

# Dr. Pramod Kumar Pisharady, PhD

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## PROFILE

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**Research Associate** : Center for Magnetic Resonance Research (CMRR), University of Minnesota  
(CURRENT)

AREA OF RESEARCH : Diffusion MRI, Microstructure Imaging, Neurodegenerative diseases

**Postdoc.** : Center for Magnetic Resonance Research (CMRR), University of Minnesota  
(2014-2017)

AREA OF RESEARCH : Diffusion MRI, Sparse signal recovery, Neurodegenerative diseases

**Postdoc.** : Biological Engineering, Massachusetts Institute of Technology (MIT)  
(2013-2014)

AREA OF RESEARCH : Biomedical image processing, Structural variability modeling

**Ph.D** : Electrical & Computer Engineering, National University of Singapore (NUS)  
(2007-2012)

AREA OF RESEARCH : Computer vision & Pattern recognition, Computational intelligence

## EDUCATION & TRAINING (*Chronological reverse order*)

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**PERIOD** October 2014 – November 2017  
**POSITION** Postdoctoral Research Associate  
**UNIVERSITY** CMRR, University of Minnesota (UMN), USA  
**ADVISOR** Christophe Lenglet

My research at CMRR broadly focuses on the reconstruction of white matter fiber parameters from diffusion MRI (dMRI) data. We proposed an algorithm for improved reconstruction of fiber parameters from largely under-sampled data, which substantially shorten the required acquisition time. I am also working on translational research projects, applying dMRI analysis tools for understanding the white matter structural damages in two neurodegenerative diseases, Amyotrophic Lateral Sclerosis (ALS) and Tuberous Sclerosis Complex (TSC).

**PERIOD** October 2013 – October 2014  
**POSITION** Postdoctoral Research Associate  
**UNIVERSITY** Massachusetts Institute of Technology (MIT), USA  
**ADVISOR** Mark Bathe

While at MIT, I started developing a computational framework for processing Diffusion Spectrum Imaging (DSI) and microscopic image datasets. We developed algorithms for quantifying the diffusion and connectivity information from DSI data. Absolute measures of diffusion anisotropy and diffusivity, and relative measures of connectivity are developed from the diffusion spectrum and orientation distribution functions. A Bayesian model selection framework was also designed to facilitate intergroup comparison of structural connectivity, based on a Varying Coefficient Modeling (VCM) approach.

PERIOD	<b>August 2007 – April 2012</b>
POSITION	<b>Doctoral Research Scholar (with NUS Research Scholarship)</b>
UNIVERSITY	<b>National University of Singapore (NUS), Singapore</b>
ADVISORS	<b>Prahlad Vadakkepat; Loh Ai Poh</b>
THESIS	Computational Intelligence Techniques in Visual Pattern Recognition
COURSES	Neural networks, Computer vision & pattern recognition, Machine vision, Linear systems, Computer control systems, Optimal control systems.
GPA	4.58/5.0

My PhD thesis work was focused on development of novel computational algorithms for improved extraction of information from digital images. We proposed novel algorithms for the recognition of patterns embedded in images by combining different artificial intelligence tools such as fuzzy sets and rough sets, exploiting the power of each of these tools for information extraction. We addressed issues such as object size and shape variations, complex backgrounds, and inter-class similarity. The applications we considered include recognition of hand postures and face. We also considered one biomedical application: the classification of cancers based on micro-array based gene expression data. The research that I consider as the major contribution of my PhD thesis is a Bayesian model of primate visual attention system which was published in IJCV, for which I received the best student paper award by Pattern Recognition and Machine Intelligence Association. The model was developed to address the complex-background problem in recognition of patterns from natural scenery images.

PERIOD	<b>August 1999 – August 2003</b>
DEGREE	<b>Bachelor of Technology (Instrumentation &amp; Control Engineering)</b>
GRADE	<b>Honors with Distinction, University Gold Medal (First Rank)</b>
UNIVERSITY	<b>Calicut University, India</b>

## WORK EXPERIENCE (*Chronological reverse order*)

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### RESEARCH:

PERIOD	<b>May 2011 – September 2013</b>
JOB TITLE	<b>Research Scientist (Computer Vision &amp; Artificial Intelligence)</b>
EMPLOYER	<b>Institute of High Performance Computing (IHPC), A*STAR, Singapore</b>

My research at IHPC was focused on development of systems for human-computer interaction. Some of the specific research issues we addressed include robustness of the recognition algorithm with respect to speed and size of dynamic gestures, and with respect to position and orientation of the gesturer. Our project was titled *Social Situation Awareness*, which had the objective to propose a computational model of social interaction and to use it for developing a tutor robot. I was responsible for developing the interaction system with automatic sensing of natural modalities and social interaction signals.

