

Badri N. Patro

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Research Interests: Computer Vision, Natural language Processing & Machine Learning.

Education

- 2016–Present **Doctor of Philosophy in Electrical Engineering**, *Indian Institute of Technology Kanpur, India*, Specialized in Communication & Signal processing.
- 2009–2012 **Masters of Technology in Electrical Engineering**, *Indian Institute of Technology Bombay, India*, Specialized in Communication & Signal processing.
- 2003–2007 **Bachelor of Technology in Electronic & Tele Communication Engineering**, *National Institute of Science and Technology, Brahmapur, Orissa*.

Conference Publication

- 2019 **Badri N. Patro, Mayank Lunayach, Shivansh Patel, Vinay P. Namboodiri**, “U-CAM: Visual Explanation using Uncertainty based Class Activation Maps”, International Conference on Computer Vision (ICCV), Seoul Korea, 2019.
- 2018 **Badri N. Patro, Sandeep Kumar, Vinod K. Kurmi, Vinay P. Namboodiri**, “Multimodal Differential Network for Visual Question Generation”, Conference on Empirical Methods in Natural Language Processing (EMNLP), Belgium, 2018.
- 2018 **Badri N. Patro*, Vinod K. Kurmi*, Sandeep Kumar*, Vinay P. Namboodiri**, “Learning Semantic Sentence Embeddings using Pair-wise Discriminator”, Proceedings of 27th International Conference on Computational Linguistics (COLING 2018), Santa Fe, New Mexico, USA, 2018.
- 2018 **Badri N. Patro, Vinay P. Namboodiri**, “Differential Attention for Visual Question Answering”, Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Salt Lake City, Utah, USA, 2018.
- 2014 **Badri N. Patro**, “Design and implementation of novel image segmentation and BLOB detection algorithm for real-time video surveillance using DaVinci processor”, International Conference on Advances in Computing, Communications and Informatics ICACCI, pp. 1909-1915, India, Sept 2014.

Work Experience

- 2019(May–July) **Microsoft India (R&D) Pvt. Ltd.**, *Data Scientist Intern*, Bing-Vision, Hyderabad.
- Design & developed Multimodal Transformer for active tag prediction.
 - Created Multimodal Active Tag Prediction dataset .

- 2013–2015 **Samsung R&D Institute, Delhi**, *Lead Engineer*, Audio Processing and Multimedia on Tizen D2TV, Delhi, India.
- Design & developed audio processing modules for Visual Impaired people in IPTV.
 - Designed subtitle, Teletext and caption modules for MPEG-2 TS & rendered in D2TV.
 - Worked on audio and language modules for IPTV at Samsung Electronics, **South Korea**.
- 2012–2013 **Harman International Limited**, *Associate Software Engineer*, Multimedia and Audio Processing, Pune, India.
- Design and implemented audio post processing algorithms (Parametric Equalizer, Doppler Effect, DRC and SRC) for car audio acoustic system using OMAP3530 processor.
- 2007–2009 **Larsen & Toubro EmSyS Ltd, Mysore**, *Assistant Software Engineer*, DC to DC and AC to DC Power Converter Designer .
- Design and developed an end-to-end hardware module for universal input AC-DC Power Converter using Flyback Topology.
 - Design and developed an end-to-end hardware module for DC-DC converter using Active Clamp Technology. Also, also controlled (PD,PID) all the dc-dc modules by generating PWM signal using CPLD.

Teaching Experience

- 2019 **Tutor**, *ESC201: Introduction to Electronics*, Autumn, IIT Kanpur .
- 2019 **Teaching Assistant**, *MSO201A: Probability and Statistics*, Winter, IIT Kanpur .
- 2018 **Tutor**, *ESC201: Introduction to Electronics*, Autumn, IIT Kanpur .
- 2018 **Teaching Assistant**, *Research Lab Development Committee*, Summer, IIT Kanpur.
- 2018 **Teaching Assistant**, *Department Post-Graduation Committee*, Winter, IIT Kanpur.
- 2017 **Teaching Assistant**, *ESC201: Introduction to Electronics*, Autumn, IIT Kanpur.
- 2017 **Teaching Assistant**, *ESC201: Introduction to Electronics*, Summer, IIT Kanpur .
- 2017 **Teaching Assistant**, *EE301A: Digital Signal processing*, Winter, IIT Kanpur.
- 2016 **Teaching Assistant**, *EE601A: Image Signal processing*, Autumn, IIT Kanpur.
- 2012 **Research Assistant**, *Texas Instrument-Digital Signal processing Lab*, IIT Bombay.

PhD Research Work

Title **Multimodal Conversation systems using Encoder-Decoder based approaches.**
Supervisors -: Prof. Vinay P. Namboodiri.

Description, .

