

Major Project Presentation

# Multilingual Aspects of Job Recommendation Portal

By

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# Table of Content

- Introduction to recommendation & translation system
- Text Translation & Existing Models
- AI4Bharat IndicTrans & Samanantar
- Text to Speech using IndicTTS
- Modification of translation and Text to-Speech API
- The Application Demonstration and GUI
- Conclusion
- Future Scope

# Introduction

Multilingual Job Recommendation Portal for physically disabled youth

- Translation of the job description into multiple Indian languages.
- Conversion of the text into speech in the Indian languages.

# Text translation

- Neural Machine Translation (NMT) [1]  
This approach involves analyzing patterns in large volumes of text in both the source and target languages, which allows the system to identify and learn the relationships between words and phrases.
- NMT models are consisting of an encoder and a decoder which encode the input text and generate the translation in the target languages respectively

Ref: Google's neural machine translation system: Bridging the gap between human and machine translation[1]

# Some available models / services

- Google Translate
- DeepL
- Microsoft Translator
- Amazon Translate
- ChatGPT

Not accurate in Indian languages.

# AI4Bharat - IndicTrans

- IndicTrans is a Transformer-4x ( 434M) NMT model trained on a very big dataset and opensource
- The dataset used in order to train the dataset is released as the “Samanantar”[2] dataset by the organization.
- The results demonstrate that the model outperforms all publicly available open 8 source models, while also surpassing commercial systems like Google and Bing Translate on most datasets.
- “indic-English” and “en-indic” released models which support 11 Indian languages.

Ref: Samanantar: The largest publicly available parallel corpora collection for 11 indic languages[2]

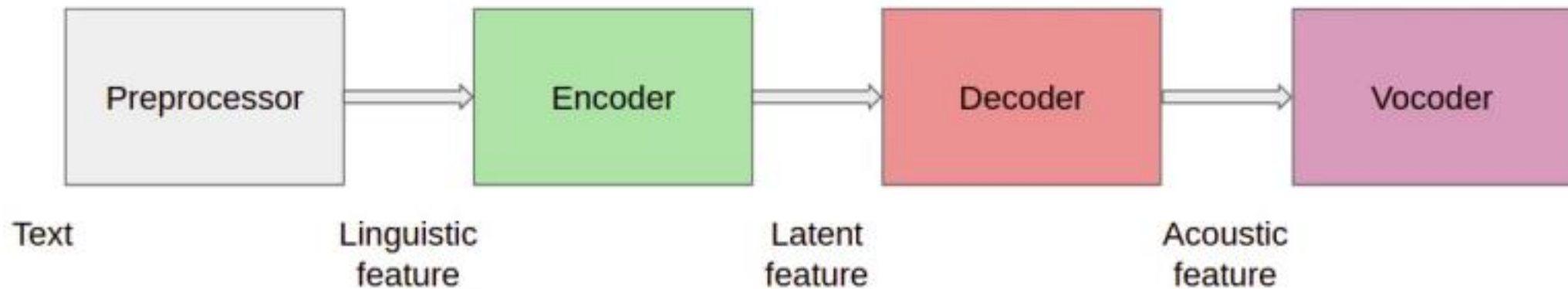
# Samanantar Dataset

- The dataset contains a total of 49.7 million sentence pairs between English and 11 Indic languages (from two language families).
- It contains parallel language sentences ranging from 141K pairs between English-Assamese to 10.1M pairs between English-Hindi. About 37.4M pairs are mined by different mining methods explained in the paper, with only 12.4 M existing resources, giving the new dataset which is about 3 times of the existing one

Language
Assamese (as)
Hindi (hi)
Marathi (mr)
Tamil (ta)
Bengali (bn)
Kannada (kn)
Odia (or)
Telugu (te)
Gujarati (gu)
Malayalam (ml)
Punjabi (pa)

# Text to Speech (TTS)

A standard TTS model works in 4 blocks, which are Preprocessor, Encoder, Decoder, and Vocoder





# Some recent TTS Model

## **Acoustic Model**

- FastPitch[3]
- GlowTTS[4]
- VITs[5]

## **Vocoders**

- HiFi GAN V1[6]
- Multi-Band MelGAN[7]
- Wavegrad[8]

