Seminar Topics for Sem-II, 2021-22
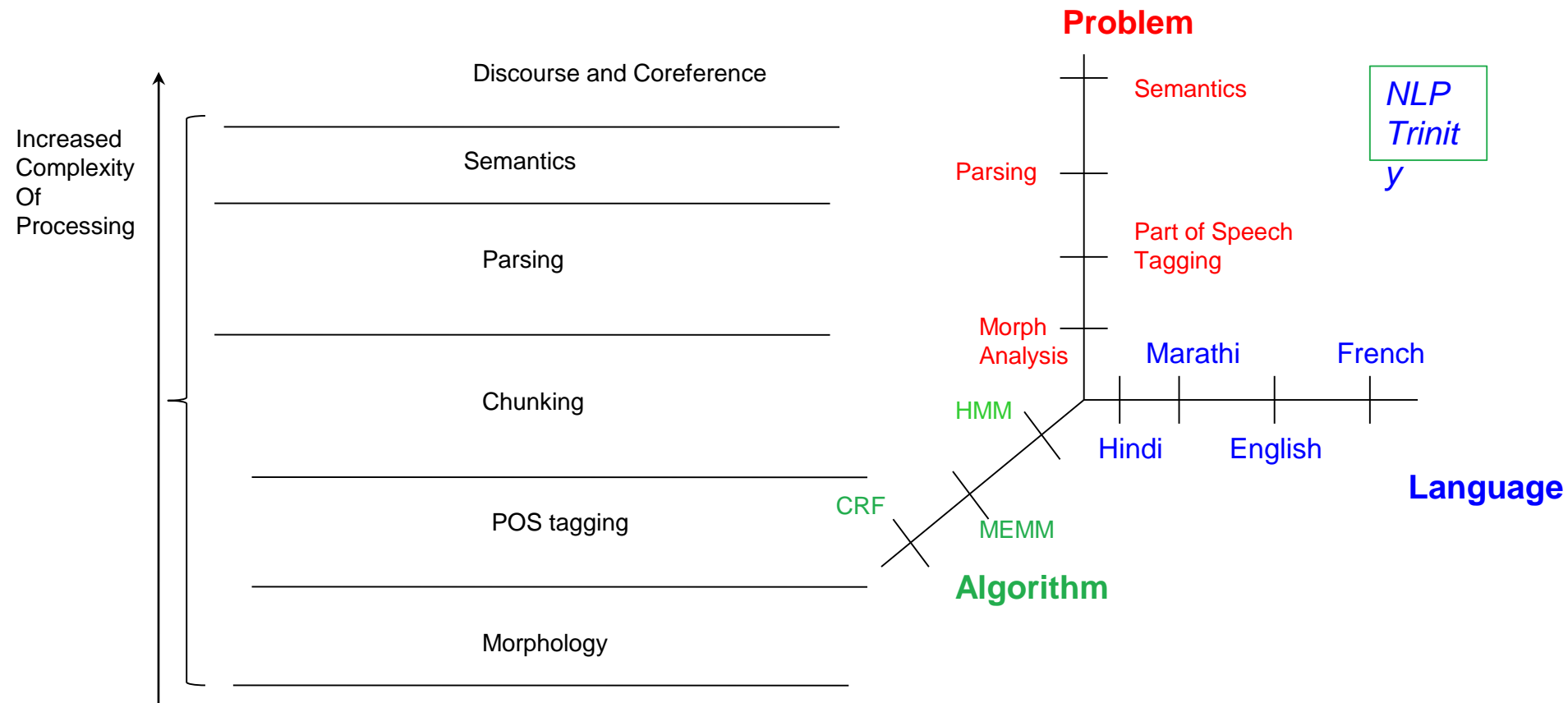
Pushpak Bhattacharyya

