DEEPAK **BABY**

| | | |

Experience

Applied Scientist
Oct 2020 – Present

Amazon Alexa AGI
Aachen, Germany.

- Working on developing state-of-the-art multi-modal architectures leveraging large language models.
- Lead scientist in establishing incremental learning framework for Alexa ASR models for model freshness and hotfixing.
- Develop and maintain speech recognition models for Alexa devices on multiple languages.
- Close collaboration with various engineering teams automating the production model builds.
- Extensive experience in working with big data, developing machine learning models and continuously improving them for prod deployment.

Post-doctoral Researcher
May 2019 - June 2020

IDIAP Research Institute
Martigny, Switzerland.

- Post-doctoral research fellow in the SNSF project 'SHISSM' with Prof. Hervè Bourlard.
- Collaborated with several PhD students providing support and guidance on their research.
- Developed speech enhancement (denoising and dereverberation) approaches using variational and adversarial auto-encoders.

Post-doctoral Researcher
Feb 2017 - Apr 2019

Ghent University
Ghent, Belgium.

- Post-doctoral research fellow in the ERC project 'RobSpear' with Prof. Sarah Verhulst.
- Developed neural network-based machine learning techniques for modelling and correcting hearing impairment.
- Seminal work on using neural networks for approximating computational auditory models and hearing aids.
- Patent on neural network-based computational auditory models and publications in Nature: Machine Intelligence and Nature Communications.
- The patent was eventually granted $1M ERC funding for startup.

Visiting Researcher
Apr - Jun 2015

Nuance Communications Inc.
Merelbeke, Belgium.

- Investigated the previously proposed exemplar-based speech enhancement approaches as front-end for Nuance's ASR tasks on automotive data.

Visiting Researcher
Jun - Aug 2013

Tampere University of Technology
Tampere, Finland.

- Internship with Prof. Tuomas Virtanen, Audio Research Group, Dept. of Signal Processing.
- Investigated the use of Modulation Envelope features for feature enhancement to improve the noise robustness of Automatic Speech Recognition systems

Teaching Assistant
2013 - 2016

KU Leuven
Leuven, Belgium..

- Conducted the exercise sessions for the course *'Stochastic Signal and System Analysis'*.

Education

KU Leuven
Leuven, Belgium.

Doctor of Philosophy (PhD)
2012 - 2016

Thesis : *Non-negative Sparse Representations for Speech Enhancement and Recognition*
Supervisor: Prof. Hugo Van hamme

IIT Bombay
Mumbai, India.

Master of Technology (M.Tech)
2010 - 2012

Specialization: Communication and Signal Processing (GPA: 9.45/10)
Thesis : *Extensions to Greedy Algorithms in Compressed Sensing*
Supervisor : Prof. Sibi Raj B Pillai

College of Engineering
Trivandrum, India.

Bachelor of Technology (B.Tech)
2005 - 2009

Specialization: Electronics and Communication Engineering (GPA: 7.57/10)

Skills

Programming: Python, Tensorflow, PyTorch
Cloud Infrastructure and DevOps: AWS, SageMaker, Docker, CI/CD, GNU/Linux
Data Engineering: PySpark, Pandas

Patents & Publications

Patents

NEURAL NETWORK MODEL FOR COCHLEAR MECHANICS AND PROCESSING
Deepak Baby, Sarah Verhulst, Fotios Drakopoulos, Arthur Van Den Broucke
U.S. Patent 11 800 301, October 2023

Peer Reviewed Journals

Biophysically realistic neural-network models of auditory neurons and synapses for neuroscience and machine-hearing applications
Sarah Verhulst, Fotios Drakopoulos, Arthur Van Den Broucke, **Deepak Baby**
JOURNAL OF COMPUTATIONAL NEUROSCIENCE, 2021, Online

A convolutional neural-network model of human cochlear mechanics and filter tuning for real-time applications
Deepak Baby, Arthur Van Den Broucke, Sarah Verhulst
Nature Machine Intelligence 3.2 (Feb. 2021) pp. 134–143. 2021

A convolutional neural-network framework for modelling auditory sensory cells and synapses
Fotios Drakopoulos, **Deepak Baby**, Sarah Verhulst
Communications Biology 4.1 (June 2021) p. 827. 2021

Automated speech analysis to improve TMS-based language mapping: Algorithm and proof of concept
Laura Seynaeve, **Deepak Baby**, Hugo Van hamme, Steven De Vleeschouwer, Patrick Dupont, Wim Van Paesschen
Brain Stimulation: Basic, Translational, and Clinical Research in Neuromodulation (Oct. 2019). Elsevier, 2019

