listener.



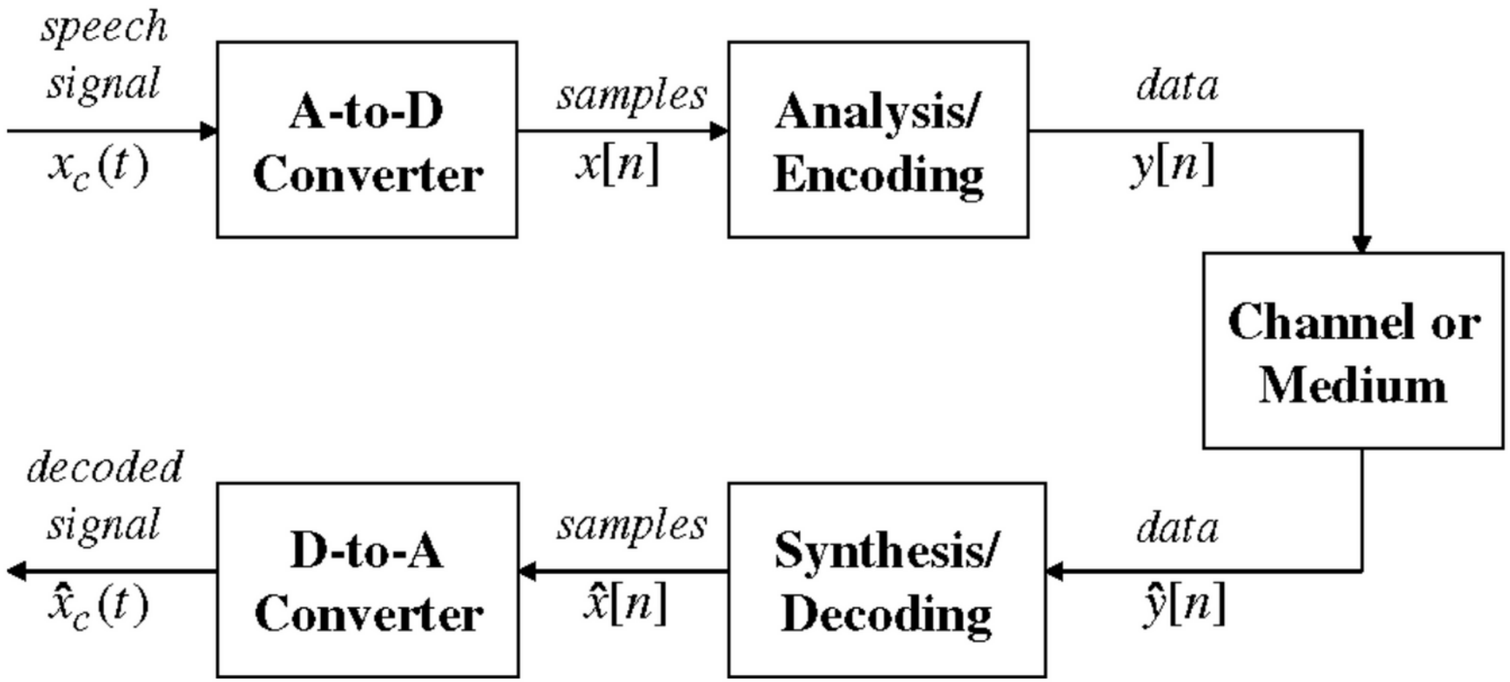
Sampling Rate

Number of samples obtained in one second.