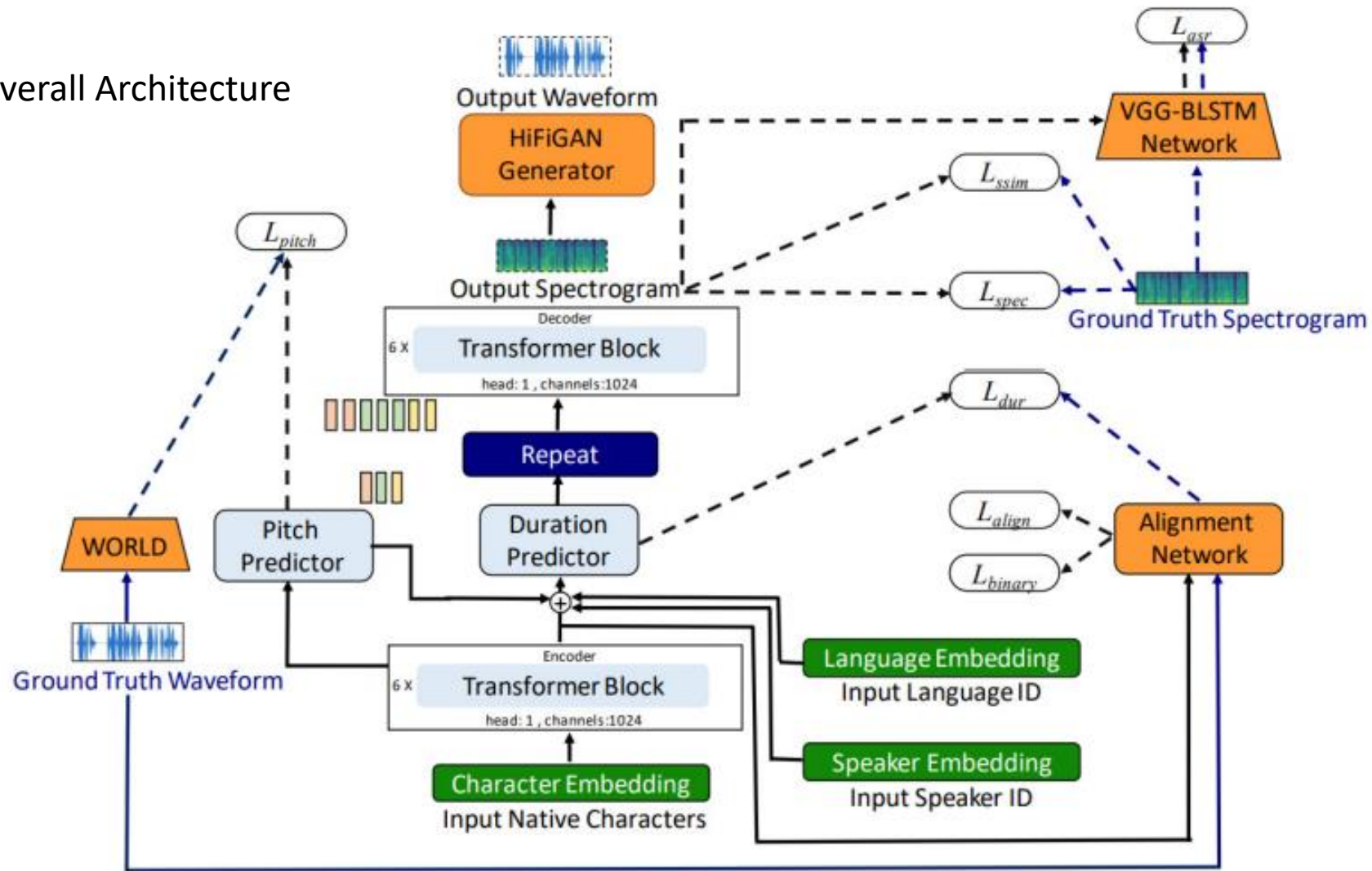
# Indic TTS

The model is introduced in the paper titled “Towards Building Text-To-Speech Systems for the Next Billion Users” [9]

The paper evaluates different choices of acoustic models, vocoders, supplementary loss functions, training schedules, and speaker and language diversity for Dravidian and Indo-Aryan languages. As the result, the paper shared that monolingual models with FastPitch and HiFi-GAN V1, trained jointly on male and female speakers to perform the best.

