

Vijai Thottathil Jayadevan

Curriculum Vitae

+1 (408) 348 6596
vijai.tj@gmail.com
www.vijaijayadevan.com
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Education

- 2014 – 2020 **Doctor of Philosophy, Electrical & Computer Engineering**, *Purdue University*, West Lafayette, IN, USA.
GPA: 3.82 (4.0 scale)
- 2011 – 2013 **Master of Science, Electrical & Computer Engineering**, *The University of Arizona*, Tucson, AZ, USA.
GPA: 4.0 (4.0 scale)
- 2004 – 2008 **Bachelor of Technology, Electronics & Communication Engineering**, *Cochin University*, Cochin, India.

Technical Skills

- Programming Python, MATLAB, C++
Web HTML, CSS, .NET Framework, Javascript
Other Git, PyQt, Unity, VIM, LaTeX
- Frameworks and Libraries TensorFlow/Keras, PyTorch, Scikit-learn, Pandas, OpenCV, Hugging Face

Experience

Jun 2020 – Present **Senior Computer Vision Scientist II**, *ChemImage Corporation*, Pittsburgh.

- Served as the team lead for a group of machine learning scientists and engineers with a track record of successfully delivering numerous milestones on various research projects.
- Developed deep learning models to perform multi-target semantic segmentation on in vivo images captured by a multispectral endoscope. The model achieved the targeted level of performance well ahead of the deadline. This was challenging as the targets were not always exposed and were many times obscured by blood, fat or tissue.
- Devised methods to deal with noisy human annotations using techniques like assigning confidence-based scores to annotations (which can be then utilized in model training), co-teaching networks and noise transition matrix estimation.
- Used GradCAM to interpret the model outputs which lead to the identification of some data annotation issues. Fixing these issues lead to a significant improvement in results. Used Monte Carlo dropout to estimate model uncertainty. Post-processing techniques based on these uncertainty estimates lead to improved detections.
- Enabled distributed training on an on-premise server with multiple GPUs using data parallelism by writing manual training loops. Set up a Determined AI based interface to enable efficient resource sharing, experiment tracking, hyper-parameter tuning and visualization on the multi-GPU server.
- Developed a trainable shape prior based segmentation method based on elastic functional data analysis to detect targets of specific shapes.
- Implemented a CycleGAN based image translation model used to generate scanning electron microscopy (SEM) images from optical microscopy images which was then used to perform image registration between the two modalities.
- Gained considerable experience in data collection (in vivo, multispectral images) at labs and also in processing raw data which included steps like dark frame subtraction, flat field correction and motion compensation between wavelength frames of a scene.
- Set up a git repository and designed a custom git workflow which enabled seamless code collaboration.

- Jan 2014 – **Graduate Research Assistant**, *Purdue University*, West Lafayette.
 May 2020 The focus of my work was on understanding the role of priors (like symmetry, compactness, planarity etc.) in three-dimensional (3D) visual perception and in using this information to develop better computer vision algorithms. I have worked on problems like 3D reconstruction from images, modeling human visual perception, 3D point cloud decomposition, 3D point cloud registration, object detection and tracking, image segmentation and image restoration.
- Aug 2018 – **Graduate Teaching Assistant**, *Purdue University*, West Lafayette.
 May 2019 As a teaching assistant for Linear Circuit Analysis II (ECE 202), my responsibilities included holding regular office hours to help students understand the material and creating solutions for home-works and exams.
- Aug 2011 – **Graduate Research Assistant**, *The University of Arizona*, Tucson.
 Dec 2013 The research work involved the development of an algorithm for predicting the intermittency in solar irradiance caused due to clouds by analyzing the pictures taken by a camera tracking the sun. It involved image segmentation using probabilistic graphical models and non-rigid object tracking in images.
- Aug 2008 – **Systems Engineer**, *Tata Consultancy Services*, Cochin.
 May 2011 Developed economic and statistical software applications for International Monetary Fund (IMF). Gained experience in developing web and desktop applications as well as windows services using coding languages like C# and VisualBasic.

Selected Academic Projects

- *Shadow Rendering Algorithm (Spring 16)*: Implemented an efficient, high quality soft shadow rendering algorithm. The entire graphics rendering pipeline was developed from scratch in C++.
- *Computer Vision Algorithms (Fall 2014)*: Implemented and tested, in C++, the following algorithms: (1) Zhang's calibration algorithm to estimate intrinsic and extrinsic camera parameters (2) the normalized eight-point algorithm to estimate the fundamental matrix and perform 3D reconstruction from multiple views (3) the cascaded AdaBoost classifier for object detection.
- *JPEG Encoder (Spring 2014)*: Implemented a baseline JPEG encoder in ANSI C
- *Monte Carlo simulation (Spring 2012)*: Implemented a Monte Carlo simulation project to find out the probability law on angle of divergence from initial direction of photons traveling through a scattering media, as part of a course on probability.