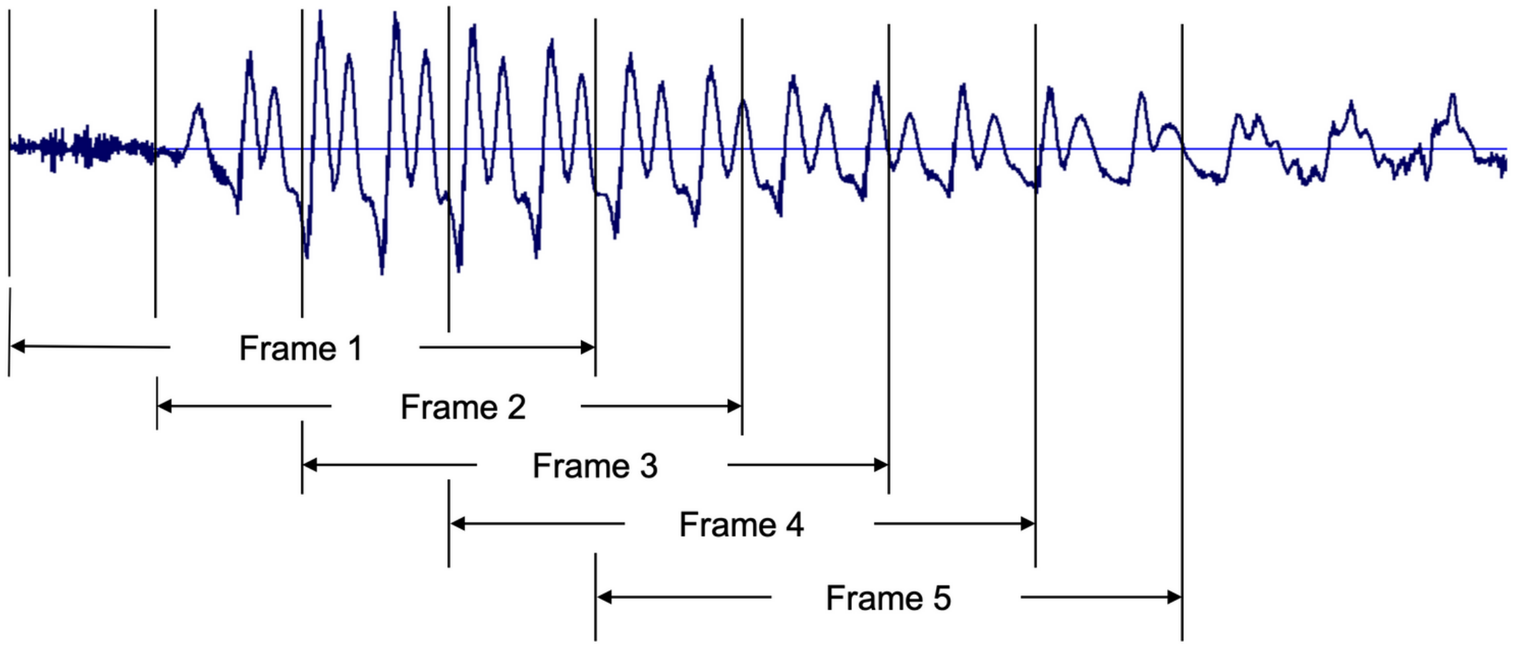
Speech Coding

Method of representing the speech signal pre and post transmission.



