# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

**(AUTONOMOUS)**

**Accredited by NAAC with 'A' Grade & NBA (Under Tier - I), ISO 9001:2015 Certified Institution**

**Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada**

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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**


# REPORT

**on**

## ATAL Sponsored Faculty Development Program

**on**

## "Data Analysis Tools & Techniques for Text and Speech Analytics"

**(14th to 19th November 2022 – Online Mode & 21st to 25th November 2022 – Offline Mode)**

**Lakireddy Bali Reddy College of Engineering (A)** has organized **ATAL Sponsored Faculty Development Program** on **"Data Analysis Tools & Techniques for Text and Speech Analytics"** from **14th – 25th November 2022**. This FDP received an overwhelming response with ***50 Participants (Outside Participants – 44 and In-house Participants, i.e., LBRCE – 06 (CSE – 04, AI&DS – 01, and IT – 01))*** from various institutes/colleges approved by AICTE and affiliated to various Universities across the arena of India.

**Date: 14/11/2022**

**Inauguration:**

**FDP** was inaugurated on 14/11/2022 by **Dr. D. Veeraiah, HOD – CSE, and Convener of FDP,** along with **Dr. Pradip K. Das, Professor of CSE & Resource Person, IIT Guwahati, Dr. M. Srinivasa Rao, Professor & Dean Academics, Dr. P. Bhagath, Associate Professor & Co-Coordinator and Associate Coordinators of the FDP Dr. M. Sitha Ram, Dr. S. Nagarjuna Reddy, Mr. Shaik Johny Basha, and Mr. S. Srinivasa Reddy.**

**Dr. P. Bhagath** welcomed all the dignitaries and delegates. In his welcome speech, he highlighted the importance and objectives of organizing this faculty development programme.

**Our Convener and Coordinator of the FDP, Dr. D. Veeraiah**, started his speech by thanking AICTE and ATAL Academy committee members for accepting our proposal and granting the funds to conduct this FDP. He thanked all the participants who registered from the different parts of Andhra Pradesh and Telangana. Then he thanked all the Resource Persons, Prof. Pradip K Das, Dr. Mohit Kumar, Dr. Swarup Ranjan Behera, Mr. Ritesh Ratti,

etc., for accepting our request irrespective of their busy schedule. He added the importance of speech recognition and data analytics in his speech. Finally, he said that for the next 11 days, various concepts related to Speech Processing, Research gaps, Models for Speech Recognition, NLP for Text Analytics, etc., will be discussed. He requested everyone in this FDP to attend all the sessions, which will help them in identifying/doing some research in this thrust area.

**Dr. M. Srinivasa Rao, Dean of Academics,** has thanked AICTE and ATAL Academy for giving us this opportunity to our college to conduct FDP on Data Science and its Applications. Then he thanked the Resource Person, Dr. Pradip K Das, Professor, IIT Guwahati, for accepting our request and joining us in the inaugural session. In his speech, he added, "Data is essential because data gives the information, information gives the knowledge, and knowledge gives the wisdom." At the end of his speech, he congratulated Convener, Coordinator, Co-Coordinators, and faculty members for organizing "A Right Program in a Right Time with Right Persons."

Resource Person **Dr. Pradip K Das, Professor, IIT Guwahati**, in his inaugural speech, conveyed thanks to the Principal, Coordinator, Co-coordinator, and Associate Coordinators of this FDP for giving this opportunity to act as a Resource Person. In his speech, he highlighted that this Two-week FDP is a package of concepts related to Text and Speech Analytics. He said that this FDP would cover what Speech Recognition is, how speech can be processed, NLP, Text Analytics, etc., which are the various components of Data Science.


**Fig. 1: 14/11/2022 – Inauguration Banner of ATAL Sponsored FDP on Data Analysis Tools & Techniques for Text and Speech Analytics**

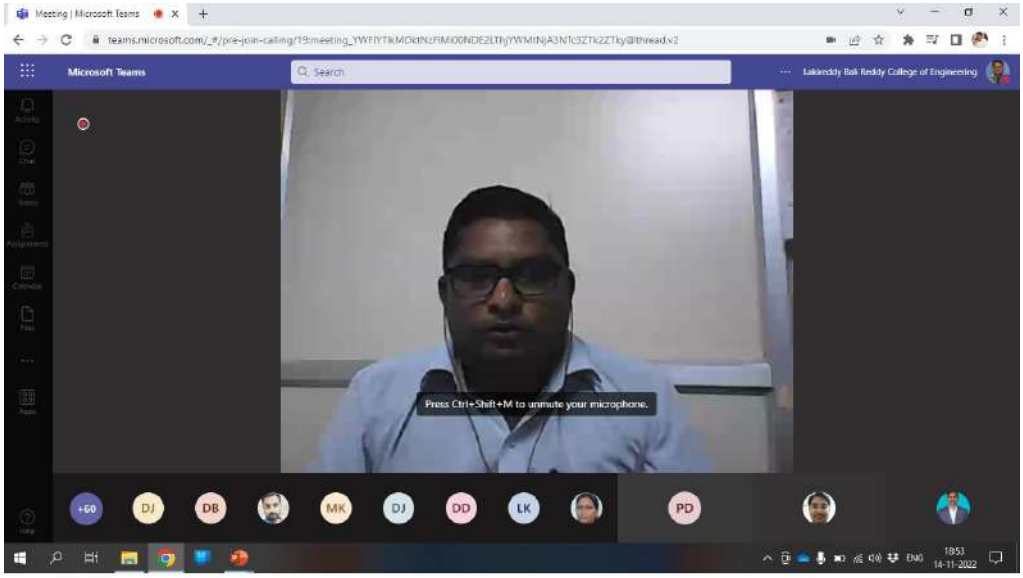


**Fig. 2: 14/11/2022 – Welcome Message by Co-Coordinator of the FDP, Dr. P. Bhagath**


**Fig. 3: 14/11/2022 - Inaugural Speech by Coordinator of the FDP Dr. D. Veeraiah**


**Fig. 4: 14/11/2022 - Inaugural Speech by Session Resource Person Dr. D. Pradip K. Das, Professor of CSE, IIT Guwahati**

## Day 1: 14/11/2022

### Online Session: I (01)

**Topics: Introduction to Speech Technology Research**

**Resource Person: Dr. Pradip K Das, Professor, IIT Guwahati**

Our Resource Person, **Dr. Pradip K Das**, started his lecture by giving clear insights on speech technology, various work areas, difficulties in processing speech signals, Vector quantization, etc. Then he discussed Hidden Markov Modeling and gave different examples of speech recognition.

