# Evaluation of Existing Text-to-Speech Systems for the Tamil Language

**Ahrane Mahaganapathy and Kengatharaiyer Sarveswaran**
**Department of Computer Science, University of Jaffna**
ahrane@univ.jfn.ac.lk

Deutscher Akademischer Austauschdienst
German Academic Exchange Service

## 1. Introduction

**Text-to-speech (TTS)** systems transform text to spoken language.

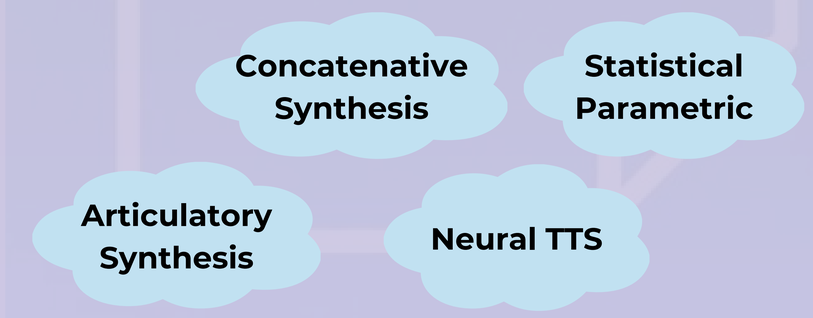
Text-to-speech conversion is not only modelling correct pronunciation as speech conveys elements such as expressiveness ( stress, intonation) and emotions.

There are more than 20 existing open-source ( e.g. Bhashini) and commercial ( e.g. ElevenLabs) Tamil TTS systems.

**Research Question:** How well do existing TTS systems synthesize expressiveness in Tamil speech?

## 2. Literature Review

### Speech Synthesis Techniques




### Evaluation Metrics

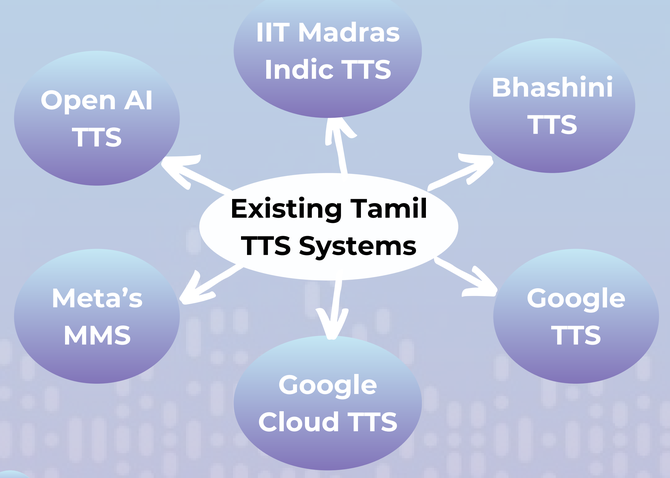
**Mean Opinion Score (MOS):** A subjective score where listeners rate the quality of speech on a scale from 1 to 5.

**Comparative Mean Opinion Score (CMOS):** A subjective score that allows listeners to compare two speech samples and rate them on a scale from -3 to +3.

**Word Error Rate (WER)**: (Yet to be done)
An objective score that measures the accuracy of synthesized speech by comparing it to a reference transcript.

## 3. Methodology for Evaluation

### Tamil TTS Systems evaluated



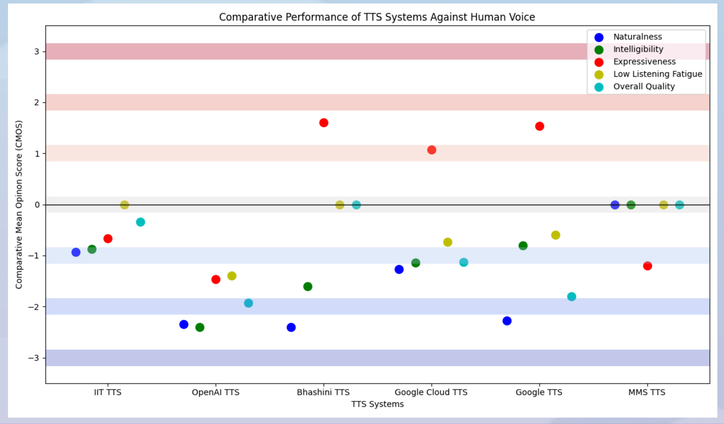

**Step 1** **Speech Data Collection**

- The human speeches were taken from published sources, including the book *Oru Yogiyin Suyasarithai* and audio narrations from *Ezhuna* Media. These speech data cover various domains, include loanwords, and show various expressions.
- TTS speeches were synthesized using the compiled corpus.

**Step 2** **Evaluation Methodology**

- The study involved 16 participants.
- Information such as basic demographic details, auditory-related issues and experience with TTS technologies was collected.
- The speech clips (both human and synthesized) were compared and evaluated two at a time by the participants.
- The speech clips were rated based on dimensions: naturalness, intelligibility, expressiveness, listening fatigue, and overall quality.
- A rating scale from -3 to +3 was used to express preference.
- The Comparative Mean Opinion Score (CMOS) was calculated by averaging the ratings for each pair across these dimensions.

## 4. Results




## 5. Challenges

- Collection of speech data across different domains, having loan words and conveying different expressions.
- Challenging for participants to understand and evaluate aspects such as stress intonation
- Objective method to evaluate expressiveness in speech.
- The results depends on the quallity of human speech evaluated.

## Selected References

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