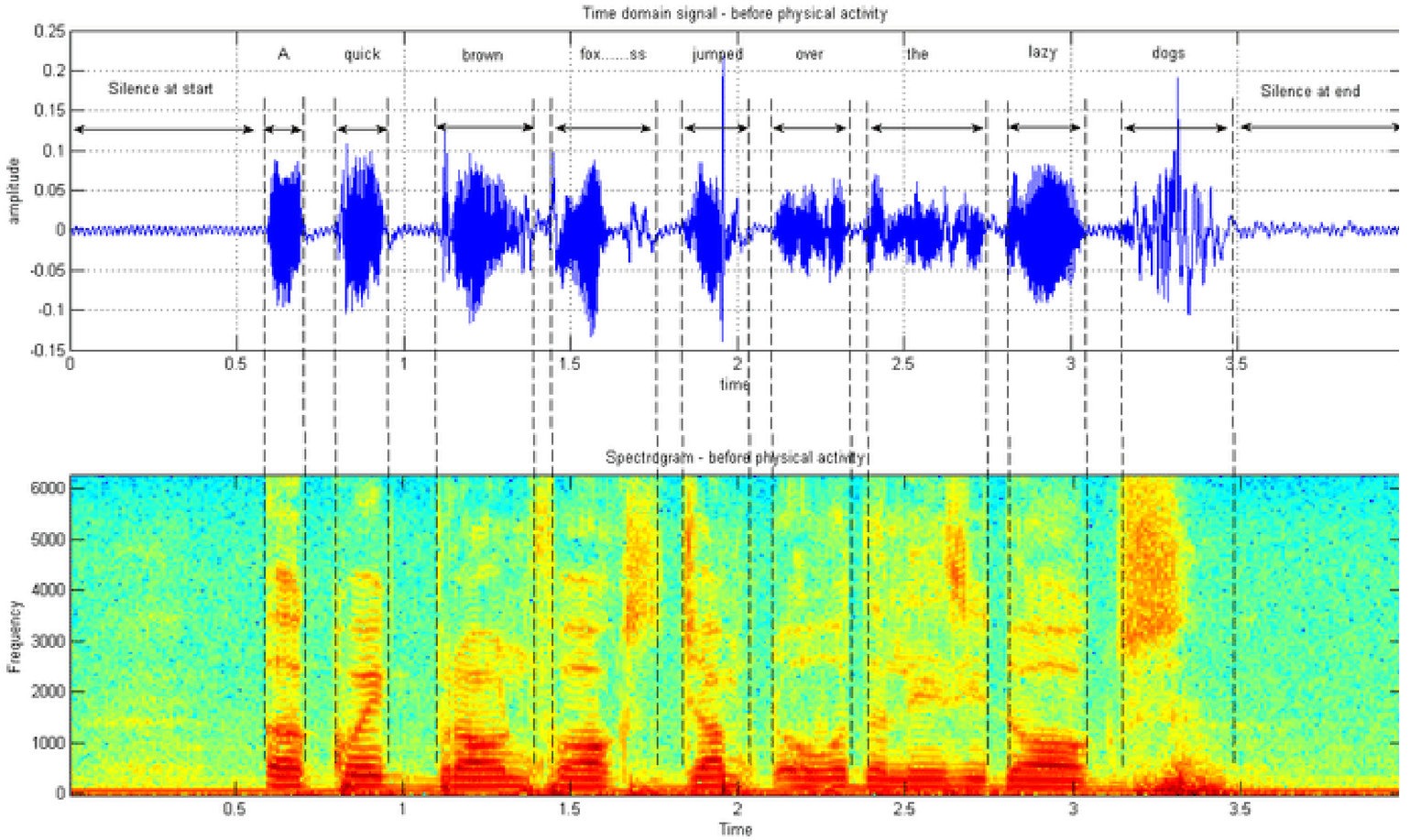
Frames

Short segments of the speech signal are “isolated” and “processed” as if they were short segments from a “sustained” sound