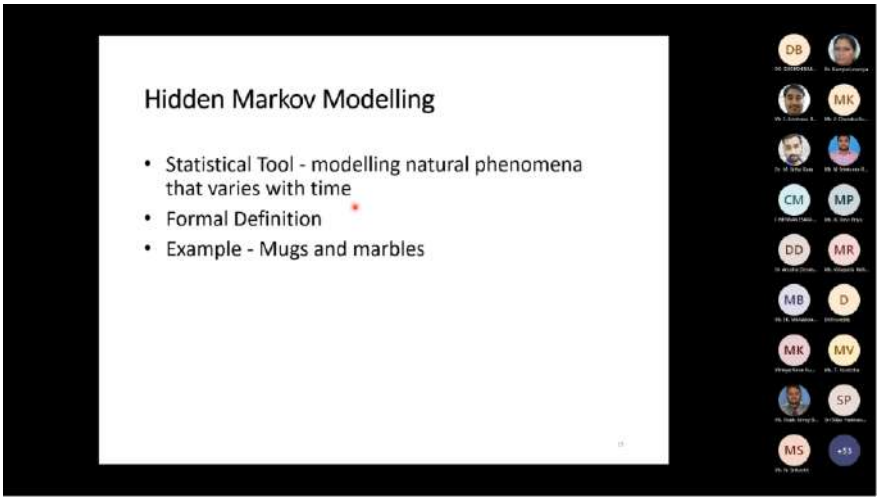


**Fig. 5: 14/11/2022 – Session I (01) by Dr. Pradip K Das on Speech Technology Research**

### Online Session: I (02)

**Topics: Frameworks for Speech Recognition**

**Resource Person: Dr. Pradip K Das, Professor, IIT Guwahati**

Our Resource Person, **Dr. Pradip K Das**, started his lecture by giving clear insights on the foundations of speech, various sounds, and features of the sounds. Then he discussed how speech could be represented in the signal format and showed a live demonstration of giving the speech input and generating the signals from it.

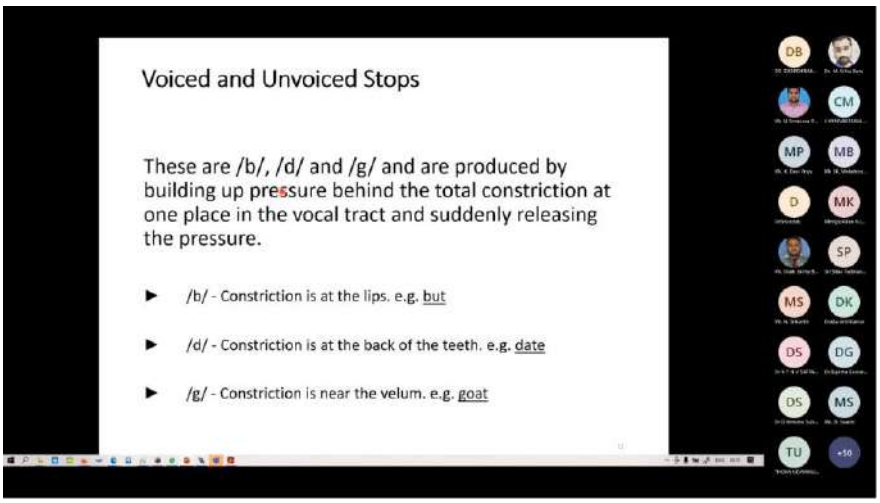


**Fig. 6: 14/11/2022 – Session I (02) by Dr. Pradip K Das on Frameworks for Speech Recognition**

## Day 2: 15/11/2022

### Online Session: II (01)

**Topics: Speech Processing: A Research Perspective**

**Resource Person: Dr. P. Bhagath, Associate Professor, LBRCE (A), Mylavaram**

Our Resource Person, **Dr. Bhagath**, started his lecture by giving clear insights into various areas of interest in Speech Processing. After that, he discussed Speaker Verification, Speech Dialog Systems, Auditory Scene Analysis, etc. Then he addressed the Speech Processing Framework and different phases in processing the speech.

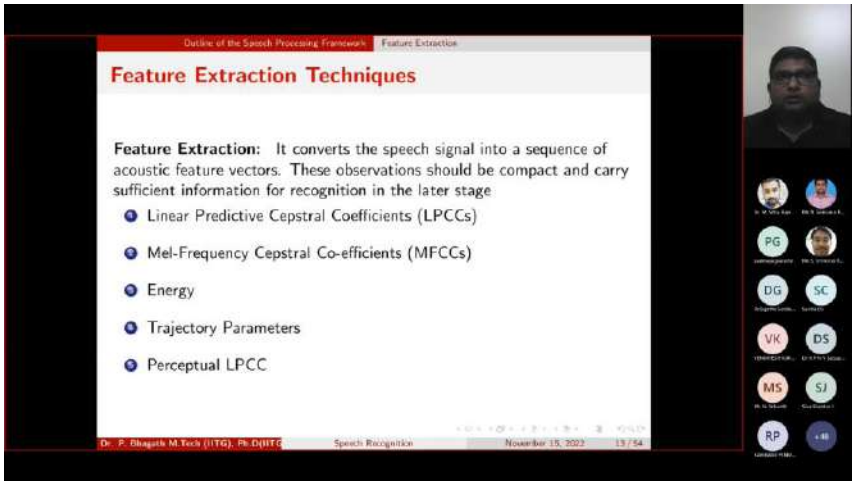


**Fig. 7: 15/11/2022 – Session II (01) by Dr. Bhagath on Speech Processing: A Research Perspective**

### Online Session: II (02)

**Topics: Speech Processing: An Application Perspective**

**Resource Person: Dr. P. Bhagath, Associate Professor, LBRCE (A), Mylavaram**

Our Resource Person, **Dr. Bhagath**, started his lecture by giving clear insights into the fundamental problems of Hidden Markov Models. After that, he discussed how HMM is modeled and evaluated and the various algorithms used in HMM. Then he discussed various open-source tools for speech processing and showed a live demonstration of speech processing.