PERIOD	<b>January 2004 – August 2004 (before PhD)</b>
JOB TITLE	<b>Junior Research Fellow (Power Electronics)</b>
EMPLOYER	<b>Center for Development of Advanced Computing (C-DAC), India</b>

I worked in a research and development project in power electronics. My responsibility was to design, develop and test Digital Signal Processing (DSP) Controller based hardware, to simulate and design Complex Programmable Logic Device (CPLD) based digital logic circuits, and to generate Pulse Width Modulation (PWM) signals for solar power inverters.

## TEACHING:

PERIOD	<b>January 2008 – December 2010</b>
JOB TITLE	<b>Graduate Assistant</b>
EMPLOYER	<b>National University of Singapore (NUS), Singapore</b>

I worked as part-time teaching assistant during my Ph.D for the following undergraduate course modules. 1) EE2010 Systems and Control, 2) EE2001 Hardware project, 3) ME4245 Robot Kinematics, Dynamics and Control, and 4) EE4306 Distributed Autonomous Robotic Systems

## INDUSTRY:

PERIOD	<b>September 2004 – July 2007 (before PhD)</b>
JOB TITLE	<b>Control &amp; Instrumentation Engineer</b>
EMPLOYER	<b>NTPC Limited, India</b>

I worked in erection, commissioning, and technical trouble shooting of Control & Instrumentation systems in coal fired electric power plants. I was responsible for the installation, testing, and commissioning of automatic process control and measurement systems. I was a part of the team erected two new power units of 250MW capacity at Bhilai, India. I also worked as an installation and maintenance engineer for a captive power plant for Bhilai steel plant.

## SCHOLARSHIPS & AWARDS (*Chronological reverse order*)

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2017	Best Poster Award, Institute for Research in Statistics and its Applications (IRSA)
2017	Travel Award, Medical Image Computing and Computer Assisted Interventions (MICCAI) Society
2017	Travel Award, Big Data Neuroscience Workshop 2017 (NSF-funded), Indiana University
2016	Regents Scholarship for course on <i>Hierarchical Bayesian Analysis</i> , School of Public Health, UMN
2013	Best Student Paper Award, Pattern Recognition and Machine Intelligence Association (PREMIA)
2007	Postgraduate Research Scholarship, NUS
2004	97.34 percentile score in the national level Graduate Aptitude Test in Engineering (GATE), India
2003	Dr. K.R. Pillai Memorial Scholarship for securing the highest score in University examination
2003	University Gold Medal (First Rank), Calicut University
2003	Third prize in the Technical Presentation Contest conducted by IEEE
2002	Merit Scholarship in first, second, fourth, fifth and sixth semesters of undergraduate course

**Medical Imaging/ Diffusion MRI (current research)**

- NEUROIMAGE 2017 Pisharady PK, Sotiropoulos SN, Duarte-Carvajalino JM, Sapiro G and Lenglet C, *Estimation of white matter fiber parameters from compressed multiresolution Diffusion MRI using sparse Bayesian learning*, Neuroimage (Accepted, In press)
- MICCAI 2017 Pisharady PK, Sotiropoulos SN, Sapiro G and Lenglet C, *A sparse Bayesian learning algorithm for white matter parameter estimation from compressed multi-shell Diffusion MRI*, International Conference on Medical Image Computing and Computer Assisted Interventions, MICCAI 2017, Springer Lecture Notes in Computer Science, vol. 10433, pp. 602-610
- MICCAI 2015 Pisharady PK, Duarte-Carvajalino JM, Sotiropoulos SN, Sapiro G and Lenglet C, *Sparse bayesian inference of white matter fiber orientations from compressed multi-resolution diffusion MRI*, International Conference on Medical Image Computing and Computer Assisted Interventions, MICCAI 2015, Springer Lecture Notes in Computer Science, vol. 9349, pp. 117-124