with fixed (non-time-varying) properties.



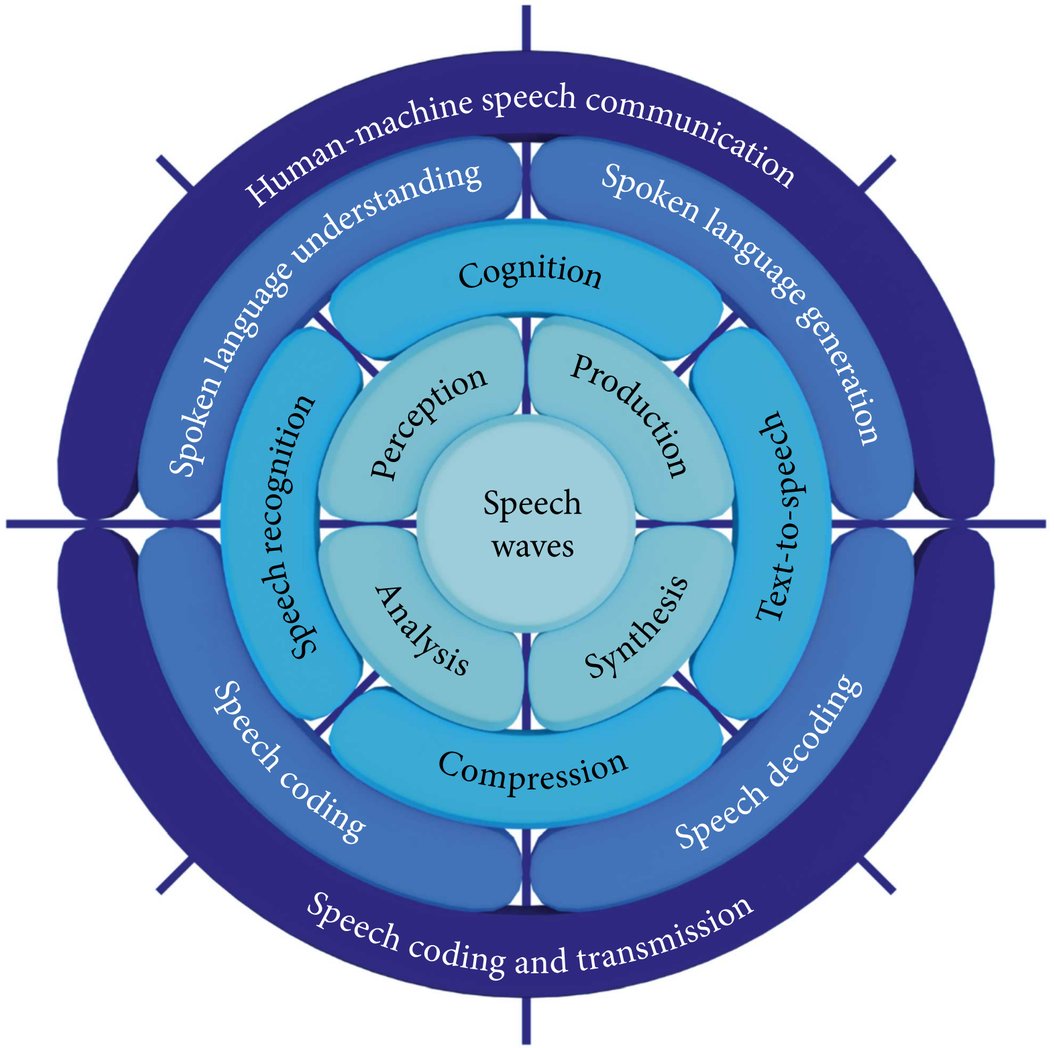
Spectral & Time Domain

Spectrum of frequencies and amplitude variations.