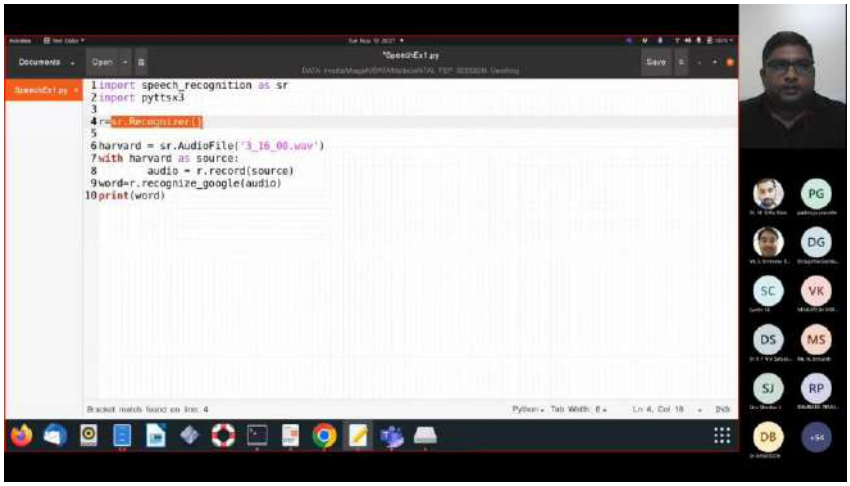


**Fig. 8: 15/11/2022 – Session II (02) by Dr. Bhagath on Speech Processing: An Application Perspective**

## Day 3: 16/11/2022

### Online Session: III (01)

**Topics: Intuition of Structural Processing Methods**

**Resource Person: Dr. P. Bhagath, Associate Professor, LBRCE (A), Mylavaram**

Our Resource Person, **Dr. Bhagath**, started his lecture by giving clear insights on various use cases of Speech Processing, such as Mobile Robots, Automated Home Appliances, etc. After that, he discussed the limitations and challenges of HMM and Deep Learning. Then he discussed the Trajectory and Fréchet Distance with examples.

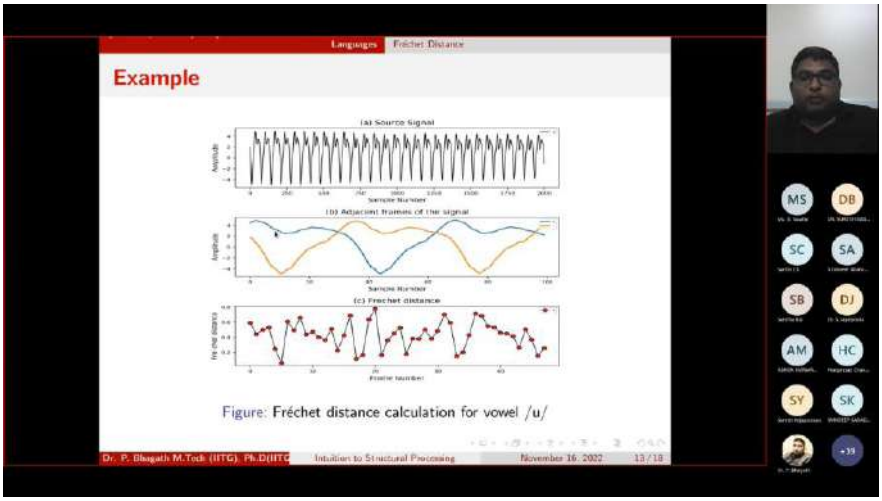


**Fig. 9: 16/11/2022 – Session III (01) by Dr. Bhagath on Structural Processing Methods**

### Online Session: III (02)

**Topics: Fundamentals of Automatic Speaker Recognition**

**Resource Person: Dr. Mohit Kumar, Assistant Professor, NIT Hamirpur**

Our Resource Person, **Dr. Mohit**, started his lecture by giving clear insights into what is automatic speech recognition, the difference between speech and speaker recognition systems, and why speaker recognition. After that, he discussed various applications (low resource) and speech data. Then he discussed Gaussian Mixture Models with examples.