Computer Science and Engineering Department

IIT Bombay

3rd November, 2021

General Remarks
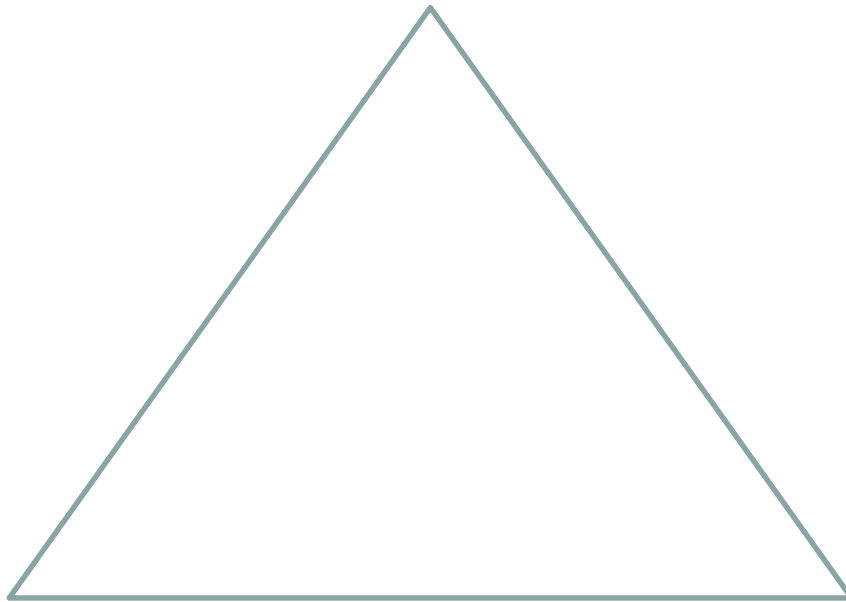
Natural Language Processing

Art, science and technique of making computers understand the generate language

NLP is layered Processing, Multidimensional too

The Trinity

Linguistics

Probability   **Coding**
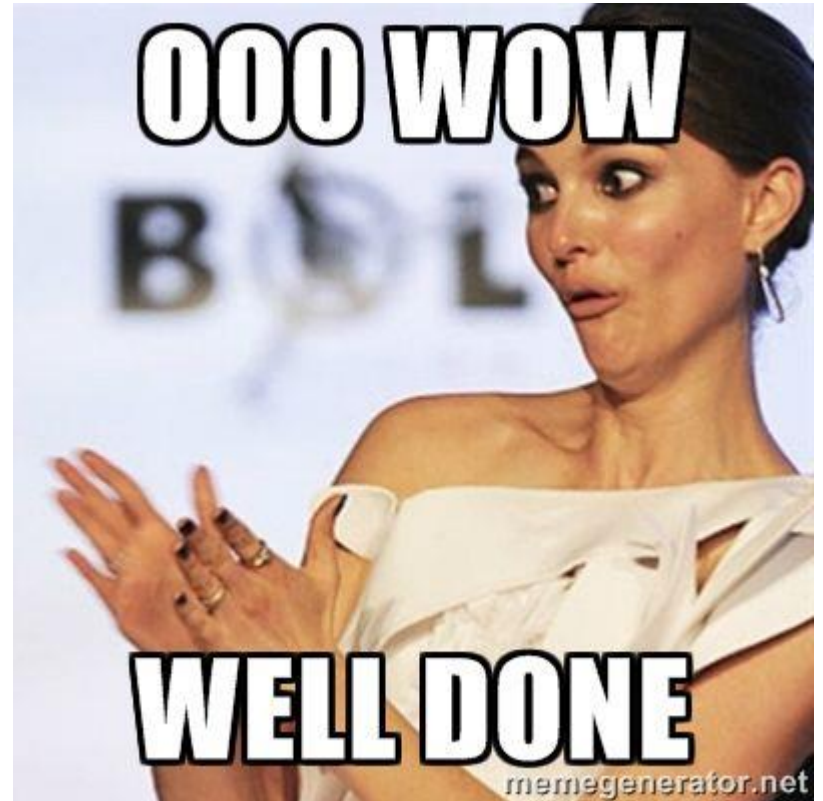
Task *vs.* Technique Matrix