Speech Processing Applications

Biggest use cases are in the area of recognition and understanding of speech in support of simplifying human– machine interface.



SPEECH CONVENTIONAL VS DEEP LEARNING

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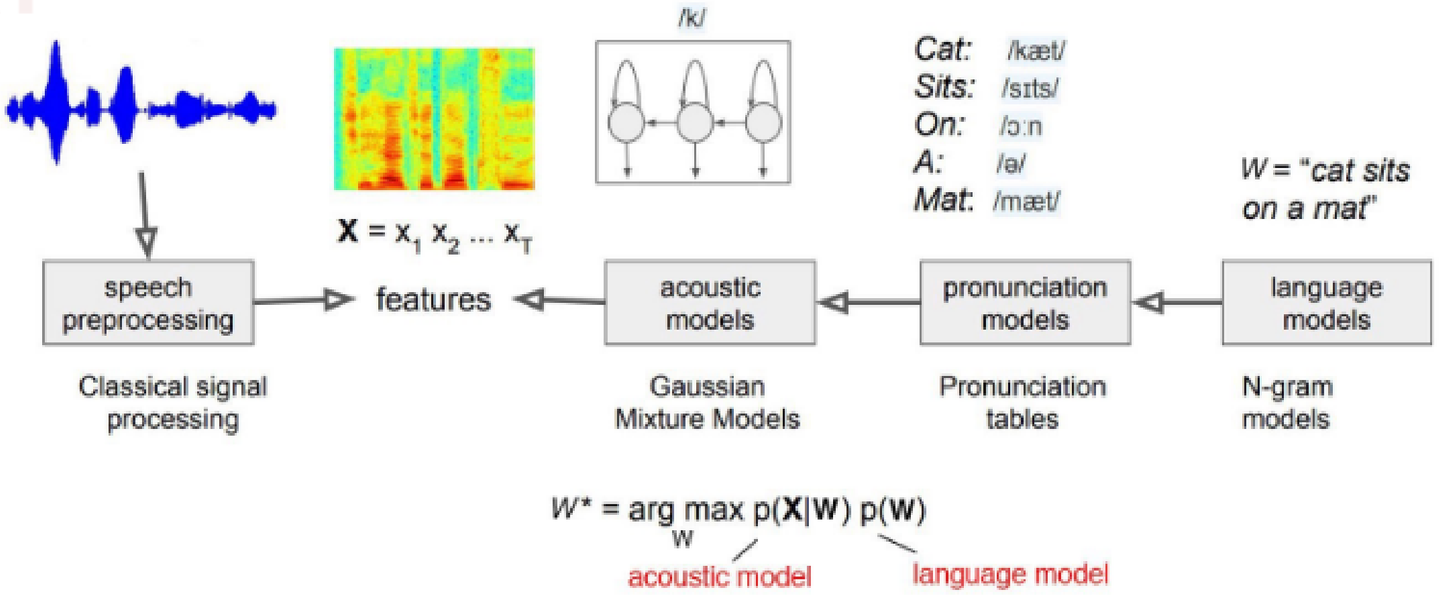
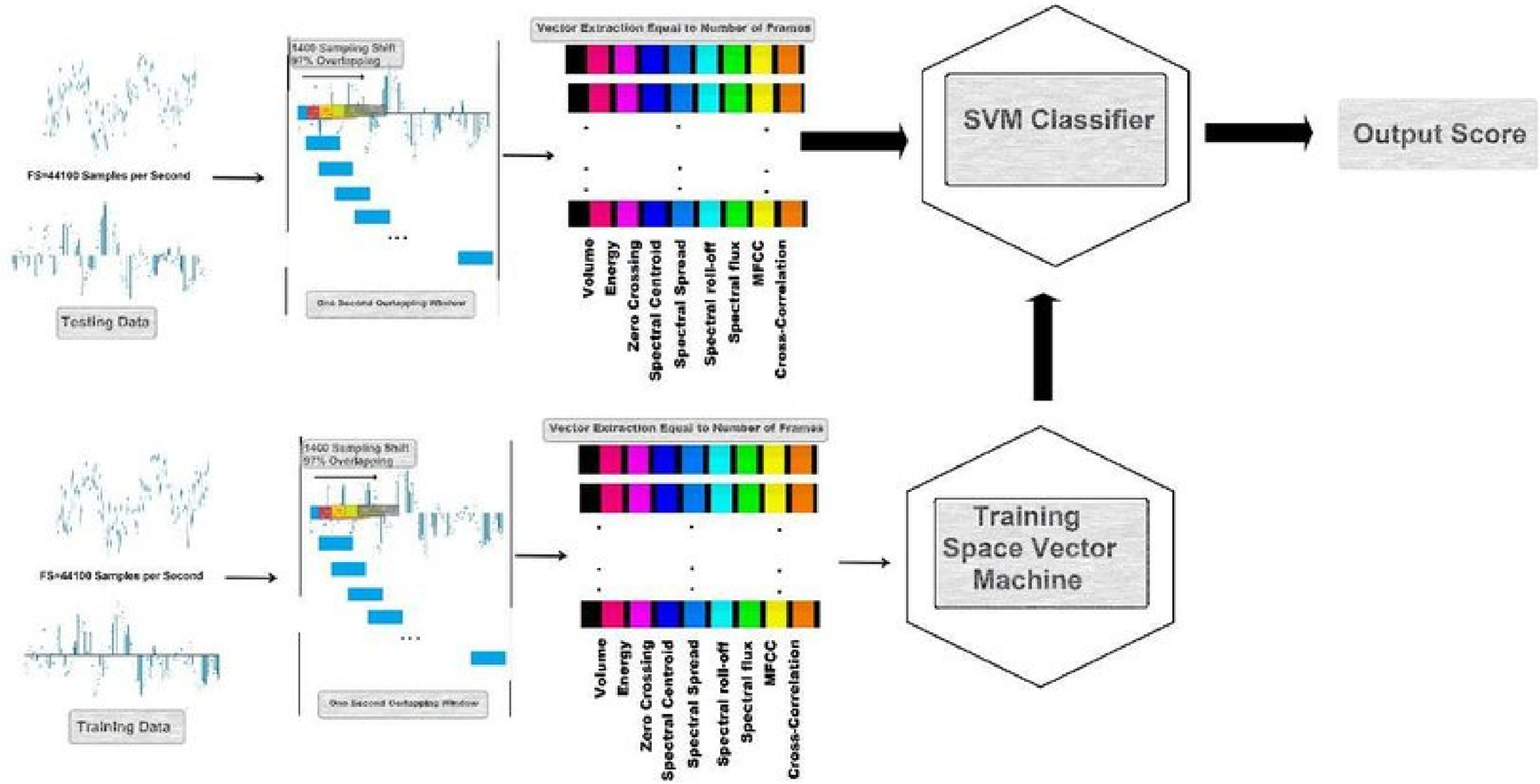
Speech to Text