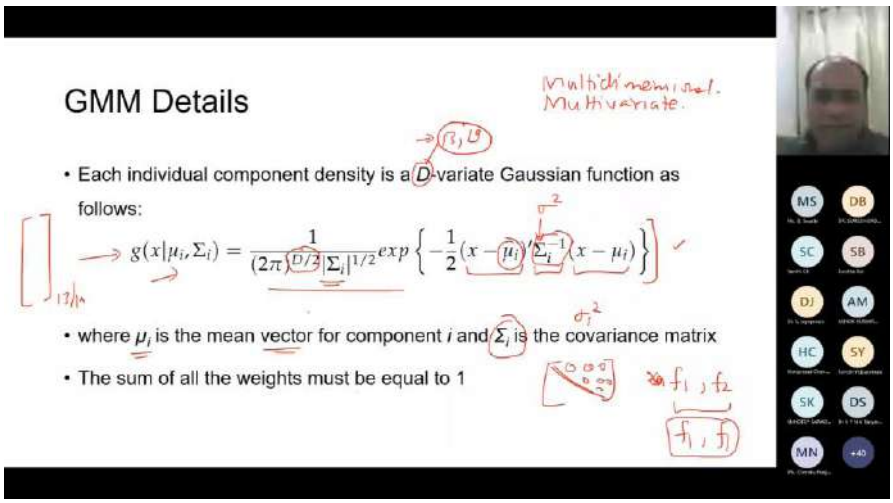


**Fig. 10: 16/11/2022 – Session III (02) by Dr. Mohit on Automatic Speaker Recognition**

## Day 4: 17/11/2022

### Online Session: IV (01)

**Topics: Applications of GMM to Speaker recognition**

**Resource Person: Dr. Mohit Kumar, Assistant Professor, NIT Hamirpur**

Our Resource Person, **Dr. Mohit**, started his lecture by giving clear insights into Universal Background Model's advantages and disadvantages. After that, he discussed the improvements at the feature level. Then he addressed the Reduction through Selection: Naïve Dropping, F-Ratio, and Linear Discriminant Analysis (LDA).

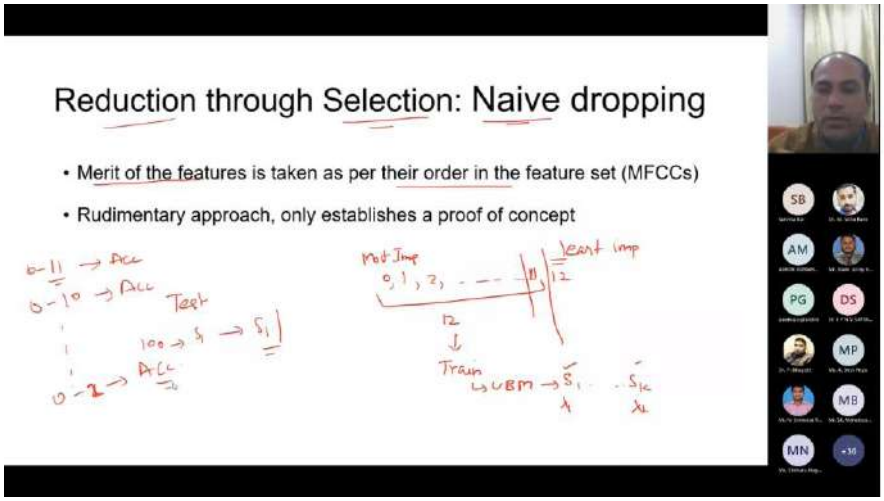


**Fig. 11: 17/11/2022 – Session IV (01) by Dr. Mohit on GMM to Speaker Recognition**

### Online Session: IV (02)

**Topics: Applications of GMM to Speaker recognition: A Practical Approach**

**Resource Person: Dr. Mohit Kumar, Assistant Professor, NIT Hamirpur**

Our Resource Person, **Dr. Mohit**, started his lecture by improving the model level with an example. After that, he discussed I-Vectors along with Dataset Preparation. At last, he debated other GMM & I-Vector Applications with real-time applications.

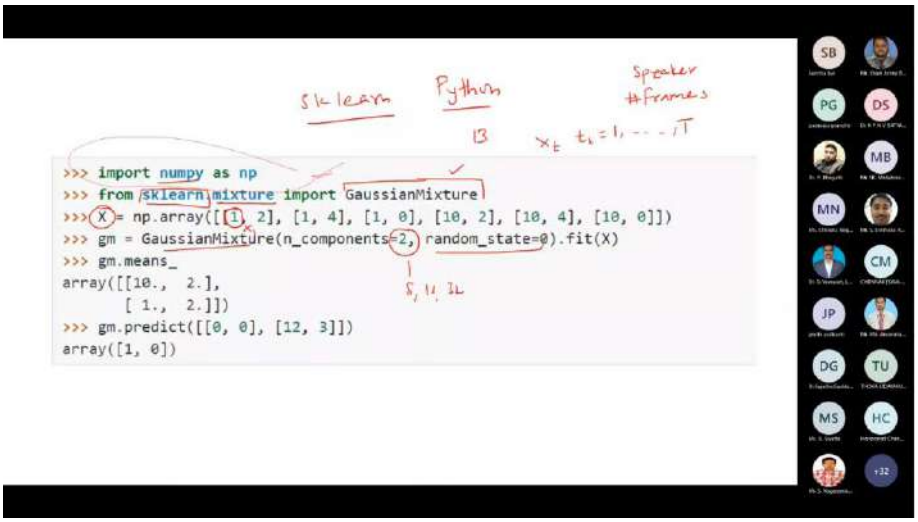


**Fig. 12: 17/11/2022 – Session IV (02) by Dr. Mohit on Applications of GMM**

## Day 5: 18/11/2022

### Online Session: V (01)

**Topics: NLP for Industry applications**

**Resource Person: Dr. Swarup, Senior Data Scientist, Reliance Jio Platforms, Hyd.**

Our Resource Person, **Dr. Swarup**, started his lecture by giving clear insights on Large Language Models. After that, he discussed one model for all tasks and language models. Then he discussed the general framework for text probability and Left-to-Right Language models with examples.