Language
Assamese (as)
Bodo (brx)
Gujarati (gu)
Hindi (hi)
Kannada (kn)
Malayalam (ml)
Manipuri (mni)
Marathi (mr)
Punjabi (pa)
Oriya (or)
Bangla (bn)
Tamil (ta)
Telugu (te)

## IndicTTS Overall Architecture




# The Translation API

Translation System / Translation / supported\_languages

GET `{{SpeechURL}}/translation/supported_languages`

Params Authorization Headers (7) Body Pre-request Script Tests Settings

Body Cookies Headers (4) Test Results

Pretty Raw Preview Visualize JSON 

```
1 {  
2   "success": true,  
3   "message": "Supported languages",  
4   "data": [  
5     "as",  
6     "hi",  
7     "mr",  
8     "ta",  
9     "bn",  
10    "kn",  
11    "or",  
12    "te",  
13    "gu",  
14    "ml",  
15    "pa"  
16  ]  
17 }
```

POST



{{SpeechURL}}/translation/single

Params

Authorization

Headers (9)

Body ●

Pre-request Script

Tests

Settings

● none

● form-data

● x-www-form-urlencoded

● raw

● binary

● GraphQL

JSON ▼

```
1 {
2   ... "data": "Welcome to text translation system developed by Indian Institute of Technology Hyderabad & Indian Institute of
      Information Technology Raichur.",
3   ... "currlan": "en",
4   ... "targetlan": "hi"
5 }
```

Body

Cookies

Headers (4)

Test Results



Status: 200 OK

Time: 2.62 s

Size: 564 B



Save

Pretty

Raw

Preview

Visualize

JSON ▼



```
1 {
2   "success": true,
3   "message": "Target Translation from en to hi",
4   "data": {
5     "भारतीय प्रौद्योगिकी संस्थान, हैदराबाद और भारतीय सूचना प्रौद्योगिकी संस्थान, रायचूर द्वारा विकसित पाठ अनुवाद प्रणाली में आपका
      स्वागत है।"
6   }
7 }
```

POST



{{SpeechURL}}/translation

Send



Params Authorization Headers (9) **Body** Pre-request Script Tests Settings Cookies

● none ● form-data ● x-www-form-urlencoded ● **raw** ● binary ● GraphQL **JSON** ▼ Beautify

```
1 {
2   ... "data": "Welcome to text translation system developed by Indian Institute of Technology Hyderabad & Indian Institute of
      Information Technology Raichur."
3 }
```

**Body** Cookies Headers (4) Test Results

🌐 Status: 200 OK Time: 37.17 s Size: 4.77 KB 📁 Save as Example ...

Pretty

Raw

Preview

Visualize

JSON ▼



```
1 {
2   "success": true,
3   "message": "All Translation from en to ['as', 'hi', 'mr', 'ta', 'bn', 'kn', 'or', 'te', 'gu', 'ml', 'pa']",
4   "data": {
5     "as": "হায়দরাবাদৰ ইণ্ডিয়ান ইনষ্টিটিউট অৱ টেকন'লজী আৰু ৰাইচুৰ ইণ্ডিয়ান ইনষ্টিটিউট অৱ ইনফৰমেশন টেকন'লজীৰ দ্বাৰা বিকশিত টেক্সট
      অনুবাদ পদ্ধতিৰে স্বাগতম।",
6     "hi": "भारतीय प्रौद्योगिकी संस्थान, हैदराबाद और भारतीय सूचना प्रौद्योगिकी संस्थान, रायचूर द्वारा विकसित पाठ अनुवाद प्रणाली में
      आपका स्वागत है।",
7     "mr": "भारतीय तंत्रज्ञान संस्था हैदराबाद आणि भारतीय माहिती तंत्रज्ञान संस्था रायचूर यांनी विकसित केलेल्या मजकूर अनुवाद प्रणालीत
      आपले स्वागत आहे.",
8     "ta": "ஹைதராபாத் இந்திய தொழில்நுட்ப நிறுவனம் மற்றும் ராய்ச்சூர் இந்திய தகவல் தொழில்நுட்ப நிறுவனம் உருவாக்கிய உரை மொழி
      ..."
```