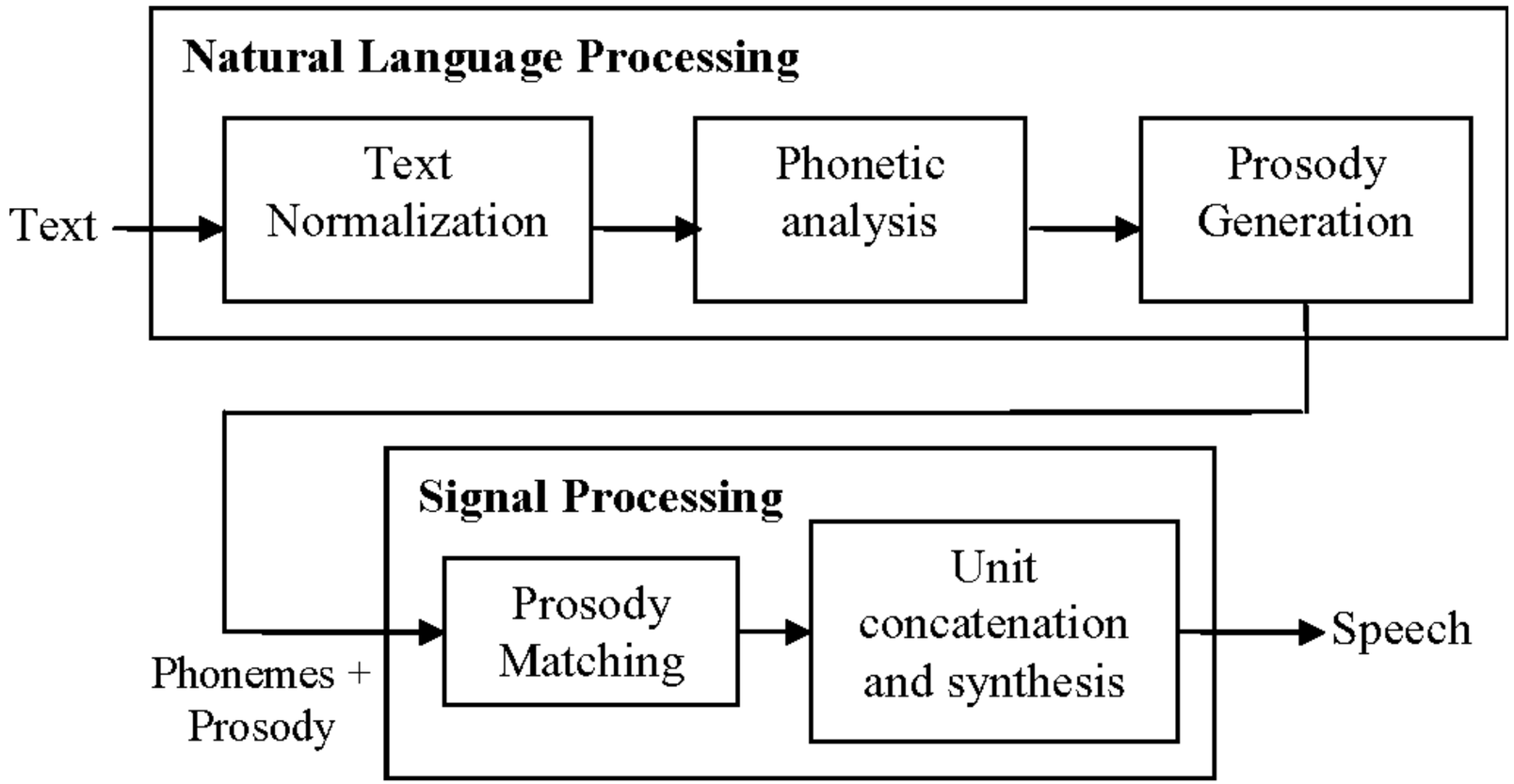
Conventional Machine Learning

Speech Classification



Conventional Machine Learning

Text to Speech



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