Nitthilan Kannappan Jayakodi

Curriculum Vitae

School of Electrical Engineering and Computer science
Washington state University
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Professional Summary

- Pursuing PhD in AI/ML. Interested in artificial general intelligence (AGI) and Deep generative models (GAN, VQVAE) for Video/Image/3D Graphics (GCN/CNN).
- 12 years of software product development experience with wide exposure in building end to end systems from embedded to web technologies.
- Passionate about developing optimized algorithms and exploring different domains. Developed video applications for conferencing, broadcast, and storage. Worked on ME/RC for H264/MPEG and developed plugin/webRTC/Html5 based video endpoints

AI in Animation: [Current Focus Area] Working on Neural scene representation for fast and high-quality free-viewpoint rendering. Extending the ideas of Neural Sparse Voxel Fields (NSVF, Liu et. al. 2020) and Neural Radiance Fields (NeRF, Mildenhall et. al. 2020) to

- Multi-resolution coarse to fine approach of learning
- Single image to scene representation
- Animate 3D objects by adding a time dimension.

PhD Research Summary

My PhD research is at the intersection of Machine Learning (ML) and Computing Systems (Sys). The overarching theme of my research is to bridge these two areas. Specifically, I'm working towards the vision of *Edge AI* to efficiently deploy AI solutions for emerging applications (e.g., robotics, self-driving cars, augmented/virtual reality, and smart health) on edge platforms that are constrained by resources (power, compute, and memory).

- Developed a novel hardware-aware design and optimization framework to trade-off power, performance, and accuracy for performing inference using deep neural networks.
- Studied effective instantiations of this framework for different applications: Convolutional neural networks for image classification, Graph convolutional networks for 3D computer vision, and Generative adversarial networks for image manipulation tasks.
- Published papers at top-tier venues including three journal papers (ACM/IEEE Transactions on CAD and Embedded Computing Systems) and four conference papers (AAAI, DAC, DATE, ICCAD). One journal paper is under review at Journal of Artificial Intelligence Research.

Education

Washington State University, Pullman, WA — Fall 2017 –
Doctor of Philosophy in Electrical and Computer Engineering (GPA 3.95)
Advisor: Prof. Jana Doppa
Research Topic: *Towards Edge AI: A Hardware-Aware Design and Optimization Framework to Efficiently Deploy Deep Neural Networks on Edge Platforms*

Anna University College of Engineering, Guindy, Chennai, India — 2000 – 2004
Bachelor of Engineering, ECE Department, 8.9 CGPA *First class with distinction*

DAV, Mogappair, Chennai, India. — 1998 – 2000
12th and 10th standard: 92.75% and 88%

Professional Appointments

Research Assistant, Washington State University, EECS — Aug 2017 – current

Teaching Assistant, Washington State University, EECS — Aug 2018 – May 2019
CptS 437: Introduction to Machine Learning
CptS 315: Introduction to Data Mining

Senior Staff Engg.
Polycom R&D, India — May 2012 - Jun 2017

Lead and Senior Engineer, Media Processing
Ittiam Systems, India — Oct 2009 - Apr 2012

Senior Design/Dev. Engineer, Product R & D Engineering
Tata Elxsi, India — Oct 2004 - Apr 2009

Awards and Honors

Richard Newton Young Fellowship, Special Interest Group on Design Automation — 2020

Nominated for Best Paper Award, DATE Conference — 2020

Selected to Present at DAC PhD Forum, Design Automation Conference (DAC) — 2020

Three-Minute VCEA Thesis Competition, Runner-Up, WSU — 2020

Harold and Diana Frank Electrical Engineering Fellowship, WSU — 2019

Harold and Diana Frank Electrical Engineering Fellowship, WSU — 2018

Crimson Code Hackathon, Runner-Up, WSU — 2018

Suksdorf Fellowship, WSU — 2017-2019

I-Corps, WSU Innovation Corps program participant — 2019

WESKA, WSU Entrepreneurship program participant — 2019

CEO Award, a Polycom worldwide recognition for outstanding technical contribution — 2016

Member of Technical Staff Recognition for technical leadership at Ittiam Systems — 2012

164th rank of 100000 students in Tamil Nadu Professional Courses Entrance Examination, India.

Top 0.1% across India in Mathematics in 10th Standard

Highly-Refereed Journal and Conference Publications

1. Shubhomoy Das, Md Rakibul Islam, **Nitthilan Kannappan Jayakodi**, and Janardhan Rao Doppa **Active Anomaly Detection via Ensembles: Insights, Algorithms, and Interpretability.** *Journal of Artificial Intelligence Research (JAIR), 2020.* Under Review.

2. Syrine Belakaria, Aryan Deshwal, **Nitthilan Kannappan Jayakodi**, and Janardhan Rao Doppa. **Uncertainty-Aware Search Framework for Multi-Objective Bayesian Optimization.** *Proceedings of AAAI Conference on Artificial Intelligence (AAAI), 2020.* Acceptance rate: 20.6%.