Body Cookies Headers (4) Test Results

Status: 200 OK Time: 37.17 s Size: 4.77 KB Save as Example

Pretty Raw Preview Visualize

JSON



```
1 {
2   "success": true,
3   "message": "All Translation from en to ['as', 'hi', 'mr', 'ta', 'bn', 'kn', 'or', 'te', 'gu', 'ml', 'pa']",
4   "data": {
5     "as": "হায়দরাবাদৰ ইণ্ডিয়ান ইনষ্টিটিউট অৱ টেকন'লজী আৰু ৰাইচুৰ ইণ্ডিয়ান ইনষ্টিটিউট অৱ ইনফৰমেশন টেকন'লজীৰ দ্বাৰা বিকশিত টেক্সট অনুবাদ পদ্ধতিলৈ স্বাগতম।",
6     "hi": "भारतीय प्रौद्योगिकी संस्थान, हैदराबाद और भारतीय सूचना प्रौद्योगिकी संस्थान, रायचूर द्वारा विकसित पाठ अनुवाद प्रणाली में आपका स्वागत है।",
7     "mr": "भारतीय तंत्रज्ञान संस्था हैदराबाद आणि भारतीय माहिती तंत्रज्ञान संस्था रायचूर यांनी विकसित केलेल्या मजकूर अनुवाद प्रणालीत आपले स्वागत आहे.",
8     "ta": "ஹைதராபாத் இந்திய தொழில்நுட்ப நிறுவனம் மற்றும் ராய்ச்சூர் இந்திய தகவல் தொழில்நுட்ப நிறுவனம் உருவாக்கிய உரை மொழிபெயர்ப்பு அமைப்புக்கு வரவேற்கி",
9     "bn": "হায়দরাবাদের ইন্ডিয়ান ইন্সটিটিউট অফ টেকনোলজি এবং রাইচুরের ইন্ডিয়ান ইন্সটিটিউট অফ ইনফরমেশন টেকনোলজির উদ্ভাবিত পাঠ্য অনুবাদ ব্যবস্থায় স্বাগতম।",
10    "kn": "ಹೈದರಾಬಾದ್ ನ ಇಂಡಿಯನ್ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಟೆಕ್ನಾಲಜಿ ಮತ್ತು ರಾಯಚೂರು ನ ಇಂಡಿಯನ್ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇನ್ಫರ್ಮೇಷನ್ ಟೆಕ್ನಾಲಜಿ ಅಭಿವೃದ್ಧಿಪಡಿಸಿದ ಪಠ್ಯ ಅನುವಾದ ವ್ಯವಸ್ಥೆಗೆ",
11    "or": "ଭାରତୀୟ ପ୍ରଯୁକ୍ତିବିଦ୍ୟା ଓ ସୂଚନା ପ୍ରଯୁକ୍ତିବିଦ୍ୟା ସଂସ୍ଥା, ହାଇଦ୍ରାବାଦ ଏବଂ ଭାରତୀୟ ସୂଚନା ପ୍ରଯୁକ୍ତିବିଦ୍ୟା ସଂସ୍ଥା, ରାୟଚୁର ଦ୍ଵାରା ବିକଶିତ ପାଠ୍ୟ ଅନୁବାଦ ପ୍ରଣାଳୀକୁ ସ୍ଵାଗତମ୍।",
12    "te": "ఇండియన్ ఇన్స్టిట్యూట్ ఆఫ్ టెక్నాలజీ హైదరాబాద్, ఇండియన్ ఇన్స్టిట్యూట్ ఆఫ్ ఇన్ఫర్మేషన్ టెక్నాలజీ రాయచూర్ అభివృద్ధి చేసిన టెక్స్ట్ ట్రాన్స్లేషన్ సిస్టమ్కు",
13    "gu": "ઇન્ડિયન ઇન્સ્ટિટ્યૂટ ઓફ ટેકનોલોજી હૈદરાબાદ અને ઇન્ડિયન ઇન્સ્ટિટ્યૂટ ઓફ ઇન્ફોર્મેશન ટેકનોલોજી રાયચુર દ્વારા વિકસિત ટેક્સ્ટ ટ્રાન્સલેશન સિસ્ટમમાં આપનું",
14    "ml": "ഇന്ത്യൻ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഓഫ് ടെക്നോളജിയും ഇന്ത്യൻ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഓഫ് ഇൻഫർമേഷൻ ടെക്നോളജിയും വികസിപ്പിച്ചെടുത്ത ടെക്സ്റ്റ് ട്രാൻസ്ലേഷൻ",
15    "pa": "ਇੰਡੀਅਨ ਇੰਸਟੀਟਿਊਟ ਆਫ਼ ਟੈਕਨੋਲੋਜੀ ਹੈਦਰਾਬਾਦ ਅਤੇ ਇੰਡੀਅਨ ਇੰਸਟੀਟਿਊਟ ਆਫ਼ ਇਨਫਰਮੇਸ਼ਨ ਟੈਕਨੋਲੋਜੀ ਰਾਇਚੂਰ ਵੱਲੋਂ ਵਿਕਸਿਤ ਟੈਕਸਟ ਟ੍ਰਾਂਸਲੇਸ਼ਨ ਸਿਸਟਮ ਵਿੱਚ ਤੁਹਾਡਾ ਸੁਆਗਤ ਹੈ।"
16  }
17 }
```

