

# Artificial Intelligence in the Last Frontier

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# Where Did I Start?



2016 15th IEEE International Conference on Machine Learning and Applications

## Inferring Hearing Loss from Learned Speech Kernels

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Lisa Lucks Mendel<sup>3</sup>, Sungmin Lee<sup>3</sup>, Chhayakanta Patro<sup>3</sup>, Monique Pousson<sup>3</sup>

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*Abstract*—Does a hearing-impaired individual's speech reflect his hearing loss, and if it does, can the nature of hearing loss be inferred from his speech? To investigate these questions, at least four hours of speech data were recorded from each of 37 adult individuals, both male and female, belonging to four classes: 7 normal, and 30 severely-to-profoundly hearing impaired with high, medium or low speech intelligibility. Acoustic kernels were

speech. The speech production characteristics of individuals with hearing impairment have been described in depth by a number of researchers [2], [6]–[8], indicating several notable features that are distinct to this population, including omission, substitution, and place of articulation errors. The frequency of errors increases with the degree of hearing loss. Abnormal

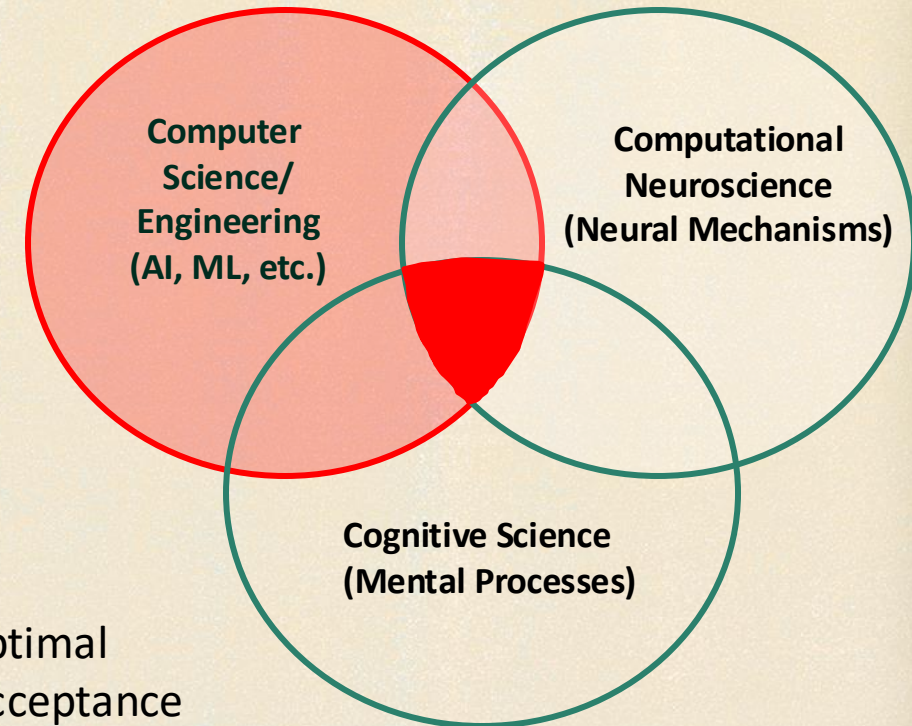
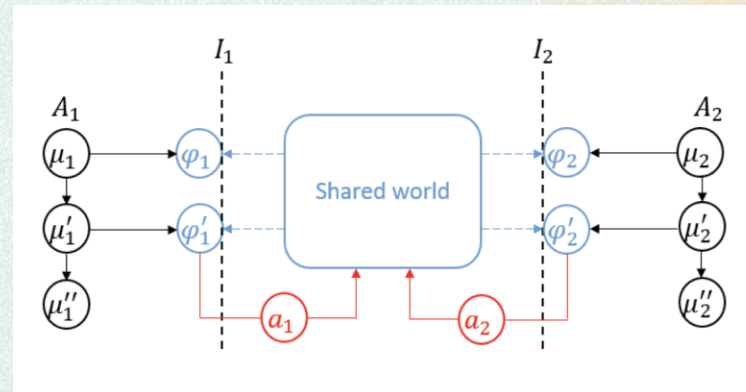
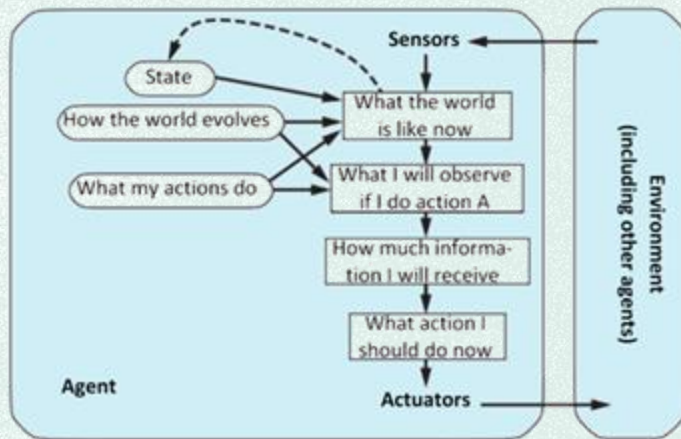
### V. ACKNOWLEDGMENT

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Learned about the potential of AI to assist and improve human lives.

