Aditya Deshpande

Applied Scientist II, Amazon AI – Computer Vision

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Education

University of Illinois at Urbana-Champaign
Urbana-Champaign, Illinois, USA

PhD in Computer Science *Aug 2014 – May 2020*

Advisors: Prof. David Forsyth and Prof. Alexander Schwing

Thesis Committee: Svetlana Lazebnik, Dhruv Batra, Alexander Schwing and David Forsyth

Thesis Title: Learning Multiple Solutions to Computer Vision Problems

International Institute of Information Technology
Hyderabad, India

B. Tech. with Master of Science by Research in Computer Science *Aug 2008 – Jul 2014*

Advisor: Prof. P J Narayanan

Thesis Title: Combining Data and Task Parallelism on Hybrid CPU and GPU Systems

Professional Experience

Amazon – AI (*Manager: Onkar Dabeer*) Seattle, USA

Sr. Applied Scientist, AWS Computer Vision Science *Apr, 2022 - Present*

- I research and develop novel computer vision and machine learning algorithms to ambiguous problems in areas of Transfer Learning and 3d Vision.
- I write production code to launch the algorithms into AWS Computer Vision services.

Amazon – AI (*Managers: Avinash Ravichandran, Marzia Polito, Onkar Dabeer*) Seattle, USA

Applied Scientist II, AWS Computer Vision Science *Sep, 2019 - Mar, 2022*

- I helped launch an AutoML service, AWS Rekognition Custom Labels.

Amazon – AI (*Manager: Joseph Tighe*) Seattle, USA

Applied Scientist Intern *May, 2018 - Aug, 2018*

- I developed an algorithm to detect visual relationships i.e. interactions between two objects in an image such as man plays guitar, woman kicks football etc.
- The algorithm was ranked 10^{th} on leader-board among 140+ submissions in Kaggle competition for ECCV'18 workshop – Open Images Challenge, Visual Relationship Detection Track (Poster).

Apple Research (*Managers: Luciano Spinello, Tie-qi Chen*) Cupertino, USA

Computer Vision Research Intern *May, 2015 - Aug, 2015 & May, 2016 - Aug, 2016*

- I developed a real-time CUDA/GPU implementation of a stereo algorithm (2015).
- I implemented a deep learned feature descriptor to match corners of objects in two images (2016).

Google Inc (*Manager: Rajesh Chandrashekaran*) Bengaluru, India

Software Engineering Intern *May, 2011 - Aug, 2011*

- I wrote code for backend & UI of Google Apps C-panel to launch useful features in production.

Publications

- A linearized framework and a new benchmark for model selection for fine-tuning, arxiv pre-print. *Aditya Deshpande, Alessandro Achille, Avinash Ravichandran, Hao Li, Luca Zancato, Charless Fowlkes, Rahul Bhotika, Stefano Soatto and Pietro Perona.*
- Fast, Diverse and Accurate Image Captioning Guided By Part-of-Speech, In Proceeedings of IEEE/CVF CVPR'19 (**Oral**). *Aditya Deshpande*, Jyoti Aneja*, Liwei Wang, Alexander Schwing and David Forsyth.*
- Visual Relationship Detection, In ECCV'18 Open Images Challenge Workshop. *Aditya Deshpande et al.*
- Convolutional Image Captioning, In Proceedings of Computer Vision and Pattern Recognition (CVPR'18). *Jyoti Aneja*, Aditya Deshpande* and Alexander Schwing* (*= equal contribution).
- Learning Diverse Image Colorization, In Proceedings of Computer Vision and Pattern Recognition (CVPR' 17). *Aditya Deshpande, Jiajun Lu, Mao-Chuang Yeh, Min Jin Chong and David Forsyth.*
- Recovering the 3D Geometry of Heritage Monuments from Image Collections, In Digital Hampi: Preserving Indian Cultural Heritage, Springer. *Rajvi Shah, Aditya Deshpande, Anoop Namboodiri, P J Narayanan.*
- Learning Large-Scale Automatic Image Colorization, In Proceedings of International Conference on Computer Vision (ICCV'15). *Aditya Deshpande, Jason Rock and David Forsyth.*
- Fast Burrows Wheeler Compression Using All-Cores. In Ashes workshop of International Parallel and Distributed Processing Symposium (IPDPSW'15) (**Oral**). *Aditya Deshpande and P J Narayanan.*
- Multistage SFM: Revisiting Incremental Structure from Motion, In Proceedings of International Conference on 3D Vision (3DV'14). *Rajvi Shah, Aditya Deshpande and P J Narayanan.*