# Text to Speech API

Translation System / TextToSpeech / supported\_languages

GET `{{SpeechURL}}/tts/supported_languages`

Params Authorization Headers (7) Body Pre-request Script Tests Settings

☒ none ☐ form-data ☐ x-www-form-urlencoded ☐ raw ☐ binary ☐ GraphQL

This request does not have a body

Body Cookies Headers (4) Test Results

Pretty Raw Preview Visualize JSON

```
1 {
2   "success": true,
3   "message": "Supported languages",
4   "data": {
5     "as": "Assamese - অসমীয়া",
6     "bn": "Bangla - বাংলা",
7     "brx": "Boro - বড়ো",
8     "en": "Indian English",
9     "gu": "Gujarati - ગુજરાતી",
10    "hi": "Hindi - हिंदी",
11    "kn": "Kannada - ಕನ್ನಡ",
12    "ml": "Malayalam - മലയാളം",
13    "mni": "Manipuri - মিজোবাহা",
14    "mr": "Marathi - मराठी",
15    "or": "Oriya - ଓଡ଼ିଆ",
16    "pa": "Punjabi - ਪੰਜਾਬੀ",
17    "raj": "Rajasthani - राजस्थानी",
18    "ta": "Tamil - தமிழ்",
19    "te": "Telugu - తెలుగు"
20  }
21 }
```



POST

{{SpeechURL}}/tts/single

Send

Params

Authorization

Headers (9)

Body

Pre-request Script

Tests

Settings

Cookies

none

form-data

x-www-form-urlencoded

raw

binary

GraphQL

JSON

1

{

2

"input": [

3

{

4

"source": "यह संपूर्ण अनुप्रयोग का परीक्षण है।"

5

}

6

]

7

}

Body

Cookies

Headers (4)

Test Results

Status: 200 OK

Time: 1641 ms

Size: 262.59 KB

Save as Example

Pretty

Raw

Preview

Visualize

JSON

1

{

2

"audio": [

3

{

4

"audioContent": "UklGRvYSAwBXQVZFZm10IBIAAADAAEAgD4AAD6AAAEACAAAABmYWN0BAAAALHEAABkYXRhxBIDAAAAACduic2vwWoNiCe/Tbvwik:"

5

}

6

],

7

"config": {

8

"language": {

9

"sourceLanguage": "hi"