3. **Nitthilan Kannappan Jayakodi**, Janardhan Rao Doppa, and Partha Pratim Pande. **SETGAN: Scale and Energy Trade-off GANs for Image Applications on Mobile Platforms.** *Proceedings of 39th IEEE/ACM International Conference On Computer Aided Design (ICCAD), 2020.* Acceptance rate: 23.9%

4. **Nitthilan Kannappan Jayakodi**, Janardhan Rao Doppa, and Partha Pratim Pande **PETNet: Polycount and Energy Trade-off DeepNetworks for Producing 3D Objects from Images.** Proceedings of *Proceedings of IEEE/ACM 57th Design Automation Conference (DAC), 2020.* Acceptance rate: 21%

5. **Nitthilan Kannappan Jayakodi**, Syrine Belakaria, Aryan Deshwal, and Janardhan Rao Doppa. **Design and Optimization of Energy and Accuracy Trade-Off Networks for Mobile Platforms via Pretrained Deep Models** *ACM Transactions on Embedded Computing Systems (TECS),19(1): 4:1-4:24, 2020.*

6. Biresh Kumar Joardar, **Nitthilan Kannappan Jayakodi**, Janardhan Rao Doppa, Partha Pratim Pande, Hai (Helen) Li, and Krishnendu Chakrabarty. **GRAMARCH: A GPU-ReRAM based Heterogeneous Architecture for Neural Image Segmentation.** *Proceedings of 23rd IEEE/ACM Design, Automation and Test in Europe (DATE) Conference, 2020.* Acceptance rate: 23%. Nominated for Best Paper Award

7. Aryan Deshwal, **Nitthilan Kannappan Jayakodi**, Biresh Kumar Joardar, Janardhan Rao Doppa, and Partha Pratim Pande. **MOOS: A Multi-Objective Design Space Exploration and Optimization Framework for NoC enabled Manycore Systems.** *ACM Transactions on Embedded Computing Systems (TECS), 18(5s): 77:1-77:23, 2019.*

8. **Nitthilan Kannappan Jayakodi**, Anwesha Chatterjee, Wonje Choi, Janardhan Rao Doppa, and Partha Pratim Pande. **Trading-off Accuracy and Energy of Deep Inference on Embedded Systems: A Co-Design Approach** *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 37(11): 2881-2893, 2018.*

Grant Proposals

- Jana Doppa (PI), Umit Ogras, and Partha Pande. *Small: Dynamic Resource Management in Heterogeneous Mobile SoCs: Novel Algorithms and Efficient Deployment of Emerging Applications*. National Science Foundation (NSF), Core Program. $500K (8/2020–8/2023). Pending.
  - My research work on design and optimization framework for EdgeAI contributed to half of this proposal.

Patents

- U.S. Provisional Patent Application filed on August, 2020, entitled, **Heterogeneous GPU-RERAM Architecture for Neural Networks,** Biresh Kumar Joardar, **Nitthilan Kannappan Jayakodi**, Janardhan Rao Doppa, Partha Pratim Pande.

Professional and Outreach Activities

Conference and Journal Reviewer

- Reviewer for IJCAI-2019, AAAI-2019, ESWEEK-2019, DAC-2020, AAAI-2020
- IEEE Transactions on Computer-Aided Design (TCAD), 2019, 2020
- ACM Transactions on Design Automation of Electronic Systems (TODAES), 2019, 2020
- ACM Transactions on Embedded Computing Systems (TECS), 2019

Organizer

- Volunteer for International Conference on Machine Learning (ICML), 2019
- Volunteer for Embedded Systems Week, 2018

Skills

- DL Frameworks: PyTorch, Keras, Caffe, TensorFlow, Numpy
- C, C++, Java, Javascript, Torch, Lua, Python, Unix
- MPEG2, MPEG4, H264/5, H263, SVC, RTP, RTCP, RTSP, HLS, Ffmpeg, Gstreamer
- Web Interface: WebRTC, Socketio, REST, MVC , Frontend (Angularjs, Html5, Threejs, Canvas), Backend (Nodejs, Spring, Apache)

- OpenCV, Android (libGDX, phonegap, ionic)
- Database: nosql, mongo, mongoose, postgres,
- Embedded: OMAP3430 (TI), IVA HD[OMAP4, Netra] (TI), ARM*, ADSP 219x, INTEL MMX/SSE/SSE2, 8051

Products @ Polycom (Responsible for design, implementation, testing, and delivery)

- Video Conferencing plugin for chrome 64 bit using PPAPI
- RTP, RDP and HTML5 based Content Collaboration platform between MCU, Lync and Browser endpoints
- Automation Platform for bringing up Infrastructure for Video as a service on VMWare
- Platform Director: Life cycle management of virtual instances on VMWare using viJava

Products @ ITTIAM (Responsible for design, implementation, testing, and delivery)

- Mpeg2 (MP@HL) HD(1080i@30fps) Encoder/Transcoder for Broadcast on Netra (IVAHD Accelerated)
- MPEG4 Simple Profile (SP) HD(720p@30fps) Encoder for Smart Phones on OMAP34xx (Arm+DSP+IVA)
- Mpeg4 SP D1 (480p@30fps) Encoder for Portable Media Player and Recorder on C64x+ DSP (OMAP3430).

Online Courses

- Deep Learning, Oxford. Nando de Freitas (youtube)
- Heterogeneous Parallel Programming , University of Illinois Urbana-Champaign (98.6%)
- Introduction To Finance , University of Michigan (100%)
- CS184.1x: Foundation of Computer Graphics, UCB
- Introduction to Artificial Intelligence, Stanford University (91.9%)