Relevant Graduate Coursework

- Digital Signal Processing
- Biomedical Imaging
- Digital Image Processing
- Computer Vision
- Real Analysis
- Model Based Imaging
- Applied Linear Algebra
- Digital Image Analysis
- Computational Methods in Optimization
- Probability & Statistics for Optics
- Advanced Linear Systems Theory
- Advanced Computer Graphics
- Computational Models and Methods
- Advanced Topics in Visual Perception
- Numerical Linear Algebra
- Statistical Machine Learning

Publications

Journal Articles

V. Jayadevan, T. Sawada, E. Delp, and Z. Pizlo, "Perception of 3D symmetrical and nearly symmetrical shapes," *Symmetry*, vol. 10, no. 8, p. 344, 2018.

A. Michaux, V. Kumar, **V. Jayadevan**, E. Delp, and Z. Pizlo, "Binocular 3D object recovery using a symmetry prior," *Symmetry*, vol. 9, no. 5, p. 64, 2017.

A. Michaux, **V. Jayadevan**, E. J. Delp, and Z. Pizlo, "Figure-ground organization based on

three-dimensional symmetry,” *Journal of Electronic Imaging*, vol. 25, no. 6, p. 061606, 2016.

V. Jayadevan, J. J. Rodriguez, and A. D. Cronin, “A new contrast-enhancing feature for cloud detection in ground-based sky images,” *Journal of Atmospheric and Oceanic Technology*, vol. 32, no. 2, pp. 209–219, 2015.

Conference Publications

V. Jayadevan, A. Michaux, E. Delp, and Z. Pizlo, “3D shape recovery from real images using a symmetry prior,” in *IS and T International Symposium on Electronic Imaging Science and Technology, Computational Imaging XV*, 2017, pp. 106–115.

V. P. Lonij, **V. Jayadevan**, A. E. Brooks, J. J. Rodriguez, K. Koch, M. Leuthold, and A. D. Cronin, “Forecasts of PV power output using power measurements of 80 residential PV installs,” in *2012 38th IEEE Photovoltaic Specialists Conference*. IEEE, 2012, pp. 003 300–003 305.

V. Jayadevan, J. J. Rodriguez, V. P. Lonij, and A. D. Cronin, “Forecasting solar power intermittency using ground-based cloud imaging,” in *World Renewable Energy Forum, WREF 2012, Including World Renewable Energy Congress XII and Colorado Renewable Energy Society (CRES) Annual Conference*, 2012, pp. 2100–2106.

Other Publications

V. Jayadevan, J. J. Rodriguez, and A. D. Cronin, “A conditional random field model for context aware cloud detection in sky images,” *arXiv preprint arXiv:1906.07383*, 2019.

V. Jayadevan, E. Delp, and Z. Pizlo, “Skeleton extraction from 3D point clouds by decomposing the object into parts,” *arXiv preprint arXiv:1912.11932*, 2019.

V. Jayadevan, T. Sawada, E. Delp, and Z. Pizlo, “Monocular and binocular recovery of 3D symmetrical and near-symmetrical shapes,” *Journal of Vision*, vol. 18, no. 10, pp. 719–719, 2018.

V. Jayadevan, A. Cronin, V. Lonij, S. Jones, and G. Torres, “Looking to the sky to predict solar power intermittency,” in *APS Four Corners Section Meeting Abstracts*, 2011.

V. Lonij, S. Orsburn, A. Salhab, E. Kopp, A. Brooks, **V. Jayadevan**, J. Greenberg, M. St Germaine, N. Allen, S. Jones *et al.*, “The Tucson Electric Power solar test yard,” in *APS Four Corners Section Meeting Abstracts*, 2011.

References

Dr. Edward J. Delp

Professor

Department of Electrical & Computer Engineering

Purdue University

☎ +1 (765) 494-1740

✉ ace@ecn.purdue.edu

Dr. Zygmunt Pizlo

Professor

Department of Cognitive Sciences

University of California, Irvine

☎ +1 (317) 796-5225

✉ zpizlo@uci.edu