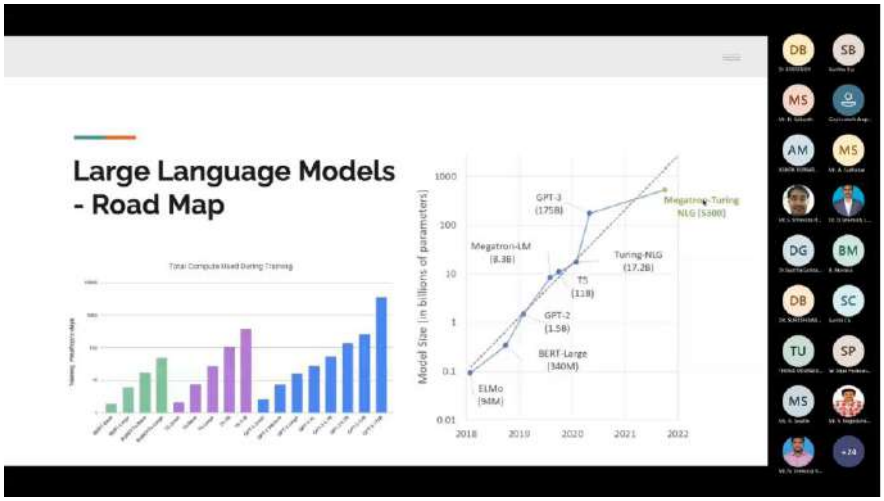


**Fig. 13: 18/11/2022 – Session V (01) by Dr. Swarup on NLP**

### Online Session: V (02)

**Topics: Deploying ML applications**

**Resource Person: Dr. Swarup, Senior Data Scientist, Reliance Jio Platforms, Hyd.**

Our Resource Person, **Dr. Swarup**, started his lecture by giving clear insights into Neural Language Models with their High-Level Pipeline, Training, and Cross-Entropy Loss. Improvements at the model level with an example. After that, he discussed Transfer Learning with Word Embedding and ELMo. Finally, he mentioned BERT Transformer.

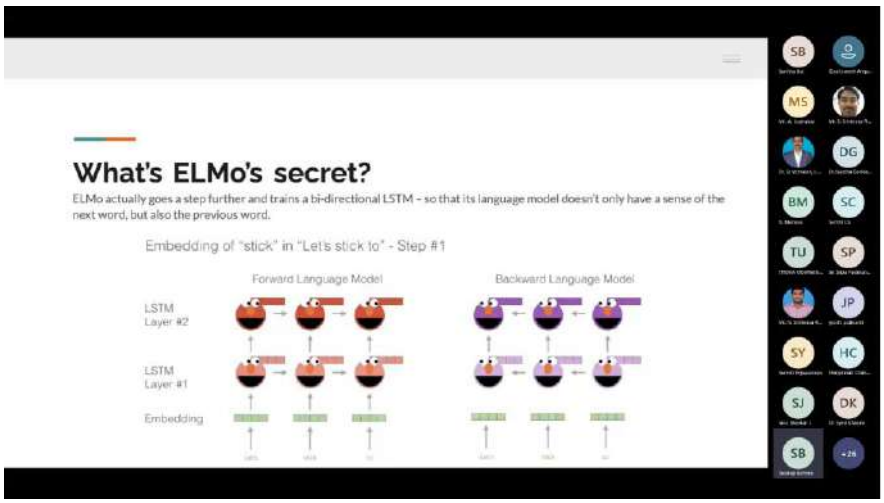


**Fig. 14: 18/11/2022 – Session V (02) by Dr. Swarup on Transfer Learning and Transformer**

## Day 6: 19/11/2022

### Online Session: VI (01)

**Topics: Transformer based models for NLP – I**

**Resource Person: Mr. Ritesh Ratti, Senior Data Scientist, Delivery Hero, Germany**

Our Resource Person, **Mr. Ritesh**, started his lecture by giving clear insights into the Evolution of Unstructured Data and the Basics of NLP. After that, he discussed the various problems with NLP and Traditional NLP Pipeline. Then he discussed different NLP use cases, word embedding methods, and limitations.

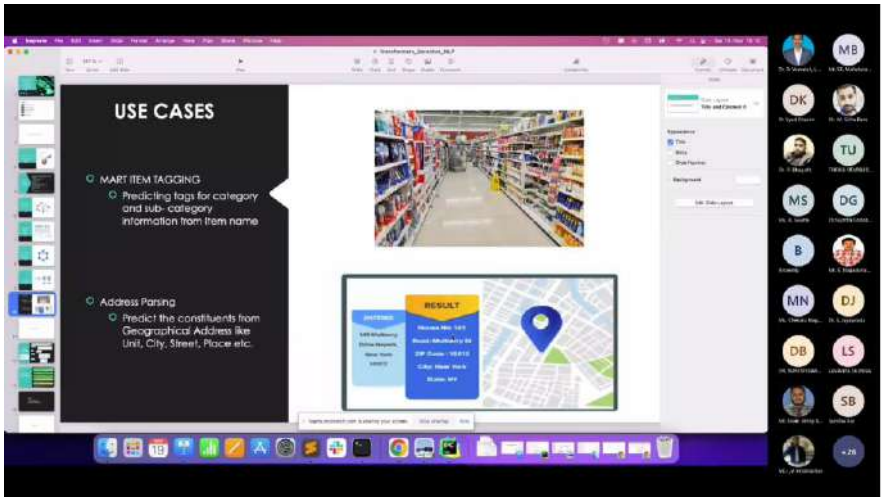


**Fig. 15: 19/11/2022 – Session VI (01) by Mr. Ritesh on NLP and its Use Cases**

### Online Session: VI (02)

**Topics: Transformer-based models for NLP – II**

**Resource Person: Mr. Ritesh Ratti, Senior Data Scientist, Delivery Hero, Germany**

Our Resource Person, **Dr. Mohit**, started his lecture by giving insights on Sequence-to-Sequence Modeling, Intuition behind Attention, and various types of Attention. After that, he discussed how the self-attention process works and the Transformer. Then he has shown the live execution of Transformers Library using Jupyter Notebook.