Task (row) vs. Technique (col) Matrix	Rules Based/Knowledge-Based	Classical ML				Deep Learning		
		Perceptron	Logistic Regression	SVM	Graphical Models (HMM, MEMM, CRF)	Dense FF with BP and softmax	RNN-LSTM	CNN
Morphology								
POS								
Chunking								
Parsing								
NER, MWE								
Coref								
WSD								
Machine Translation								
Semantic Role Labeling								
Sentiment								
Question Answering								

3 Generations of NLP

- Rule based (demands problem and language insight)

- Statistical ML (SVM, Decision Tree, Linear Classifiers; demands)

- Deep Learning- Deep Feedforward, RNN, CNN, Transformers

Emergence of Multimodality

- Scarcity of data: DL ineffective

- Get additional training signals from Speech, Image, Video

Emergence of 0-shot, few-shot and Multitasking

- Data scarcity forces imaginative solutions

- Domain Adaptation

- Active Learning

- Tasks to

Emergence of very Large Language Models

- GPT3, PaLM, Bloom
- Prompt Engineering: e.g, for metaphor,
- Injecting Knowledge into VLLM

- LLMs and Natural Language Generation- avoidance of Hallucination, Ensuring of 3Cs

VLLM experiments

Metaphor → Normal

Normal → Metaphor

Metaphor to normal conversion: Prompts

- **Input**: I'm drowning in a sea of grief → **output**: I am very sad

- **Input**: He flared up → **output**: He is really angry

- **Input**: I'm feeling blue → **output**: I'm feeling sad

Metaphor to normal conversion: Testing

- **Input**: It is raining cats and dogs → **output**: It is raining heavily

- **Input**: Making chocolate chip cookies is a piece of cake → **output**: Making chocolate chip cookies is easy

- **Input**: Rohan is a night owl → **output**: Rohan is a person who stays up late at night

- **Input**: Bill is an early bird → **output**: Bill is an early riser.

Metaphor generation: Prompts

- **Input**: The area became hot → **Output**: Heat engulfed the area

- **Input**: This is a very good thing to have additionally→ **output**: This is the icing on the cake.

- **Input**: I'm feeling sad → **Output**: I'm feeling blue.

Metaphor generation: : Testing

- **Input**: His words were very harsh → **Output**: His words were like a dagger

- **Input**: She is going through a lot of ups and downs → **Output**: She is on a roller coaster ride