10

},

11

"audioFormat": "wav",

12

"encoding": "base64",

13

"samplingRate": 22050

14

}

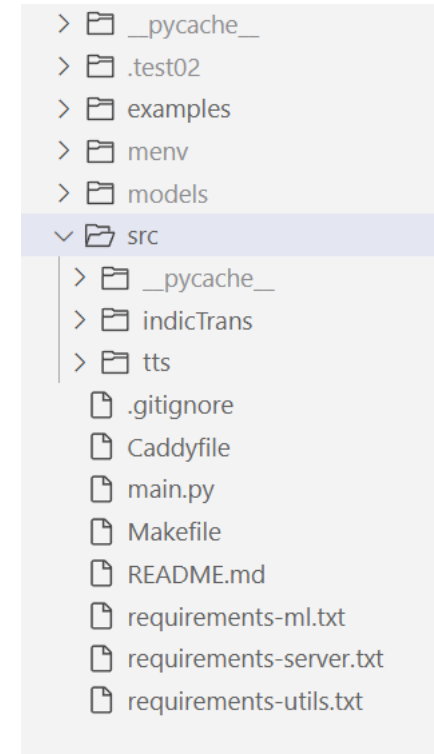
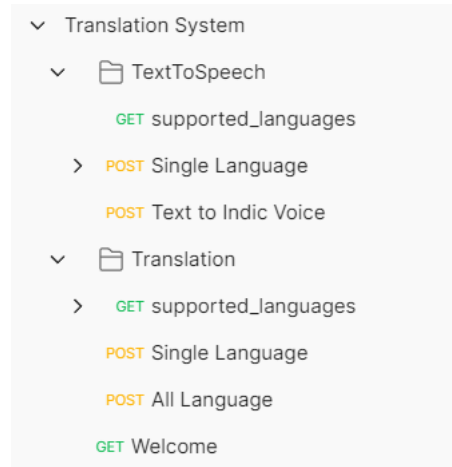
15

}

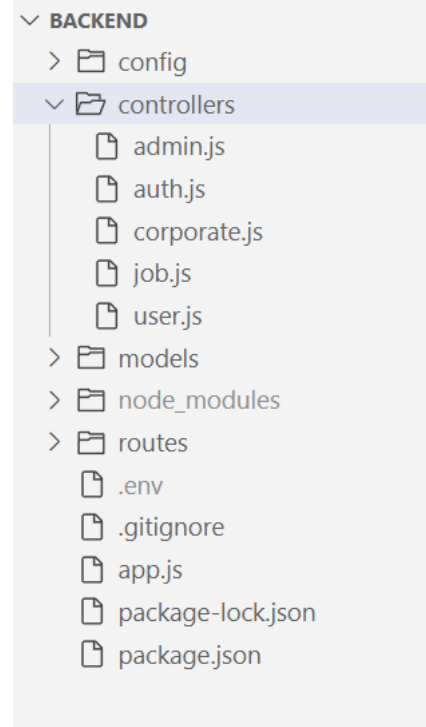
# The Application and GUI

- Translation System made on Python using fast API
- Frontend made on ReactJs using MUI
- Backend made on NodeJS

# The TTS Repository



# The NodeJS Application



- > Admin
- ▼ Auth
  - GET Test
  - POST Google Login
- > Corporate
- ▼ Job
  - POST create
  - GET getJob by Id
  - PUT update
  - GET getAllJob
  - DEL delete
  - GET Job by a company
  - GET jobTranslate
  - POST apply
  - DEL removeApplication
- ▼ User
  - POST create
  - PUT update
  - GET getUser by email
  - GET getAll User
  - GET getUser by Id
  - DEL delete

# The React App

## Welcome to Y4J Translation System

Please select the whether you want to translate to text or speech. Then select the language you want to translate to.

TEXT SPEECH

Input

English

Please add your text here

This is a test.

TRANSLATE

Output

Hindi - हिंदी

Translated Text

यह एक परीक्षा है।

COPY TO CLIPBOARD

## Welcome to Y4J Translation System

Please select the whether you want to translate to text or speech. Then select the language you want to translate to.

TEXT

SPEECH

MALE

FEMALE

Input

English

Please add your text here

This is a test.

TRANSLATE

Output

Hindi - हिंदी

▶ 0:01 / 0:01



DOWNLOAD

# Application Demonstration



## Recommended Jobs

### सॉफ्टवेयर इंजीनियर

Location: हैदराबाद

Company Name: अमेज़न

Company Id:643ccc23b179b95814d663fc

Last date to apply: 20-3-2021

[VIEW DETAILS](#)

### डेटा इंजीनियर

Location: दूरस्थ

Company Name: अमेज़न

Company Id:643ccc23b179b95814d663fc

Last date to apply: 20-3-2021

[VIEW DETAILS](#)

