Nataraj K S

774/31, Kuvempu A1 Cross, Stage 2, Shivakumaraswamy layout, Davangere, Karnataka

Email: nattaruda@gmail.com
Mobile: +91-887-953-8379

EDUCATION

Ph.D.	Electrical Engineering Dept., IIT Bombay	Aug. 2014 – Sep. 2021
M.Tech.	Electrical Engineering Dept., IIT Bombay	July 2009 – June 2012
B.E.	Electronics & Comuunication Engg., BIET, Davangere	Sep. 2001 – June 2005

AREAS OF INTEREST

- Speech and Audio Processing
- Signal Processing
- Embedded Systems
- Machine Learning

RESEARCH EXPERIENCE

Ph.D. Thesis
Estimation of place of articulation of fricatives from spectral parameters using artificial neural network Aug. 2014 – Sep. 2021

Speaker-independent estimation of the place of articulation (PoA) of fricatives from spectral parameters.

- Developed an automatic technique to estimate PoA from irregular-shaped oral cavity contours obtained from imaging techniques [11].
- Developed new spectral parameters to estimate PoA of consonants by studying the relationship between the spectral parameters and PoA obtained from imaging techniques, and estimated PoA using GMM and artificial neural networks [1], [7], [9].
- Improved estimation of PoA by using spectral parameters during vocalic transition segments [2], [5].

Visual speech-training aid with feedback of articulatory efforts

- Developed a system for a dynamic display of vocal tract shape to provide visual feedback using 2D mid-sagittal view of the vocal tract with variable rate animation [10].
- Based on inputs from speech therapists and teachers, included the time-aligned display of the frontal view of the speaker's face along with playback of the time-scaled speech [4], [15].

Epoch detection using Hilbert envelope for glottal excitation enhancement and maximum-sum subarray for epoch marking [3], [14]: Development of a technique for detecting glottal excitation epochs in the speech signal which provides consistent performance for different kinds of speech signal including those with voice disorders, and for telephone-quality speech.

M.Tech. Thesis July 2009 – June 2012
Estimation of vocal tract shape for speech training aids

- Developed a method for improving the consistency of vocal tract shape estimation by selecting the frames based on windowed energy index [13].
- Developed an automatic technique for the detection of transition segments in vowel-consonant-vowel utterance for estimation of the place of closure of oral stops [12].

PROFESSIONAL EXPERIENCE

Advanced Analytics Intern, Lilly Capability Center India, Bangalore Oct. 2021 – Jan. 2022

Alzheimer's detection from spontaneous speech signal.

Senior Design Engineer, Tensilica Technologies India, Pune July 2012 – July 2014

Optimization of audio processing algorithms on Tensilica processors

- Optimization of mp3 encoder algorithms on HiFi2 processor (31% reduction in computation cycles over first level optimized code)
- Optimization of Dolby Audio Post-processing (DAP) algorithms on HiFi 2 processor (40% reduction in computation cycles over first level optimized code).

Senior Software Engineer, Robert Bosch Engineering & Business Solutions Ltd., Bangalore Sep. 2005 – Aug. 2008

Software development (Requirement Analysis, Design, Coding and Testing) of Electronic Control Unit (ECU) functions for automotive diesel systems for Japanese customer

- Development of diagnostic lamp driver, diagnostic system management software, and CAN software (configuration on ECU, scheduling, error handling, & system data calibration).
- Developed the functionality for excavator control similar to cruise control.
- Coordinated between software & system team for 3 months at Bosch Japan
- Worked as a system engineer for on-vehicle testing for 2 months at Bosch Germany.

AWARDS AND HONOURS

- Second prize in ISCA endorsed 5 minute PhD thesis contest, Summer School on Speech Processing, DAIICT, Gandhinagar, 2019.
- Excellence in teaching assistantship, Dept. of Electrical Engg., IIT Bombay , Mumbai, 2017.
- Best student paper award, NCVPRIPG 2015, IIT Patna , Patna, 2015.