- **Input**: He is a very energetic fellow → **Output**: He is a ball of fire

Emergence of Multilingual Models for Foundational NLP Tasks

- Single Neural Model for Computational Morphology across Languages

- Single Neural Model for Lower Layers of NLP Stack- POS, Chunk, NER

Three main umbrellas

- Machine Translation

- Sentiment and Emotion

- Information Extraction

Our Industry and Govt.Partners

- IBM
- Accenture
- Adobe
- LG
- Elsevier
- Ministry of Information technology

- Google
- Meta
- L & T Infotech
- Erosnow
- Ministry of Education
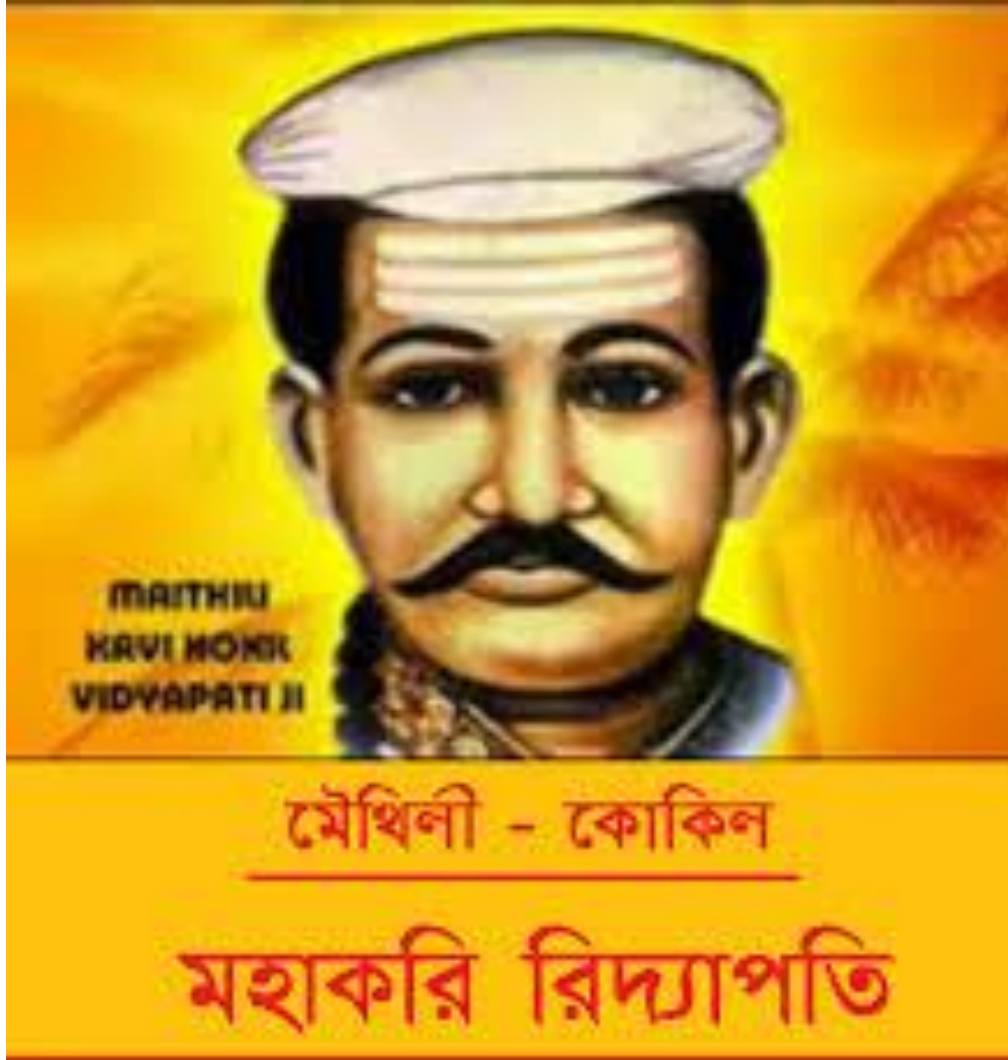- Gupshup
- Samsung
- DRDO
- OtherIITs, IIITs, IISc