- Developing a conversation system based on Image-based Question Answering module, question generation module and Visual Dialog.
- Developed an Exemplar base Differential Attention for Visual Question Answering and Visual Question Generation (VQG).
- Analyzing Model Uncertainty in VQG module using Bayesian architecture.
- Understanding Data Uncertainty (aleatoric) and Modal Uncertainty (epistemic) for diverse answer generation in Visual Dialog model.
- Enhancing Attention of Visual Question Answering and Visual Dialog Module using interpretation of the answer module.
- Developed a Granular Attention Network for enhancing attention in Visual Dialog.

Github

- 2018 **Multimodal Differential Network for Visual Question Generation**, : .
 - o <https://badripatro.github.io/MDN-VQG/>.
- 2018 **Learning Semantic Sentence Embeddings using Pair-wise Discriminator**, : .
 - o <https://badripatro.github.io/Question-Paraphrases/>.
- 2018 **Differential Attention for Visual Question Answering**, : .
 - o <https://badripatro.github.io/DVQA/>.

Technical Course Projects

- 2016 Visual Question Answering.(Computer Vision)
- 2016 Object Recognition and Localization.(Selected Topics of Image Processing)
- 2016 Direction of Arrival Based Spatial Co-variance Model For Blind Source Separation. (Speech Signal Processing)
- 2016 Robust Video Stabilization Based on Particle Filter Tracking of Projected Camera Motion. (Video Processing)
- 2011 Run length encoding, Barrel Shifter, floating point adder & Bus behavior design Projects using VHDL and Verilog. (VLSI Design Lab)
- 2010 SENSE: Sensitive Encoding technique for Fast MRI using Back Projection. (Medical Image Processing)
- 2010 An Semi-Autonomous, External Command Reading White line Follower Robot. (Embedded System-Robotics)
- 2010 Adaptive Beamforming using microphone array for hands-free Telephony with the help of generalized side lobe technique. (Adaptive Signal Processing)
- 2010 Detection of Duplicate Forgery in Handwritten Signature using Statistical DWT & EDM.(Wavelet Transform)
- 2009 Frequency Code(LFM) and Phase code(Barker code) Pulse Compression Techniques in Mono Pulse Radar.(Digital Signal Processing)

Industrial Workshops

- 2017 Summer school on advance computer vision using Deep learning (DL for vision and language(Caption, VQA), DL for videos, object detection, semantic segmentation, Domain Adaption, and advances in 3D (IIITH).
- 2017 Summer School on Machine Learning using Deep Learning (optimization for DL, GAN, VAE, DL for RL and game theory)(IIITH).
- 2016 Mysore Park Workshop on Vision, Language and AI (Video Caption, guided LSTM, GAN, Adversarial auto-encoders, reinforcement learning, deep contextual models)(VLAI 2016, Mysore).
- 2016 Summer School on computer vision using Deep Learning(CNN, RNN, Auto-encoder, optimization for DL, Symbolic DL & Face, Pose and Egocentric action recognition, model compression)(IIITH).

- 2012 Audio Engineering(Acoustics, Recording, Broadcasting Technology, Surround Sound, Microphones& Speakers) & Audio Post Processing (Harman International).

Technical skills

Deep learning Pytorch, Torch, Tensorflow.

Language : Lua, Python, C, C++, VHDL, Verilog, MATLAB.

Processor : DM6437, DM6467, OMAP3530, C5510, MSP430, PIC, u8059.

Tools : Source Insight, L^AT_EX, Rhapsody, Perforce, Beyond Compare.

IDE : Code Composer Studio, Xilinx, GHDL, Icurus Verilog, Keil, Sublime.

Analyzer : Audacity, Praat audio analysis, Eagle, Pspice.

Student Volunteer Awards

2018 Received Student Volunteer Award from EMNLP 2018.

2018 Received Student Volunteer Award from CVF for CVPR 2018.

Travel Grant Awards

2018 Received Conference Travel Grant from Microsoft India for EMNLP 2018.

2018 Received Conference Travel Grant from Google India for CVPR 2018.

2018 Received Conference Travel Grant from IIT Kanpur for COLING 2018.

2017 Selected in Quiz competition in Deep learning summer school for Computer Vision, IIITH.

2017 Selected in Quiz competition in Deep learning summer school for Machine Learning, IIITH.

Professional Service

2018 Served as a reviewer in conferences (such as CVPR-2018, ICVGIP-2018, ICCV-2019,WACV2020)

2018 Presented Poster on Visual Question Answering in ICVGIP Conference.

2017 Participated in ACM-MSR Summit 2018 at IIITH sponsored by Microsoft India

2017 Presented poster on Visual Question Answering in Advance Computer Vision using Deep Learning at IIITH.

2016 Participated in the Mysore Park workshop on Vision, Language and AI, sponsored by Google and Infosys.