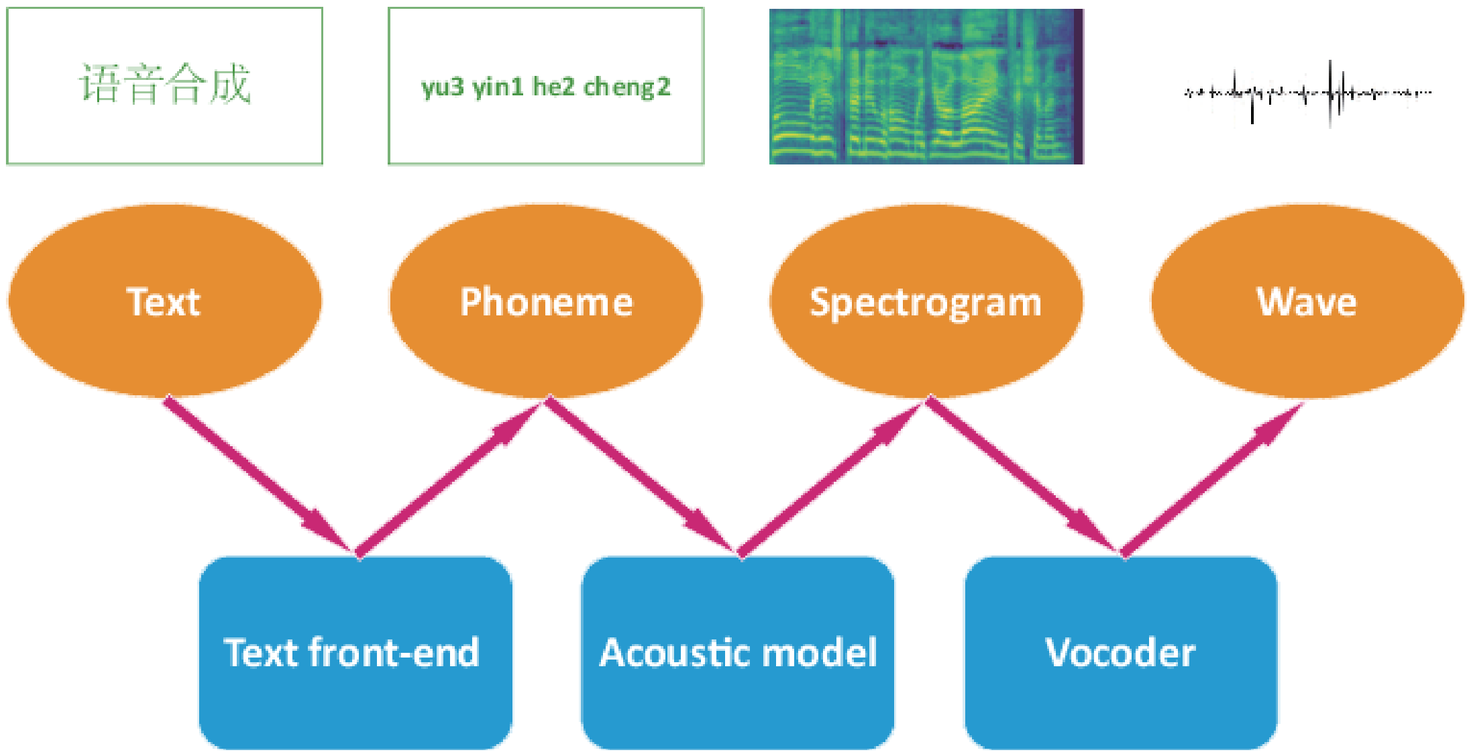
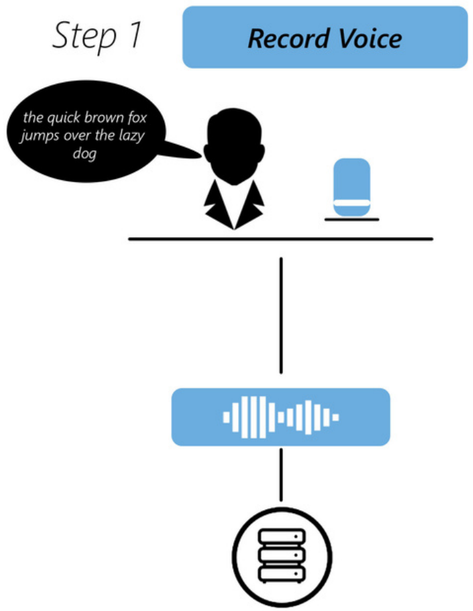
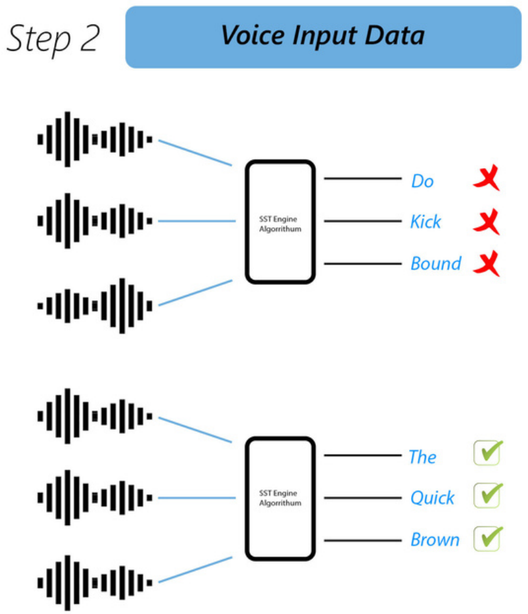
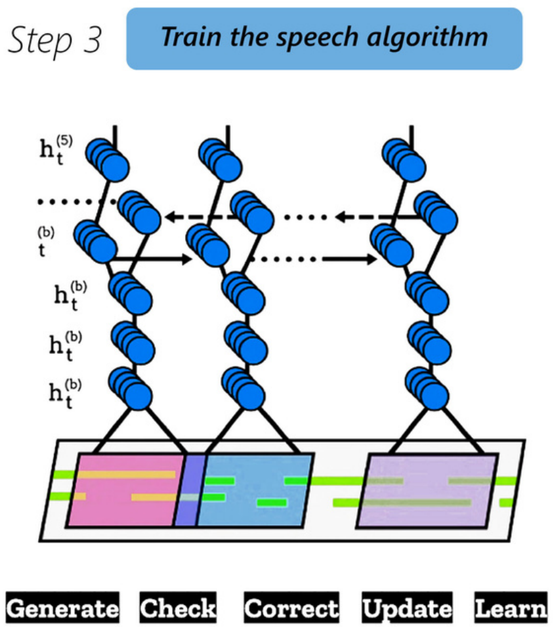


