



# LingoPros

AuToBI Toolchain and Web Hosted Analyzer

Josh Shaffer, Matthew Quintana, Erik Strauss &  
Luis Montes

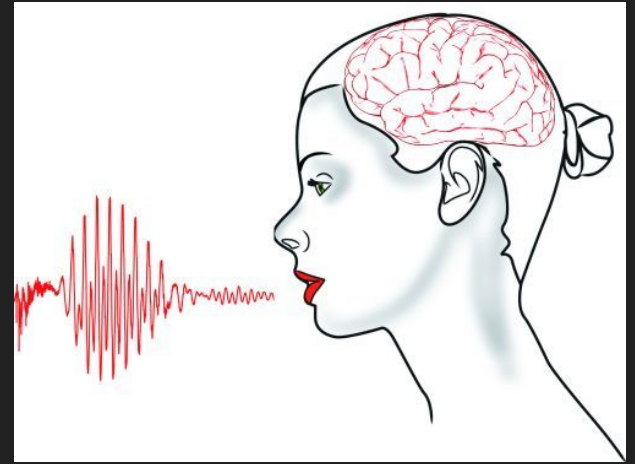
Mentor: Ana Paula Chaves Steinmacher

# Speech Analysis

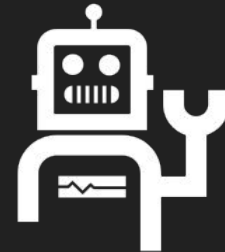
What is speech analysis?

- Measuring prosodic features
- Language Proficiency

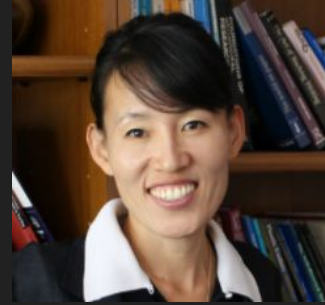
Prevalence of Automatic Speech Recognition



<https://www.fel.cvut.cz/en/vv/tymy/sami/11.jpg>

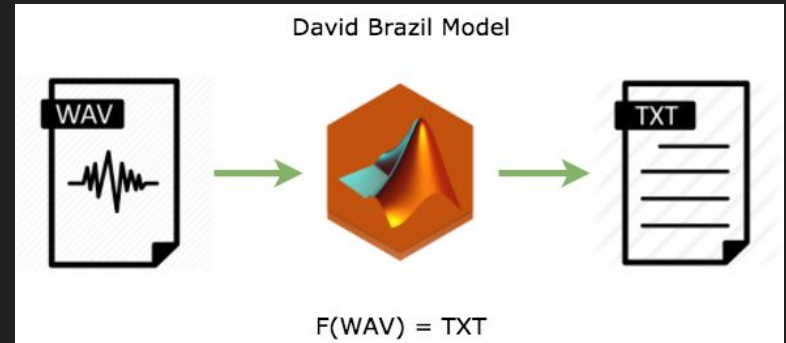


# Dr. Okim Kang and Dr. David O. Johnson



## Applied Linguistics Speech Lab

- Native vs Non-native English speakers
- Difficulty annotating audio samples
- Developed their own speech analyzer:  
The David Brazil Model



# The Brazil program

- Slow and inconvenient to use.
- Client wants the program to be accessible online

