Speech and Language Processing (3rd ed. draft) Dan Jurafsky and James H. Martin **Chapter 28 Phonetics CSE 424** Task 3 **Group 25** Md Saif Mokarrom - 20301121 AL Shahriar Him - 20301131 Tanzir Hossain - 20301154 Ismail Hossain Saihan - 20301159 ST: Abid Hossain RA: Adib Muhammad Amit 28.2.1 The Vocal Organs Air passes through the larynx, also known as the voice box or Adam's apple, and proceeds through the trachea. Within this process, both voiced and unvoiced sounds are generated, encompassing the alphabet and all English vowels. Consonants, on the other hand, can be either voiced or unvoiced, created by regulating or hindering the airflow in various manners. 28.2.2 Consonants: Place of Articulation Consonants are produced by limiting the flow of air, and they can be categorized into six classes based on prominent points of articulation such as labial, dental, alveolar, palatal, velar, and glottal. 28.2.3 Consonants: **Manners of Articulation** 28.1 Speech Sounds and Phonetics Transcription In fricatives, the airflow is partially restricted rather than completely halted. Dental fricatives allow air to pass between the teeth and around the tongue. Palato-alveolar The International Phonetic Alphabet fricatives involve positioning the tongue just (IPA), which was initially created behind the alveolar ridge and directing the in 1888 and has since evolved, is airflow through a groove formed by the the widely accepted standard for tongue. transcribing the sounds of languages worldwide. In this chapter, the ARPAbet, a simplified phonetic 28.2.4 Vowels alphabet that employs ASCII symbols to ent a subset of A Like consonants, vowels can be English sounds based on the IPA, differentiated based on the position of the will be articulators involved in their production. For utilized for representing phones. example, the highest point of the tongue is Many symbols in both the IPA and typically found near the front of the mouth ARPAbet correspond to familiar when producing a vowel. The tongue is Roman letters. positioned higher compared to other organs. In the case of a diphthong, the tongue undergoes significant changes in position while the vowel is being articulated. 28.2 Articulatory 28.2.5 Syllables **Phonetics** A syllable consists of a vowel-like sound combined with the adjacent consonants that Articulatory phonetics is the branch are closely linked to it. The central vowel of study that examines how speech within a syllable is referred to as the 28.3.1 Prosodic Prominence: Accent, sounds are produced through the **Stress and Schwa** nucleus. The starting consonants of a manipulation of airflow from the syllable are known as the onset. The lungs ptional consonant or consonants that come Prosody refers to the examination of by the mouth, throat, and nasal after the nucleus are called the coda. organs. This section delves into the intonation and rhythmic elements in language. It focuses on how variations in exploration of these processes. pitch (F0), energy, and duration are utilized to convey pragmatic, affective, or conversational meanings. Prosody plays a crucial role in highlighting the significance of specific words or phrases within speech. 28.3 Prosody This chapter offers a 28.3.2 Prosodic Structure computational perspective on Prosody refers to the examination of phonetics, which examines the speech sounds used in various ntonation and rhythmic elements in Prosodic structure is frequently explained through the concept of prosodic phrasing, language. It focuses on how languages and how they are variations in pitch (F0), energy, and produced by the human vocal which suggests that an utterance possesses duration are utilized to convey a prosodic phrase structure similar to its tract, represented acoustically, pragmatic, affective, or syntactic phrase structure. The ability to and manipulated digitally. It conversational meanings. Prosody automatically anticipate prosodic highlights the underlying assumption in speech plays a crucial role in highlighting boundaries is valuable for tasks such as recognition and text-to-speech text-to-speech (TTS). the significance of specific words or algorithms that spoken words phrases within speech. consist of smaller units of speech. 28.3.3 Tune 28.4 Acoustic Phonetics and Even if two utterances share the same 28.4.1 Waves **Signals** prominence and phrasing patterns, they can still exhibit prosodic differences due to naving distinct tunes. Additional instances of The sine and cosine functions, which depict these differences can be observed in the At the beginning of this chapter, the sine waves, form the fundamental basis of specific melodic patterns used in English to acoustic waveform and its acoustic analysis. Frequency refers to the convey contradiction or surprise. conversion into a digital format, as number of cycles per second, also known as well as frequency analysis, are Hertz, at which a wave repeats itself. In a swiftly introduced. graph, the amplitude A of a sine wave represents its highest value on the Y-axis. 28.4.2 Speech Sound Waves 28.5 Phonetic Resources To visually represent sound waves, we can use a time-series graph illustrating changes in air pressure. Quantization is the process of The CMU Pronouncing Dictionary, representing real-valued numbers as which is an open-source resource, integers, with the difference between two provides pronunciations for different ntegers serving as the minimum granularity. word forms. Additionally, for Values closer than this quantum size are research purposes, the UNISYN represented identically. dictionary offers detailed information such as syllabifications, stress patterns, and pronunciations for various English dialects. 28.4.3 Frequency and Amplitude; Pitch Loudness Sound waves are characterized by frequency, amplitude, and additional factors for pure sine waves. In speech sound waves, regular peaks correspond to the opening of vocal folds during vibration. 28.4.4 Interpretation of Phones from a Waveform By examining waveforms visually, we can gather significant information. Vowels, which possess voices and often have duration and volume, are identified by periodic peaks in the amplitude, indicating the opening of vocal folds. 28.4.5 Spectra and the Frequency **Domain** The spectrum of a signal reveals its frequency components and their amplitudes It serves as a tool for exploring the onstituent frequencies of a sound wave at a specific moment, offering an alternative representation of the original waveform. 28.4.6 The Source-Filter Mode The source filter model explains the acoustics of a sound by simulating how the vocal tract shapes the pulses produced by the glottis. When a wave with the same fundamental frequency passes through different places in the vocal tract, distinct harmonics are amplified.

Concept Map