Conventional Machine Learning

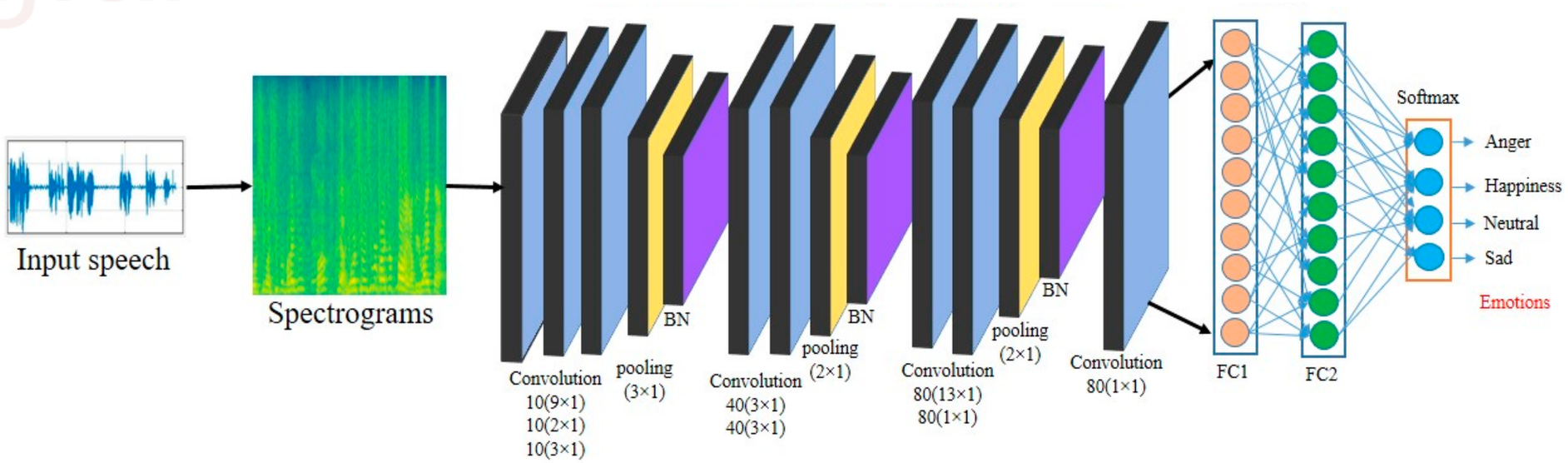
Speech to Text







Speech Classification



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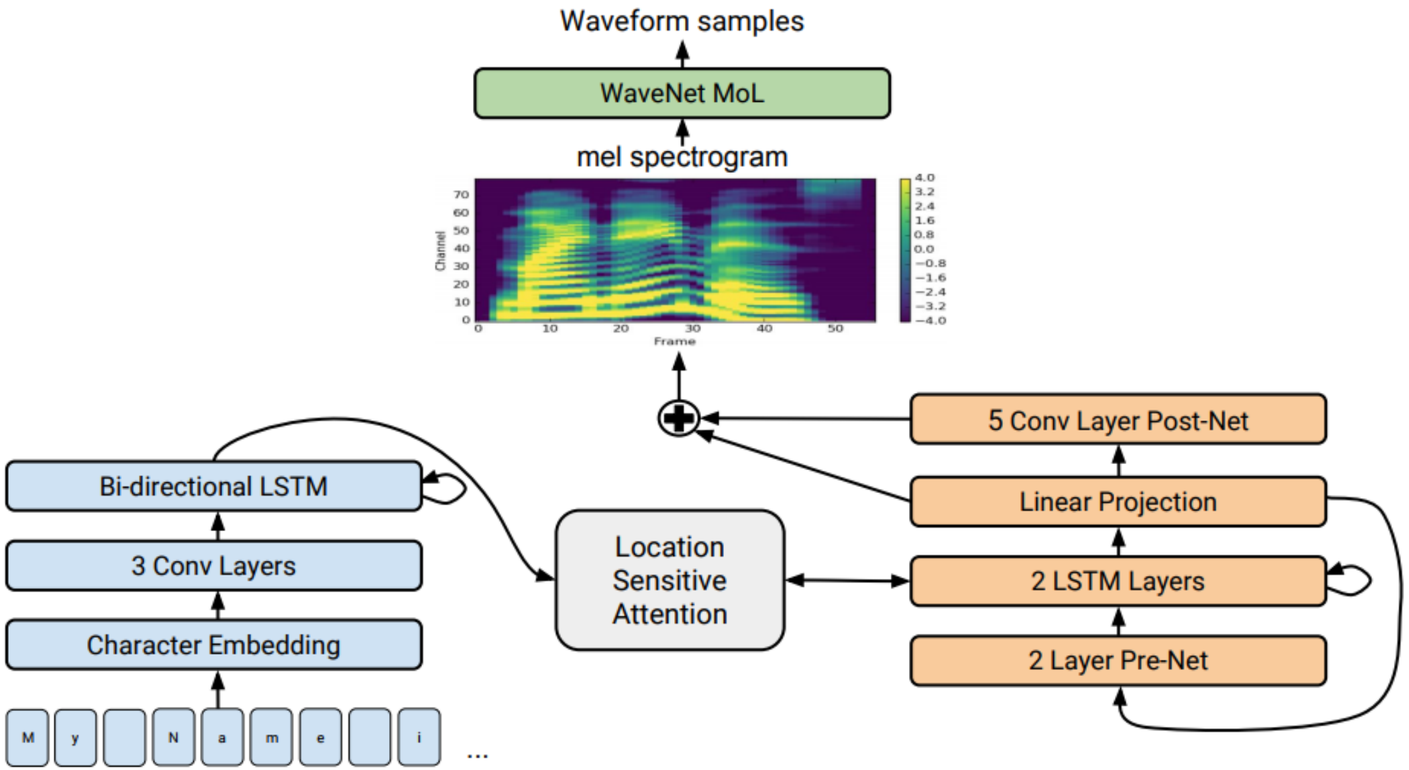

THANK YOU

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