# What is My Research About?

Beyond One-Size-Fits-All: Developing personalized, robust, and efficient AI models.



**M. H. Kapourchali** and B. Banerjee. (2020) "EPOC: Efficient perception via optimal communication", Thirty-Fourth AAAI Conference on Artificial Intelligence [Acceptance rate  $1591/7737=20.56\%$ ]

**M. H. Kapourchali** and B. Banerjee. (2019) "State estimation via communication for monitoring", IEEE Transactions on Emerging Topics in Computational Intelligence.

# UAA Students' Contributions to AI

- ✓ CSCE A405 Artificial Intelligence
- ✓ CSCE A415 Machine Learning
- ✓ CSCE A485 Computer and Machine Vision
- ✓ CSCE A605 Advanced Artificial Intelligence
- ✓ CSCE A615 Advanced Machine Learning
- ✓ CSCE A685 Advanced Computer and Machine Vision



2023 International Conference on Machine Learning and Applications (ICMLA)

## Igniting Precision: Amplifying Wildfire Prediction in Diverse Regions via Teacher-Student Model Fusion

Michael Lindemann<sup>1</sup>, Kathleen DeMichele<sup>2</sup>, Masoumeh Heidari Kapourchali<sup>2</sup>, Mohammad Heidari Kapourchali<sup>1,4</sup>, Christine Waigl<sup>3</sup>, Erin Trochim<sup>4</sup>, Long Zhao<sup>5</sup>

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## Unsupervised Learning for Exploring Hidden Structures in Self-Talk

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**Abstract**—Innerspeech decoding from EEG data holds significant importance due to its potential to revolutionize human-machine interaction and communication systems. Leveraging the power of temporal shift-invariant sparse coding, this study explores the unsupervised learning of inner-speech patterns using EEG, a prominent modality in body sensor networks. By analyzing EEG data to investigate the characteristics of inner speech, requires sophisticated signal processing techniques, machine learning algorithms, and personalized datasets. In addition, the real-time and online nature of inner speech decoding poses additional computational challenges, as it requires processing and analyzing data in a time-sensitive manner [3]. Developing efficient and robust algorithms capable of handling the high-

The poster includes the following sections:

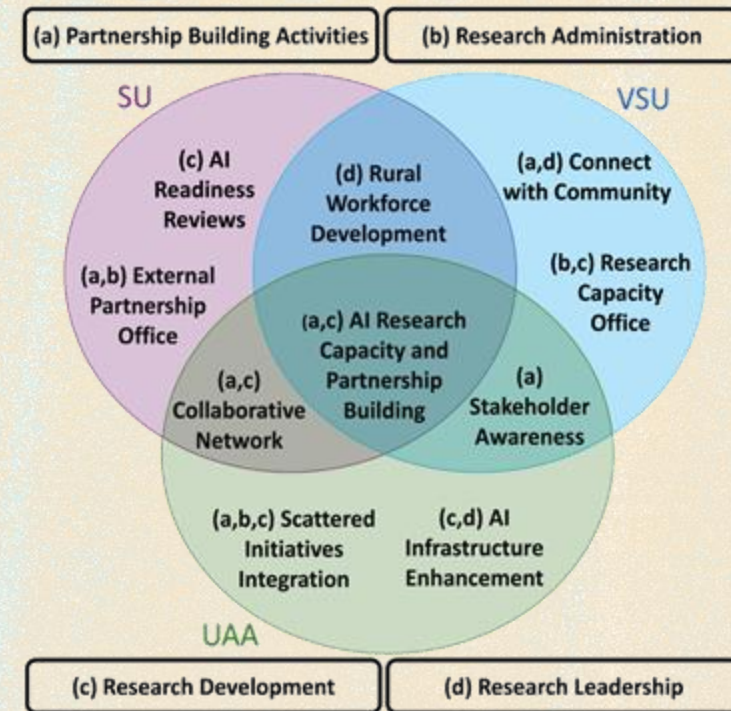
- Background:** Brain Computer Interfaces (BCI) are at the forefront of human-computer interaction, and have proven to be a promising tool for a wide range of computer systems. However, a major obstacle in the development of BCI systems is the lack of a standardized protocol for data gathering, such as EEG, to consistently monitor and interpret neural data. The distinctive attributes of an individual's inner speech can give us the ability to better understand the user's mental state and improve the user's experience.
- Dataset:** In this study, we utilized the 'Thinking out loud' dataset, collected by Hesse et al. [1], to investigate inner speech patterns. The dataset uses EEG data from ten individuals, across 6 months (10 days) and 6 months of word repetition conditions.
- Experimental Results:** For each subject, the results were based and tested on an EEG part of the data and a different part of the data. The performance evaluation involved several analyses, including a heat map generated to visualize the sparse coding between inner speech and hidden structures across the data (Figure 2).
- Models and Methods:** Learning temporal representations from time series poses a significant challenge due to the complex nature of temporal patterns [1]. It has been shown that the sparse coding approach to learning meaningful features from time series by using TSP (temporal sparse coding) [2].