PUBLICATIONS

Journals

1. **K. S. Nataraj**, P. C. Pandey, and H. Dasgupta "Estimation of place of articulation of fricatives from spectral parameters using artificial neural network", (under review).
2. **K. S. Nataraj**, P. C. Pandey, and H. Dasgupta "Estimation of place of articulation of fricatives using spectral parameters during frication and vocalic transition segments", (under preparation).
3. H. Dasgupta, P. C. Pandey, and **K. S. Nataraj**, "Epoch detection using Hilbert envelope for glottal excitation enhancement and maximum-sum subarray for epoch marking, *IEEE J. Sel. Topics in Signal Process.*, vol. 14, no. 2, pp. 461–471, 2020. (Citations : 4)

Conferences

4. Pramod H. K., P. C. Pandey, V. Mane, H. Dasgupta, **K. S. Nataraj**, A. Rathod, and S. K. Pathak "ViSTAFAE: A Visual Speech-Training Aid with Feedback of Articulatory Efforts," accepted for publication in *INTERSPEECH* 2021, Brno, Czechia, 2021.
5. **K. S. Nataraj**, P. C. Pandey, and H. Dasgupta, "Effect of frication duration and formant transitions on the perception of fricatives in VCV utterances," in *Proc. IEEE Int. Conf. Acoust. Speech Signal Process. 2020 (ICASSP 2020)*, Barcelona, Spain, 2020, pp. 6259–6263.
6. **K. S. Nataraj**, H. Dasgupta, and P. C. Pandey, "Early indirect techniques for estimating the vocal tract area function," in *Proc. 3 rd Int. Workshop History Speech Commun. Res. (HSCR 2019)*, Vienna, Austria, 2019.

7. **K. S. Nataraj**, P. C. Pandey, and H. Dasgupta, "Estimation of place of articulation of English fricatives using the modified dominant spectral centroid and slope as the spectral parameters," in *Proc. Int. Workshop Speech Process. Voice Speech Hear. Disorders 2018 (WSPD 2018)*, Mysore, India, 2018, paper no. 39.
8. H. Dasgupta, P. C. Pandey, and **K. S. Nataraj**, "Detection of glottal excitation epochs in speech signal using Hilbert envelope," in *Proc. 19th Annual Conf. Int. Speech Commun. Association (INTERSPEECH 2018)*, Hyderabad, India, 2018, pp. 2132–2136. (Citations : 1)
9. **K. S. Nataraj**, P. C. Pandey, and H. Dasgupta, "Estimation of place of articulation of fricatives from spectral characteristics for speech training," in *Proc. 18th Annual Conf. Int. Speech Commun. Association (INTERSPEECH 2017)*, Stockholm, Sweden, 2017, pp. 339–343. (Citations : 4)
10. R. Jain, **K. S. Nataraj**, and P. C. Pandey, "Dynamic display of vocal tract shape for speech training," in *Proc. National Conf. Commun. 2016 (NCC 2016)*, Guwahati, India, 2016, paper no. 1570220186. (Citations : 2)
11. **K. S. Nataraj** and P. C. Pandey, "Place of articulation from direct imaging for validation of its estimation from speech analysis for use in speech training," in *Proc. 5th National Conf. Computer Vision, Pattern Recognition, Image Process., and Graphics 2015 (NCVPRIPG 2015)*, Patna, India, 2015, paper ID 88. (Citations : 3)
12. Jagbandhu, **K. S. Nataraj**, and P. C. Pandey, "Detection of transition segements in VCV utterences for estimation of the place of closure of oral stops for speech training", in *Proc. 13th Annual Conference of the International Speech Communication Association (Interspeech 2012)*, Portland, Oregon, 2012, pp. 406–409.
13. **K. S. Nataraj**, Jagbandhu, P. C. Pandey, and M. S. Shah, "Improving the consistency of vocal tract shape estimation," in *Proc. National Conference on Communications 2011 (NCC 2011)*, Bangalore, India. (Citations : 10)

Patent Application

14. P. C. Pandey, H. Dasgupta, and **K. S. Nataraj**, "Real-time pitch tracking by detection of glottal excitation epochs in speech signal using Hilbert envelope," US Patent Application Publication No. US2021/0201938A1, 1 Jul 2021, PCT Application No. WO2020/044362 A2 03 Aug 2019, Indian Patent Application No. 201821032901, 01 Sep 2018.
15. P. C. Pandey, P. H. Kachare, H. Dasgupta, **K. S. Nataraj**, and V. Mane, "Method and system for time-scaled audiovisual feedback of speech production efforts," Indian Patent Application No. 202121033606, 27 Jul 2021

COURSES

Credit courses at IIT Bombay

- Speech Processing
- Digital Signal Processing
- DSP system Design
- Digital Image Processing
- Embedded System Design
- Applied Linear Algebra

Online courses

- Machine Learning (Stanford University, Coursera)
- Neural Networks and Deep Learning (deeplearning.ai, Coursera)
- Improving Deep Neural Networks (deeplearning.ai, Coursera)
- Convolutional Neural Networks (deeplearning.ai, Coursera)
- Structuring Machine Learning Projects (deeplearning.ai, Coursera)