### शीर्ष ई-कॉमर्स बहुराष्ट्रीय कंपनी-वरिष्ठ वित्तीय परिचालन विश्लेषक

Location: हैदराबाद

Company Name: अमेज़न

Company Id:643ccc23b179b95814d663fc

Last date to apply: 7-5-2023

[VIEW DETAILS](#)[ALL JOBS](#)





## Recommended J

## सॉफ्टवेयर इंजीनियर

Location: हैदराबाद  
Company Name: अमेज़न  
Company Id:643ccc23b  
Last date to apply: 20-3

VIEW DETAILS

ALL JOBS

## Job Details

Job Title:डेटा इंजीनियर  
Job Id:644e47e42c539f57cc24f3d6  
HR Email:testing@amazon.in  
HR Name:अरमान  
Job Description:डेटा इंजीनियर  
Job Location:दूरस्थ  
Job Type:डब्ल्यूएफएच  
Disability Type:पैर काम नहीं कर रहे  
Company Name:अमेज़न  
Job Vacancies:20  
Start Date:20-3-2021  
End Date:20-3-2021  
Status:active

CLOSE

REMOVE APPLICATION

## पनी-वरिष्ठ वित्तीय

95814d663fc



All Jobs

Job Id	Job Title	HR Name	HR Email	Number of Applicants	Action
644e4162ad2d784c454a8c32	सॉफ्टवेयर इंजीनियर	अरमान	cs22btech11051@iith.ac.in	0	<div>DELETE</div> <div>VIEW DETAILS</div>
644e47e42c539f57cc24f3d6	डेटा इंजीनियर	अरमान	testing@amazon.in	1	<div>DELETE</div> <div>VIEW DETAILS</div>
644e4cd58aa0f2355c80ce2a	शीर्ष ई-कॉमर्स बहुराष्ट्रीय कंपनी-वरिष्ठ वित्तीय परिचालन विश्लेषक	पार्थ सिंह	hr@amazon.jp	0	<div>DELETE</div> <div>VIEW DETAILS</div>



All Jobs

Job Id	Job Title	Company Id	Company Name	Job Location	Action
644e4162ad2d784c454a8c32	सॉफ्टवेयर इंजीनियर	643ccc23b179b958	मेज़न	हैदराबाद	<div>DELETE</div> <div>VIEW DETAILS</div>
644e47e42c539f57cc24f3d6	डेटा इंजीनियर	643ccc23b179b958	मेज़न	दूरस्थ	<div>DELETE</div> <div>VIEW DETAILS</div>
644e4cd58aa0f2355c80ce2a	शीर्ष ई-कॉमर्स बहुराष्ट्रीय कंपनी-वरिष्ठ वित्तीय परिचालन विश्लेषक	643ccc23b179b958	मेज़न	हैदराबाद	<div>DELETE</div> <div>VIEW DETAILS</div>

English

Assamese

Hindi

Marathi

Tamil

Bengali

Kannada

Oriya

Telugu

Gujarati

Malayalam

Punjabi



## User Settings

[CREATE A USER](#)[ALL USER](#)[DELETE A USER](#)

## Job Settings

[ALL JOB](#)

## Corporate Settings

[CREATE A CORPORATE](#)[ALL CORPORATE](#)

All Users

Candidate ID	Name	Email	Action	
C12345	Armaan Malik	armaan@gmail.com	DELETE	VIEW DETAILS
C12346	Priya Patel	priya@xyz.com	DELETE	VIEW DETAILS
C12347	Rahul Sharma	rahul@abc.com	DELETE	VIEW DETAILS
C34567	Ravi Patel	ravi@mno.com	DELETE	VIEW DETAILS
C45678	Kavita Singh	kavita@lmn.com	DELETE	VIEW DETAILS
C23456	Aman Gupta	aman@pqr.com	DELETE	VIEW DETAILS
C78901	Rajesh Khanna	rajesh@stu.com	DELETE	VIEW DETAILS

# Future Improvements

- Adding more languages to the dataset.
- Explore various Transformer models.

# Challenges faced

- Working with audio files in the HTTP request.
- High system requirement of the models.

# Conclusion

- Development of an API environment for the translation of the given text into 11 Indian languages and conversion of the translated text to audio output in male and female voices in 13 Indian languages.
- Development of a working prototype for the demonstration of the job recommendation portal.



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