Joint Denoising and Dereverberation Using Exemplar-Based Sparse Representations and Decaying Norm Constraint
Deepak Baby, Hugo Van hamme
IEEE/ACM Trans. Audio, Speech & Language Processing 25.10 (2017) pp. 2024–2035. 2017

Coupled Dictionaries for Exemplar-Based Speech Enhancement and Automatic Speech Recognition
Deepak Baby, Tuomas Virtanen, Jort F. Gemmeke, Hugo Van hamme
IEEE/ACM Trans. Audio, Speech & Language Processing 23.11 (2015) pp. 1788–1799. 2015

Conferences & Workshops

Residual Adapters for Targeted Updates in RNN-Transducer based Speech Recognition System
Sungjun Han, **Deepak Baby**, Valentin Mendelev
Spoken Language Technology Workshop (SLT), 2022 IEEE, 2023, Doha, Qatar

Incremental learning for RNN-Transducer based speech recognition models
Deepak Baby, Pasquale D'Alterio, Valentin Mendelev
INTERSPEECH, 2022, Incheon, South Korea

Speech Dereverberation Using Variational Autoencoders
Deepak Baby, Hervé Bourlard
Acoustics, Speech and Signal Processing (ICASSP), 2021 IEEE International Conference on, 2021

Hearing-Impaired Bio-Inspired Cochlear Models for Real-Time Auditory Applications
Arthur Van Den Broucke, **Deepak Baby**, Sarah Verhulst
INTERSPEECH, 2020, Shanghai, China

SERGAN: Speech Enhancement using Relativistic Generative Adversarial Networks with Gradient Penalty
Deepak Baby, Sarah Verhulst
Acoustics, Speech and Signal Processing (ICASSP), 2019 IEEE International Conference on, 2019, Brighton, UK

Real-Time Audio Processing on a Raspberry Pi using Deep Neural Networks
Fotios Drakopoulos, **Deepak Baby**, Sarah Verhulst
23rd International Congress on Acoustics (ICA), 2019, Aachen, Germany

Biophysically-inspired Features Improve the Generalizability of Neural Network-based Speech Enhancement Systems
Deepak Baby, Sarah Verhulst
Proc. INTERSPEECH, 2018, Hyderabad, India

Supervised Speech Dereverberation in Noisy Environments using Exemplar-based Sparse Representations
Deepak Baby, Hugo Van hamme

Acoustics, Speech and Signal Processing (ICASSP), 2016 IEEE International Conference on, 2016, Shanghai, China

Exemplar-based Speech Enhancement for Deep Neural Network based Automatic Speech Recognition
Deepak Baby, Jort F. Gemmeke, Tuomas Virtanen, Hugo Van hamme
Acoustics, Speech and Signal Processing (ICASSP), 2015 IEEE International Conference on, 2015, Brisbane, Australia

Hybrid Input Spaces for Exemplar-based Noise Robust Speech Recognition using coupled dictionaries
Deepak Baby, Hugo Van hamme
23rd European Signal Processing Conference (EUSIPCO), 2015, Nice, France

Investigating Modulation Spectrogram Features for Deep Neural Network-based Automatic Speech Recognition
Deepak Baby, Hugo Van hamme
Proc. INTERSPEECH, 2015, Dresden, Germany

Noise Robust Exemplar Matching for Speech Enhancement: Applications to Automatic Speech Recognition
Emre Yilmaz, **Deepak Baby**, Hugo Van hamme
Proc. INTERSPEECH, 2015, Dresden, Germany

Noise Robust Exemplar Matching with Coupled Dictionaries for Single-Channel Speech Enhancement
Emre Yilmaz, **Deepak Baby**, Hugo Van hamme
23rd European Signal Processing Conference (EUSIPCO), 2015, Nice, France

Coupled Dictionary Training for Exemplar-based Speech Enhancement
Deepak Baby, Tuomas Virtanen, Tom Barker, Hugo Van hamme
Acoustics, Speech and Signal Processing (ICASSP), 2014 IEEE International Conference on, 2014, Florence, Italy

Exemplar-based Noise Robust Speech Recognition using Modulation Spectrogram Features
Deepak Baby, Tuomas Virtanen, Jort F. Gemmeke, Tom Barker, Hugo Van hamme
Spoken Language Technology Workshop (SLT), 2014 IEEE, 2014, South Lake Tahoe, USA

Ordered Orthogonal Matching Pursuit
Deepak Baby, Sibi Raj B. Pillai
Communications (NCC), 2012 National Conference on, 2012, Kharagpur, India

Preprints

iSEGAN: Improved Speech Enhancement Generative Adversarial Networks
Deepak Baby
CoRR abs/2002.08796 (Mar. 2020). 2020