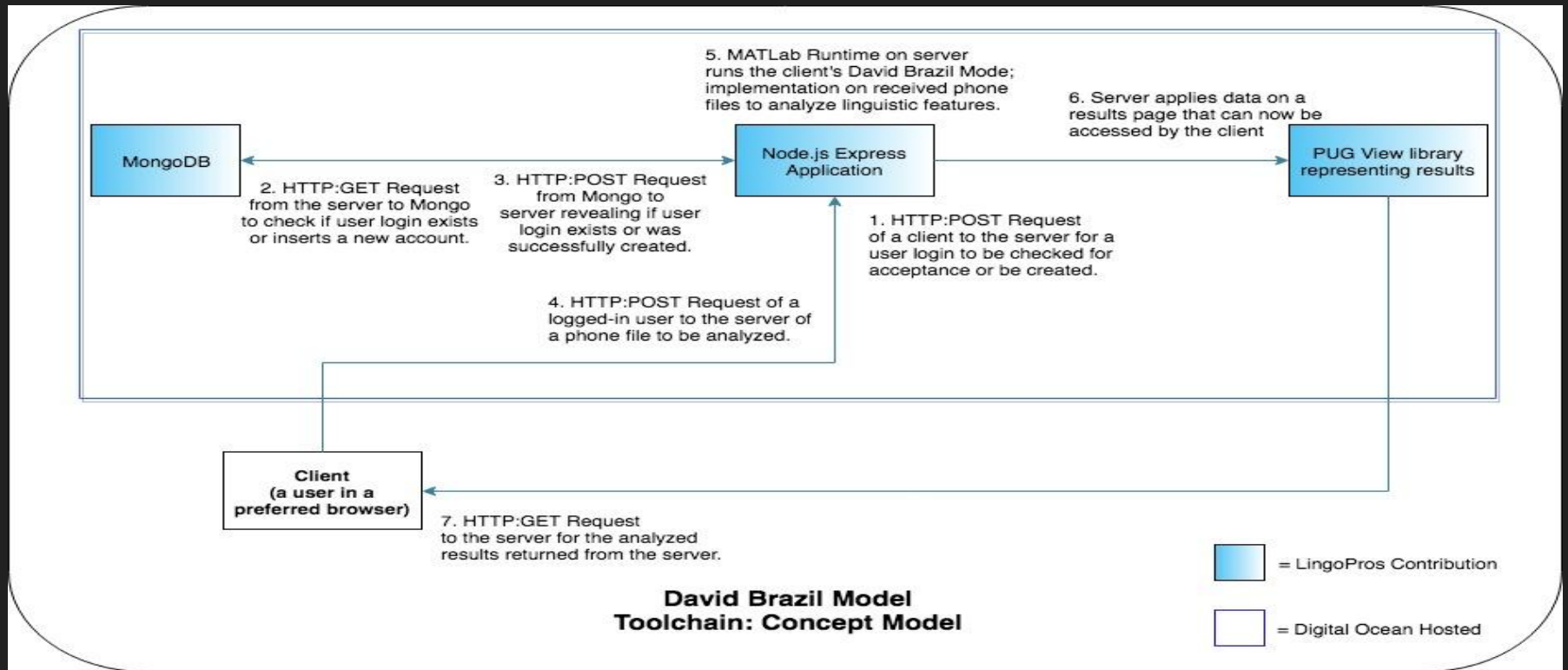


# AuToBI Problem

Standard framework using Tones and Break Indices (ToBI) model

- Brazil vs ToBI Model
  - Experimental vs Standard
- Issues:
  - Brazil criticized for not being the standard in speech analysis
  - No current proficiency analyzer to compare with

# David Brazil Model Solution



# AuToBI Solution

## AutoToBI Toolchain



 = LingoPros Contribution

# David Brazil Requirements

- Upload phone file
- Web Server
  - User Login
  - Admin page for verifying users
  - Results are displayed from the server-side application.
- Program hosted on server for designated users
  - Locally at a minimum

# AuToBI Requirements

- Run AuToBI analysis with multiple files
- Feature selection
- Machine Learning on features
- Calculate proficiency score



# David Brazil Website Implementation

<b>userLoginHandler</b>
accessCode: int
email: String
username: String
firstName: String
lastName: String
loginAttempt(String, String): void
checkValidUser(String, String): void
attemptToCreateUser(int, String, String, String, String, String): void

<b>serverOperations</b>
inputPhoneFile: File
start.m: File
outputFromDBM: File
resultsPugPage: File
storeFile(File): void
generateMATLabStartFile(File): File
runDBMAnalysis(File): File
generateResultsPage(): void
stylizeAnalyzedData(File): File
cleanServerAnalysis(): void

# AuToBI Toolchain Implementation

## **autobiRunner**

audioFilePath: String  
model: String  
outputFilePath: String  
analyzerType: String

setInputAudioFile(FilePath):void  
setAnalyzer(String): void  
setOutputFile(File): void  
setModel(String):void  
runAuToBIAnalysis(FilePath)

## **wekaRunner**

useLowLevel(Instances): int[]  
buildMeanArray(File, int[]): double[]  
frequencyCount(File[]): int[]): int[]

## **NeuralNet**

number\_nodes: int  
input\_layer: double[]  
w\_mean\_array: double[][]  
initializeNet(): void  
nonlin(double): double  
processInput(double[], int)  
testInput(double[], int)

# Challenges and Resolutions

## To Us:

- Failure to complete full David Brazil Analysis locally.
- Failure to create MATLAB runtime environment on the DigitalOcean Box
- Feature selection
- AuToBI file generation - attribute error and data mismatch

## To Client:

- Digital Ocean hosting fee.

# SEMESTER SCHEDULE:



# Conclusion

- Website
  - David Brazil Model- Dr. Okim's Program.
    - Slow, inconvenient, inaccessible
  - Audio files are analyzed online
- AuToBI Machine Learning Program
  - Use AuToBI output to pass to a Java API for feature selection
  - Pass to a neural network to calculate proficiency score



# Thank You

Joshua Shaffer - [jls865@nau.edu](mailto:jls865@nau.edu),  
Luis Montes, Matt Quintana, and  
Erik Strauss