**Computer Vision / Pattern Recognition (past research)**

- IJCV 2013 Pisharady PK, Vadakkepat P and Poh LA, *Attention based detection and recognition of hand postures against complex backgrounds*, International Journal of Computer Vision (IJCV), vol.101, no.3, pp.403-419, February 2013
- CVIU 2015 Pisharady PK and Saerbeck M, *Recent Methods and Databases in Vision-based Hand Gesture Recognition: A Review*, Computer Vision and Image Understanding (CVIU), vol.141, pp.152-165, December 2015
- ASOC 2011 Pisharady PK, Vadakkepat P and Poh LA, *Fuzzy-Rough discriminative feature selection and classification algorithm, with application to microarray and image datasets*, Applied Soft Computing (ASOC), vol.11, no.4, pp.3429-3440, June 2011
- IJHR 2010 Pisharady PK, Vadakkepat P and Poh LA, *Hand posture and face recognition using a Fuzzy-Rough Approach*, International Journal of Humanoid Robotics (IJHR), vol.7, no.3, pp.331-356, September 2010
- IJFCC 2012 Pisharady PK and Saerbeck M, *Profile invariant face recognition using neuro-biologically inspired features*, International Journal of Future Computer and Communication (IJFCC), vol.1, no.3, pp.316-320, October 2012
- ICARCV 2010 Pisharady PK, Vadakkepat P and Poh LA, *Graph matching based hand posture recognition using biologically inspired features*, Proc. of IEEE International Conference on Control, Automation, Robotics and Vision (ICARCV), pp.1151-1156, December 2010
- CIMSIVP 2013 Pisharady PK and Saerbeck M, *Robust gesture detection and recognition using dynamic time warping and multi-class probability estimates*, Proc. of IEEE Symposium on Computational Intelligence for Multimedia, Signal & Vision Processing (IEEE CIMSIVP), pp.30-36, April 2013
- ACCVW 2014 Pisharady PK and Saerbeck M, *Gesture Recognition Performance Score: A New Metric to Evaluate Gesture Recognition Systems*, Proc. of Asian Conference on Computer Vision, ACCV Workshops, Springer Lecture Notes in Computer Science, vol. 9008, pp.157-173, 2014

**Book (Research Monograph)**

- SPRINGER 2014 Pisharady PK, Vadakkepat P and Poh LA, *Computational Intelligence in Multi-Feature Visual Pattern Recognition-Hand Posture and Face Recognition using Biologically Inspired Approaches*, Springer, Book Series: Studies in Computational Intelligence, vol.556, June 2014

## PROFESSIONAL / INVITED TALKS (*Excluding conference paper presentations*)

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2017	<i>Assessment of Longitudinal Changes in Diffusion MRI in Brain and Cervical Spine in ALS</i> , 8th International Symposium on NeuroImaging in ALS (NiSALS 2017), Boston, USA
2017	(Educational lecture) <i>Diffusion MRI: Basics, Methods and Tools for Processing</i> , Training course on Imaging Methods for the Connectome Projects, Minnesota Workshop on High and Ultra-high Field Imaging, CMRR, University of Minnesota, Minneapolis, USA
2017	<i>Estimation of White Matter Fiber Parameters from Compressed Multiresolution Diffusion MRI using Sparse Bayesian Learning</i> , Big Data Neuroscience Workshop 2017, Indiana University, Bloomington, USA
2015	<i>Assessment of Neurodegeneration in ALS using Diffusion MRI</i> , 6th International Symposium on NeuroImaging in ALS (NiSALS 2015), Orlando, USA
2014	<i>Role of Mathematics in Engineering and Engineering Research</i> , NSS College of Engineering, Palakkad, India
2014	<i>Role of Mathematics in Engineering and Engineering Research</i> , Aryanet Institute of Technology, Palakkad, India
2012	(Keynote talk) <i>Computational Intelligence Techniques in Visual Pattern Recognition</i> , 3rd International Conference on Computer and Computational Intelligence (ICCCI), Bali, Indonesia

## PROFESSIONAL ACTIVITIES & MEMBERSHIPS (*Chronological reverse order*)

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<b>Reviewer</b>	(Publons reviewer profile: <a href="http://publons.com/a/1319586/">http://publons.com/a/1319586/</a> )
2017-	Magnetic Resonance in Medicine (MRM), International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
2016-	Medical Image Analysis (MedIA)
2015-	Neuroimage, IEEE TMI, Frontiers in Neuroscience, PLoS ONE, IEEE SMC
2014	Journal of Machine Learning Research
2012-2015	Applied Soft Computing, Neurocomputing, Image and Vision Computing, Artificial Intelligence in Medicine, International Journal of Humanoid Robotics
<b>Chair/ Member</b>	
2013	Chairman, IEEE Young Professionals, Singapore section
2012-2013	Member, Pattern Recognition and Machine Intelligence Association (PREMIA)
2012	Vice-Chair, IEEE Young Professionals, Singapore section
2011-2013	Technical program committee member, FIRA RoboWorld Cup and Congress
2011-	Senior member, Intl. Asso. of Computer Science and Information Technology
2010	Session Chair, special session on <i>Cognitive and Biologically Inspired Approaches in Visual Pattern Analysis</i> , FIRA Robot World Congress, Bangalore, India
2008-	Member, Institute of Electrical and Electronics Engineers (IEEE), USA