Theme: Machine Translation and Multilinguality
focus
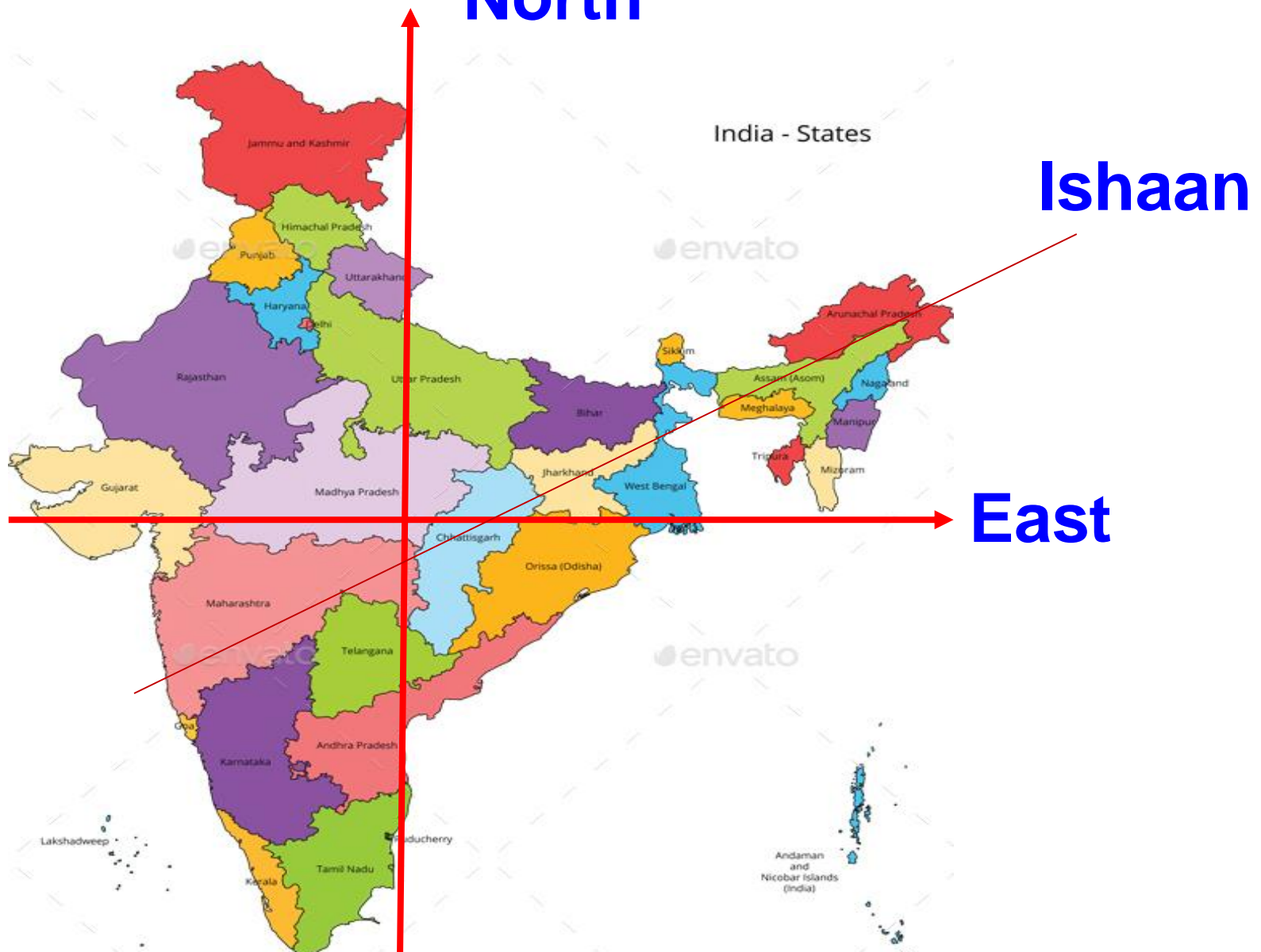## "Speech to Speech Machine Translation"

VIDYAAPATI
(Bengali, Hindi, Konkani, Maithili, Marathi)

MAITHILI
KAVI KOKIL
VIDYAPATI JI

মৈথিলী – কোকিল

মহাকরি রিদ্যাপতি

জয় জয় ভৈরবি

জয় জয় ভৈরবি অসুরভযাবনি
পসুপতিভামিনি মাযা ।
সহজসুমতিবর দিযহু গোসাইনি
অনুগতগতি তুঅ পাযা ॥ ১
বাসররৈনশবাসনশোভিত-
চরণচন্দ্রমণিচুডা ।
কঁটকদৈত্য মারি মুখ মেঁ লেল
কটউ উঁগলী করি কুডা ॥ ২
সাগরবরননযন অনুরঞ্জিত
জলদজোগফল কোঁকা ।
কটকটবিকট হোঁঠ ফরকটলি
সিন্দুর ফেন উঠি ফোঁকা ॥ ৩
ঘনঘনঘনন ঘুঁঘরু কট বাজত
হনহন কর তুঅ কাটা ।
বিদ্যাপতি কবি তুঅ পদসেবক
পুত্রবিসারি জনি মাতা ॥ ৪

ISHAAN (Assamese, Bodo, English, Hindi, Manipuri, Nepali)

North

Ishaan

East

India - States

MT Team

- Akshay Batheja (M.Tech)- High Quality Parallel text Extraction from Comparable Coprora

- Shivam Masker (M.Tech)- Pivot Base Neural Machine Translation (MT Summit)