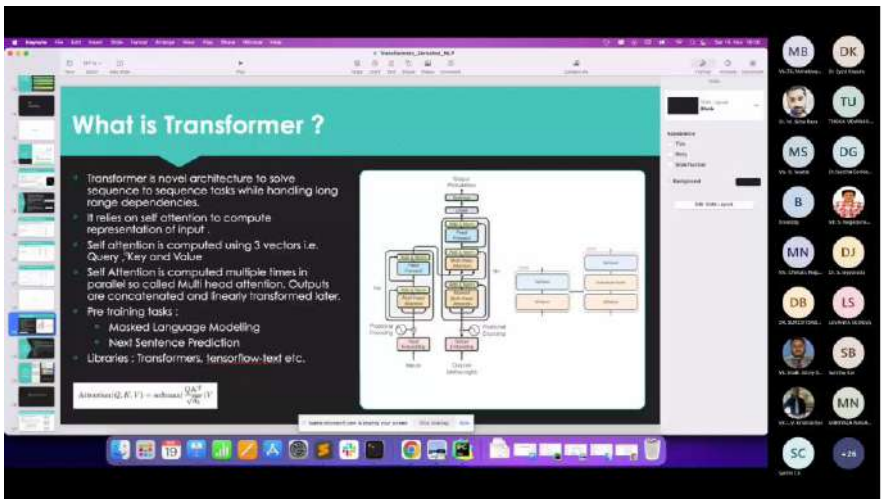


**Fig. 16: 19/11/2022 – Session VI (02) by Mr. Ritesh on Transformer based Models**

**Day 7: 21/11/2022**

**Offline Session: VII**

**Topics: Dataset Preparation for Speech Recognition**

**Resource Person: Dr. Pradip K Das, Professor, IIT Guwahati**

Our Resource Person, **Dr. Pradip K Das**, started his lecture by giving clear insights on what is dataset, how a dataset can be prepared, various steps in creating a dataset. Then he discussed the various issues in Indian Languages, what are the various Application for finding the Text-to-Speech Synthesis.

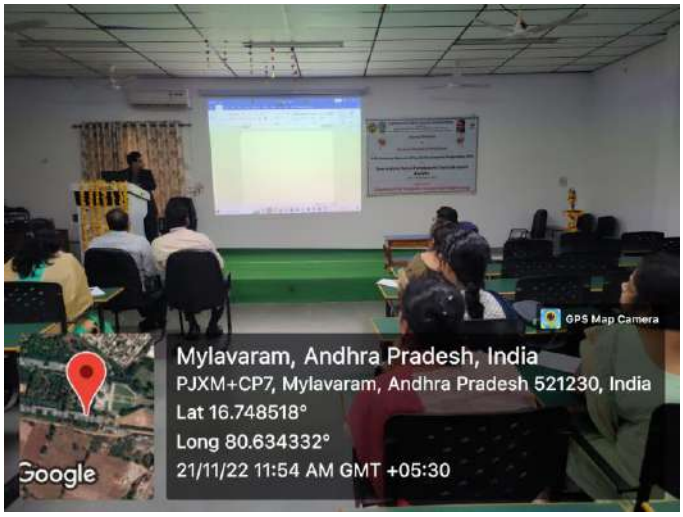


**Fig. 17: 21/11/2022 – Session VII by Dr. Pradip K Das on Dataset Preparation Steps**

**Offline Session: VIII**

**Topics: Practice Problems on Feature Extraction and visualization**

**Resource Person: Dr. Pradip K Das, Professor, IIT Guwahati**

Our Resource Person, **Dr. Pradip K Das**, started his lecture by giving clear insights on feature extraction from the sound and how they can be visualized. Then he gave a live demonstration on processing the speech like how the sound will be separated, what is the wave forms, etc. and requested the participants to practice.

**Fig. 18: 21/11/2022 – Session VIII Live Demo by Dr. Pradip K Das on Feature Extraction and Visualization**

**Day 8: 22/11/2022**

**Offline Sessions: IX & X**

**Topics: Speaker Recognition Frameworks**

**Resource Person: Dr. Mohit Kumar, Assistant Professor, NIT Hamirpur**

Our Resource Person, **Dr. Mohit Kumar**, started his lecture by giving clear insights on what is speaker recognition, how the speaker can be identified, what are the various data security and privacy issues in speaker recognition. After that, he discussed about what are the various features available in recognizing a speaker, how they should be identified, etc.

In the Afternoon session, he gave a brief intro about speech data and how input audio data will be, what are the different features and frames in speech, what are the linear predictive coefficients in speech, etc. After the basics, he discussed about different deep learning frameworks for end-to-end speech recognition i.e., Connectionist Temporal Classification, Sequence-To-Sequence and Online Sequence-to-Sequence.

Then he has shown the live demonstration of Gaussian Mixture Models (GMM) such as Simple Gaussian Curve for a Speech as well as Multiple 1D Gaussian Curves and their parameters estimation.


**Fig. 19: 22/11/2022 – Sessions IX & X by Dr. Mohit on Speaker Recognition Frameworks**

**Day 9: 23/11/2022**

**Offline Sessions: XI & XII**

**Topics: NLP Use Cases and Application Building for NLP application**

**Resource Person: Dr. Swarup, Senior Data Scientist, Reliance Jio Platforms, Hyd.**

Our Resource Person, **Dr. Swarup**, started his lecture by giving clear insights on What is Natural Language Processing, how it can be done, what are the different frameworks available for NLP, different use cases of NLP like how Siri, Alexa, Google Mini, etc. apps are working with Speech Recognition.

In the Afternoon session, he gave a brief intro about what are the different problems that arise when we are building NLP applications. After that, he discussed about how the text probability will be calculated and text can be predicted. Then he discussed about Left-to-Right Language Modeling Framework and have given a clear explanation on what to define while using N-Gram Models & Neural Models. He has explained how reviews are going to be analyzed, how bots respond to voices, etc.

Then he has shown the live demonstration of Auto Text Generation (which predicts next word), autocomplete words, sentiment analysis (classifying the sentences based on the sentences), and multilingual translation.