- Top Down Approach to Detect Multiple Planes from Pair of Images, ACM ICVGIP'14 (**Oral**). *Singhal et al.*
- Can GPUs Sort Strings Efficiently? In Proceedings of IEEE HiPC'13 (**Oral**). *Aditya Deshpande and P J Narayanan.* (**Best GPU Paper awarded by Nvidia**)
- Geometry Directed Browser for Personal Photographs, In ACM ICVGIP'12 (**Oral**). *Deshpande et al.*
- Hybrid Implementation of Error-Diffusion Dithering, In IEEE HiPC'11 (**Oral**). *Deshpande et al.*

Awards and Service

- Best GPU Paper Award at IEEE International Conference on High Performance Computing (Dec, 2013).
- **Outstanding Reviewer Award** for IEEE/CVF CVPR 2018 and IEEE/CVF CVPR 2020.
- **Top-400 reviewer for NeurIPS 2019**, selected to mentor at New in ML workshop.
- **Outstanding contribution in reviewing** by Journal of Parallel and Distributed Computing (Jun, 2016).
- **Reviewer for Conferences**: CVPR, ICCV, ECCV, NeurIPS, ICML, UAI, ACCV, AAAI, BMVC.
- **Reviewer for Journals**: TPAMI, TIP, JPDC, JACM.
- Awarded **Google Summer of Code scholarship** to work on CUDA acceleration of OpenJPEG (2012).
- Received the **Dean's Merit List** (2008) and **Research Award** (2012) of IIIT Hyderabad.
- Received the **National Talent Search Scholarship** (**2006**), awarded to top-1000 10th graders across India.
- Merit position in school exams of **Junior Maths Olympiad**, **National Standard Exam in Physics**.

Selected Talks

- Amazon Machine Learning Conference, 2019, Oral presentation of "A linearized framework and a new benchmark for model selection for fine-tuning."
- IEEE/CVF Computer Vision and Pattern Recognition 2019, Oral Presentation of "Fast, Diverse and Accurate Image Captioning Guided By Part-of-Speech", see the talk here.
- At – Google AI, Facebook AML, Apple 3D Vision & Illinois CSL Student Conference, 2019 – Invited Talk on "Learning Multiple Solutions to Computer Vision Problems."
- CS 445 Computational Photography by Prof. Derek Hoiem, 2017, Lecture on "The image as a virtual stage."
- CS 598 Data Driven Design by Prof. Ranjitha Kumar, 2017, Lecture on "Generative Adversarial Networks."
- 2017 Midwest Computer Vision Workshop, Chicago, "Learning Diverse Image Colorization."
- 2016 Midwest Computer Vision Workshop, Chicago, "Learning Large-Scale Automatic Image Colorization."
- IEEE International Conference on High Performance Computing, 2013, Oral Presentation of "Can GPUs Sort Strings Efficiently?"
- IEEE International Conference on High Performance Computing, 2011, Oral Presentation of "Hybrid Implementation of Error-Diffusion Dithering."

Projects and Technical Contributions

- **Fast, diverse and accurate image captioning.**
  Developed an AI algorithm that writes a sentence to describe any image. Different humans will describe the image in different ways; our method can also generate multiple descriptions. The code available at `https://github.com/aditya12agd5/convcap` is widely used (125 stars, 39 forks, 250+ citations).

- **Model selection for transfer learning.**
  In this work, I developed an algorithm to select the right model to fine-tune from a model zoo without performing any training. This algorithm is used in a production AutoML system.

- **Learning to colorize black and white images.**
  Developed an AI algorithm to add color to black-and-white image; this can help colorize old photos and movies automatically. Further improved this algorithm to produce multiple versions of color photos. Some results available at `https://bit.ly/2NdD4f7`. The code is made available at `https://github.com/aditya12agd5/divcolor`.

- **Multi-stage structure-from-motion and 3D photo browser.**
  Developed a multi-stage algorithm for structure-from-motion that first builds a coarse 3d model and then densifies it with more points and camera. This makes structure-from-motion much faster than the standard bundler and visual sfm methods. This method is used to create an immersive 3d photo browser.

- **GPGPU/CUDA – Fast dithering, string sorting and file compression.**
  Developed a fast dithering algorithm for GPUs; this is a vital component of daily-use printers. Developed a fast string sorting algorithm; it is useful for many software applications such as genomics. Developed a parallel algorithm to improve speed of bzip data compression and made file compression on computers faster. The code is available at `https://github.com/aditya12agd5/cuda_stringsort` & `https://github.com/aditya12agd5/cuda_bzip2`.