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# ***Pronunciation Tuning for Voice Search***

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# What is Pronunciation Tuning?

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- Speech Recognizers need to know how to pronounce words to recognize them.
- Pronunciation tuning is *“the process of creating pronunciations for new words or removing unused pronunciations to improve speech recognition accuracy.”*



# Why Is Pronunciation Tuning Important to Voice-Search?

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- The more obscure a word is
  - The more useful it becomes as a key word for searching
  - The more likely it is that a custom pronunciation is required for it
- Examples
  - Surnames and place names in directory applications.



# English Pronunciation Is Difficult

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- Spelling of words based upon linguistic origin rather than a simple set of rules
  - thought, enough, through, though, cough, bough, byte, bite, bight, gnaw, know.
- Foreign words spelt like foreign words.
- Pronunciation depends upon the context of the word
  - Read Vs Read, Sewer Vs Sewer
- Accents, Abbreviations, Regional differences



# Generating Pronunciations for Unknown Words

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- Commercial recognisers shipped with letter to sound rule pronunciation systems for unknown words.
- Best systems 75% accurate (for a single utterance)
- Speech Recognition Systems can have multiple pronunciations
  - Solution : Generate more pronunciations than are used
  - For small vocabularies works well but for large vocabularies can lead to confusion between phrases



# Speaker Enrolment

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- Many speech recognition systems ship with user enrolment capability.
- Speaker can add a word to a dynamic grammar by speaking.
  - The user speaks the phrase several times
  - phoneme string stored in database.
- Best suited to small vocab systems as per phoneme accuracy low for unconstrained phoneme sequences (enrolment).



# An Alternative Method (Hybrid Rule/Enrolment Method)

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- Collect Speech Samples of the new words
  - More than one utterance per new word.
- Generate a set of alternative pronunciations using letter to sound rules
- Use the speech recogniser to select the best matching one
- Remove pronunciations that cause errors (where possible)



# Benefits of Hybrid System

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- Faster, Less effort than manual process.
- Don't need skilled labour to generate speech samples
  - need native speakers.
- Measures speech recognition accuracy as you develop.
- Pronunciation can be tuned using live samples from platform.



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# Research into Hybrid Systems at Inference Communications

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- Inference has been experimenting with Hybrid Pronunciation Systems
- Vendor Independent
- Using VXML standards
  - **Pronunciation Lexicon Specification (PLS)**
  - **Speech Assessment Methods Phonetic Alphabet (SAMPA)**
  - **Speech Recognition Grammar Specification (SRGS)**



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# Automated Pronunciation Pruning System

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- Analyses confusion matrices to prune out pronunciations that cause recognition errors.
- Used on commercially deployed applications
- Performance is comparable to manual tuning of pronunciation lexicons.



# Summary

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- Inference Communications have been developing automated pronunciation tuning tools.
  - Faster & cheaper than manual process.
  - Measures speech recognition accuracy as you develop.
  - Pronunciation can be tuned using live samples from platform.
- Inference has developed an automated pronunciation pruning tool which is in commercial use.



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