**Fig. 20: 23/11/2022 – Session XI & XII by Dr. Swarup on NLP Application Building**

**Day 10: 24/11/2022**

**Offline Sessions: XIII & XIV**

**Topics: Speech Recognition System Framework and Digit Recognition System Development**

**Resource Person: Dr. P. Bhagath, Associate Professor, LBRCE (A), Mylavaram**

Our Resource Person, **Dr. Bhagath**, started his lecture by giving clear insights on overview of the research tools available for Speech Processing domain. The session focussed on Google Speech API specifically the installation of libraries and language adaption in Google Speech API. He discussed a few Python programs for Online Speech Recognition (ASR) for Indian English accent. Participants installed the required libraries and tried themselves to execute the programs discussed in the session.

In the Afternoon Session, he has shown the live demonstration of how signals will be generated through the audio, how to remove noise from sound, etc.


**Fig. 21: 24/11/2022 – Session XIII & XIV by Dr. Bhagath on Recognition Systems**

**Day 11: 25/11/2022**

**Topics: Project Charter**

**Resource Person: Dr. Swarup, Senior Data Scientist, Reliance Jio Platforms, Hyd.**

On the last day of our FDP, one of the Resource Persons, **Dr. Swarup**, joined in Project Charter and discussed with the analysis done by different teams. The most valued 4 articles were chosen and allocated for 5 teams. Every team has gone through the 4 journals, and they have submitted the following points related to the article:

i) Key points

ii) Applications

iii) Different Outcomes

**Valedictory and Feedback Session:**

On the Valedictory Session, **our Principal, Dr. K. Appa Rao, and Dean of Academics, Dr. M. Srinivasa Rao,** joined the session as Chief Guests along with **Dr. Swarup & Dr. Mohit, Resource Persons of the FDP, Dr. D. Veeraiah, Professor & HOD, Department of CSE, Convener and Coordinator of the FDP, Dr. P. Bhagath, Associate Professor, Co-Coordinator of the FDP, and Associate Co-ordinators Dr. M. Sitha Ram, Dr. S. Nagarjuna Reddy, Mr. Shaik Johny Basha and Mr. S. Srinivasa Reddy.**

**Dr. M. Sitha Ram, Associate Professor & Associate Co-ordinator, Department of CSE** welcomed all the dignitaries and delegates. In his welcome speech, he highlighted the key takeaways and objectives of organizing this faculty development programme.

**Our Principal, Dr. K. Appa Rao,** in his valedictory speech, thanked ATAL Academy and the Resource Persons for accepting the request and taking sessions in the FDP. Then he congratulated Co-ordinator, Co-Coordinator and all the members of Department of CSE for completing the FDP successfully in Hybrid Mode. After that, he congratulated all the participants and requested them to train the students on the learned topics and make them to do projects on Speech Recognition and their related concepts.

**Dr. D. Veeraiah, Professor & HOD, Department of CSE, Convener,** in his valedictory speech, thanked ATAL Academy for sanctioning the FDP to our Department. Then he thanked the Resource Persons for accepting the request and taking sessions in the FDP. After that, he thanked every faculty member and supporting staff of the department for supporting him all these days to complete this FDP in successful manner. At the last, he thanked all the Principals and Participants of surrounding colleges for deputing their faculty to learn the new concepts in last 11 days. At the end of his speech, he said that faculty of Department of CSE is open to collaborate with other college faculty to do research on NLP.

Two of the Participants named **Mr. S. Chiranjeevi, Assistant Professor, RGUKT, Nuzvid** and **Dr. K.P.N.V. Satya Sree, Professor, Usha Rama college of Engineering and Technology** has shared their feedback with the organizers as well as the participants. They are really happy with the way how the FDP was organized, took care of sessions, how the facilities are there, etc.

At the end of the valedictory session, a vote of thanks was given by **Dr. P. Bhagath, Co-Coordinator of the FDP,** in which he has been paid his gratitude towards all the participants who spared their valuable time for attending this FDP. He also appreciated the Resource Persons, Principal, Head of the Department, and Management for giving him this valuable opportunity.