- Sourabh Deghare (PhD)- Post Editing, Quality Estimate

- Vineet Bhatt (Dual Degree): ASR in low resource

- Paramveer Chaudhury (M.Tech): MT Evaluation, QE

- Arif Ahmad (Dual Degree): Disfluency Correction

MT Team cntd

- Jyotsna Khatri (PhD, to submit): Low Resource MT, Meta Learning in MT

- Tamali Banerjee (PhD Thesis Submitted): Unsupervised MT

Many tools and demoes

- https://www.cfilt.iitb.ac.in/ssmt/speech2speech
- https://www.cfilt.iitb.ac.in/mtsystem/translate
- https://www.cfilt.iitb.ac.in/text2speech/
- https://www.cfilt.iitb.ac.in/phonemizer/

Press

- Times of India: https://timesofindia.indiatimes.com/city/mumbai/iit-bombay-heads-for-mega-rd-meet-of-all-23-iits/articleshow/94822028.cms

- Indian Express: https://indianexpress.com/article/cities/mumbai/iit-bombay-technology-speech-to-speech-translation-english-marathi-8204632/

- The Hindu: https://www.thehindu.com/sci-tech/technology/iit-bombay-software-to-enable-live-translations-in-regional-languages-inside-classrooms/article66014459.ece?homepage=true

Theme: Sentiment, Emotion, Cognitive NLP

Wheel of emotions

Plutchik (1982)

SA, EA, Cognitive NLP, Computational Psychology Team

- Divyank Tiwari (M.Tech)- Multimodal, Gaze Assisted Sarcasm

- NVS Abhishek (M.Tech)- Emotion Analysis from Speech Signal

- Swaroop Nath (MS): Sentiment and Summarization in Conversational Setting

- Sapan Shah (PhD)- Retrofitting Embeddings for Emotion Analysis

Theme: Data and Model Bias, Explainability

Bias, Explainability,etc. Team

- Nihar Ranjan Sahoo (PhD)- Models for Bias, Stereotype, Sensitivity

- Sandeep Singhamshetty (M.Tech): Half Truth, Fake News etc.

- Gyanaprasad Beria (B.Tech)- Multilingual Bias Detection

- Hiren Bavaskar (B.tech)- Explainability

Theme: Information Extraction

IE Team

- Saiful Haq (PhD)- IR and Recommendation Systems
- Narjis Asad (PhD)- Bias Detection (focus- movies)
- Ashutosh Sharma (B.Tech)- IR and Recommendation
- Tanu Goyal (B.tech)- Large Language Models
- Sravanthi (PhD)- Deep Reasoning
- Avadhut (PhD)- ML for Physics (prediction of Properties from material structures)
- Tejpal Singh (MS): Summarization in E-Commerce
- Dishank (MS): Automatic Grading of Students' Long Answers

Theme: Natural Language Generation, Text to Speech, Rare Language Phenomena

NLG,TTS, Rare Language Phenomena Team

- Ashita Saxena (M.Tech)- Ellipsis, Coreference, Cohesion, Coherence

- Paval Kalyan (Dual Degree)- Narrative Generation from Stories

- Naveen Badathala (M.Tech): Hallucination Detection, Metaphor, Hyperbole

- Abisekh R K (MS): Context and Caption Consistency with Image

Theme: Knowledge Graph, Deep Learning

Focus on Question Answering, Text Entailment

KG-DL-QA Team

- Kaveri Kale (PhD)- Knowledge Graph in Medical Domain

- Ankush Agrawal (MS)- Question Answering, Knowledge Graphs

- Sakharam (M.Tech)- Question Answering and Knowledge Graphs

- Apurva Kulkarni (Dual Degree)- Intent Detection in Conversational AI

- Divyanshi Kamra (Dual Degree)- Intent Detection in CAI

Summary

- Arguably the topmost NL group in the country

- Visible Internationally

- Covers all major areas of NLP-ML

Home page:
http://www.cse.iitb.ac.in/~pb
Lab page:
http://www.cfilt.iitb.ac.in