The poster also features a flowchart of the methodology and a table of results. The table shows performance metrics for different subjects and conditions.

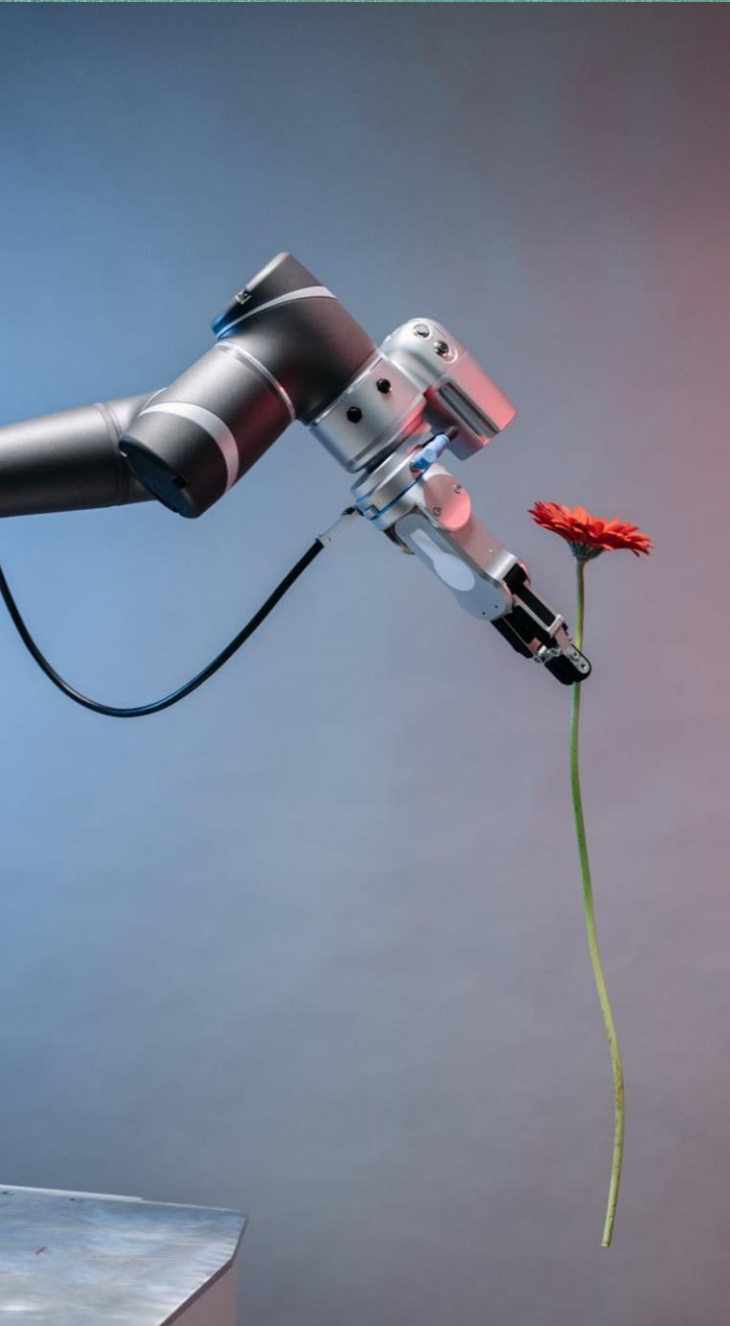
# Sample Current Project



NSF Enabling Partnerships to Increase Innovation Capacity (EPIIC) Workshop-Atlanta



Award Abstract # 2433241  
 Collaborative Research: EPIIC: Rural AI Solutions and Engagement (RAISE)



Thank You!

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