**Fig. 22: 25/11/2022 – Dr. K. Appa Rao, Principal in his Valedictory Speech**


**Fig. 23: 25/11/2022 – Dr. D. Veeraiah, Coordinator in his Valedictory Speech**


**Fig. 24: 25/11/2022 – Mr. S. Chiranjeevi, one of the participants sharing his views on FDP**


**Fig. 25: 25/11/2022 – Dr. Satya Sree, one of the participants sharing her views on FDP**

**Fig. 26: 25/11/2022 – Participants of the FDP in Valedictory Session**

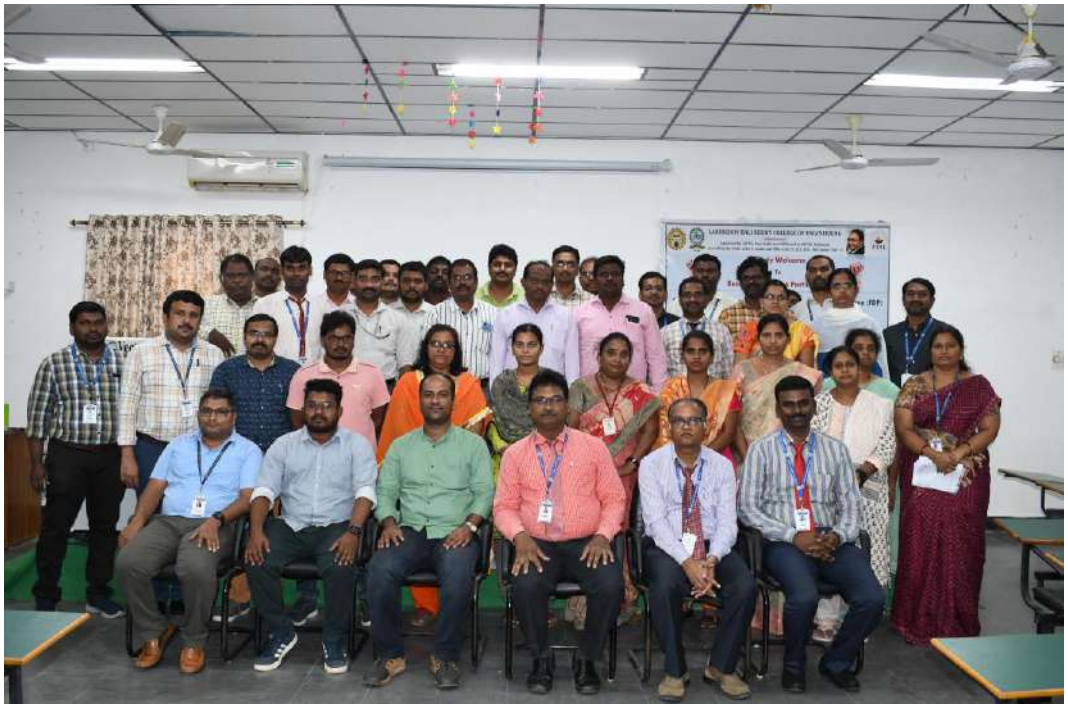

**Fig. 27: 25/11/2022 – Group Photo with Participants of the FDP in Valedictory Session**

**Convener & Coordinator**
**(Dr. D. Veeraiah)**

**Principal**
**(Dr. K. Appa Rao)**

# ***Published in Media about FDP***

***About Inauguration:***

***Link:*** **https://epaper.sakshi.com/Home/FullPage?eid=62&edate=22/11/2022&pgid=57909**

సాక్షి

## స్పీచ్ రికగ్నిషన్‌కు పెరుగుతున్న ప్రాధాన్యం

మైలవరం: ఆధునిక జీవితంలో స్పీచ్ రికగ్నిషన్‌కు ప్రాధాన్యత పెరుగుతోందని ప్రిన్సిపాల్ డాక్టర్ కె. అప్పారావు అన్నారు. మైలవరం లకిరెడ్డి బాలిరెడ్డి ఇంజినీరింగ్ కళాశాలలో ఏఐసీటీఈ-అటల్ అకాడమీ సహకారంతో కంప్యూటర్ సైన్స్ విభాగం ఆధ్వర్యంలో డేటా ఎనాలిసిస్ టూల్స్ అండ్ టెక్నిక్స్ ఫర్ టెక్స్ట్ అండ్ స్పీచ్ అనలిటిక్స్‌పై అధ్యాపకులు, రీసెర్చి స్కాలర్స్‌కు, ఇండస్ట్రీ పర్సన్స్‌కు శిక్షణ కార్యక్రమం ఏర్పాటు చేశారు. ఈ కార్యక్రమాన్ని సోమవారం ప్రారంభించి మాట్లాడారు. కన్వీనర్, సీఎస్ఈ విభాగాధిపతి డాక్టర్ వీరయ్య మాట్లాడుతూ ప్రస్తుతం మనం చాలా వాటిలో స్పీచ్ రికగ్నిషన్ ఉపయోగం చూస్తున్నామని, అవి మన జీవితంలో భాగంగా మారిపోయి ఎంతో ప్రభావితం చేస్తున్నాయన్నారు. డీన్ అకాడమిక్స్ డాక్టర్ ఎం. శ్రీనివాసరావు మాట్లాడుతూ నేటి ఆధునిక ప్రపంచంలో ప్రతిదీ వాయిస్ కమాండ్ ద్వారా తెలుసుకుంటున్నామన్నారు. గువాహటి ఐఐటీ సీఎస్ఈ ప్రొఫెసర్ డాక్టర్ ప్రదీప్‌కుమార్ మాట్లాడారు.

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## స్పీచ్ రికగ్నైజేషన్ ద్వారా భవిష్యత్తులో కొత్త ఒరవడి

మైలవరం: స్పీచ్ రికగ్నైజేషన్ రాబోయే కాలంలో కొత్త ఒరవడి సృష్టిస్తుందని రిలయన్స్ జియో సీనియర్ డేటా సైంటిస్ట్ డాక్టర్ స్వరూప్ రంజన్ బెహర తెలిపారు. మైలవరం లకిరెడ్డి బాలిరెడ్డి ఇంజినీరింగ్ కళాశాల కంప్యూటర్ విభాగంలో ఏఐసీటీఈ-అటల్ అకాడమీ ఆధ్వర్యంలో నిర్వహించిన డేటా ఎనాలసిస్ టూల్స్ అండ్ టెక్నిక్స్ ఫర్ టెక్స్ట్ అండ్ స్పీచ్ అనలిటిక్స్‌పై అధ్యాపకులు నిర్వహించిన శిక్షణ కార్యక్రమం శుక్రవారం ముగిసింది. కళాశాలలో సౌకర్యాలు, ల్యాబ్స్ పనితీరు బాగుందన్నారు. కళాశాల ప్రిన్సిపాల్ డాక్టర్ కె. అప్పారావు మాట్లాడుతూ శిక్షణలో నేర్చుకున్న కొత్త అంశాలు, అల్గోరిథమ్స్, టూల్స్‌ని స్పీచ్ మీద ఉపయోగించి ఎనాలిసిస్ చేయాలని సూచించారు. డాక్టర్ పి.భగత్, కోఆర్డినేటర్, రిసోర్స్ పర్సన్ డాక్టర్ మోహిత్‌కుమార్, డీన్ ఆఫ్ అకడమిక్స్ డాక్టర్ ఎం. శ్రీనివాసరావు ప్రసంగించారు. కార్యక్రమంలో అసోసియేట్ కోఆర్డినేటర్స్ డాక్టర్ ఎం. సీతారామ్, డాక్టర్ శీలం నాగార్జునరెడ్డి, షేక్ జానీ బాషా, శీలం శ్రీనివాసరెడ్డి, అధ్యాపకులు, వివిధ కళాశాలల అధ్యాపకులు పాల్గొన్నారు.

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