Kumar Rajamani

Postdoctoral Researcher · Universität zü Lübeck

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Work Experience

Postdoctoral Researcher, *Institute of Medical Informatics, Universität zü Lübeck* — *Lübeck, Germany, Jan 2020 - Present*

- Working on dynamic deformable attention and another variant of learnable attention for semantic segmentation of COVID lesions from Chest CT data. Conducting extensive research on attention mechanism to enhance the segmentation of the state of art Deep Learning networks. Handled exercise sessions for Medical Deep Learning course in the university.

Manager, *Robert Bosch Engineering and Business Solutions* — *Bangalore, April 2016 - Jan 2020*

- Technically managed a team in the innovation group working on latest deep learning algorithms and AI based solutions for smart-city (License Plate recognition, Vehicle counting) and Bosch smart agriculture solutions. Helped generate Intellectual Property - Patents (Filed six Invention Disclosures) and Publications (10+ International Conference Proceedings). Enabled successful completion of clinical trials of our developed algorithms at multiple hospital sites. Mentored development of algorithms for Meibomian Gland Dysfunction (Meibography).

Architect, *Robert Bosch Engineering and Business Solutions* — *Bangalore, June 2013 - March 2016*

- Technically mentored a team to build Bosch India first healthcare solution on Eyecare. Managed building the complete algorithm life cycle - from its inception as a prototype to its final deployment into the product. Helped to make several pivots for the algorithm approach from classical Image Processing algorithms to Machine Learning based methods (Weak Supervision-Multiple Instance Learning) and Deep Learning for Classification of Fundus images. Guided the group to develop state of the art algorithms that achieved excellent performance (90%+ accuracy).

Research Scientist, *GE Global Research* — *Bangalore, May 2010 - May 2013*

- Worked on oncology quantification algorithm from dynamic 4D MRI. Helped implement the entire product life cycle – from its inception as a research prototype to its final deployment into the product. The research prototype was built in collaboration with researchers from GE Global Research USA. Helped successfully transition the research prototype code into production on GE Advantage Workstation. This quantification based on Dynamic Contrast Enhanced Magnetic Resonance Imaging, was one of the first solutions at GE Research to be taken from research prototype to final deployed solution.

Head of Department, Assistant Professor, *Amrita School of Engineering* — *Bangalore, April 2008 - April 2010*

- Co-Investigator for Ministry of Human Resource Development (MHRD) projects. Built novel solutions using Haptics for Vocational Training (Fabric Painting) to enable employability among illiterates. Built a research team and helped the team to come up with several publishable results. Guided several Ph.D., MTech and BTech projects. Handled Master and Bachelor classes on Medical Image Analysis, Computer Vision, Image Processing.

Senior Scientist, *Philips Research Asia* — *Bangalore, Feb. 2007 - March 2008*

- Helped conceptualize and build Philips smart and intelligent stethoscope as part of the Healthcare for Emerging Markets research group. Actively involved in implementing algorithms using signal processing and pattern classification for heart sound and lung sound analysis. Showcased two of my innovation ideas at the Philips Innovation Day Event. Helped generate Intellectual Property - Patents (Filed three Invention Disclosures).

Education

PhD, Biomedical Engineering (Medical Image Analysis), *University of Bern* — *Bern, Switzerland, 2002-2006*

- Thesis: Three dimensional surface extrapolation from sparse data using deformable bone models
- Developed algorithms for extrapolate extremely sparse three-dimensional landmarks and bone surface points to obtain a complete, highly probable surface representation. The extrapolation was done using a statistical principal component analysis (PCA) shape model extracted from a training set of patient computer tomographic images. My solution for accurate 3D visualization of bone structures is vital in Computer Assisted Surgery (CAS) and this solution highly assists and improves anatomical navigation for surgeons.

Master of Technology (M.Tech) - Computer Science, *Sri Sathya Sai Institute of Higher Learning* — *Puttaparthy, 2000-2002*

- GPA: 4.90 / 5.00 (Top -2%)

Master of Science (M.Sc) - Mathematics, *Sri Sathya Sai Institute of Higher Learning* — *Puttaparthy, 1998-2000*

- GPA: 5.00 / 5.00 (Gold medalist)

Bachelor of Science (B.Sc) - Mathematics), *Sri Sathya Sai Institute of Higher Learning* — *Puttaparthy, 1995-1998*

- GPA: 4.91 / 5.00 (Gold medalist)

Research Interests

Deep Learning: Medical Image Analysis, Computer Vision, Shape analysis, Active Shape Models

Computer Aided Diagnosis: Classification, Segmentation, Attention Mechanism, Registration

Practical Skills

- 3+ years of Deep Learning experience in industry and academic research using Python, PyTorch
- 12+ years of Research experience in industry : C++, ITK, OpenCV, ImageJ/FiJi, CNN, Numpy, SciPy, Scikit-learn, Pandas, Qt
- Practical experience in handling lectures on medical deep learning, image processing, computer vision

Selected Publications

- A novel technique for splat generation and patch level prediction diabetic retinopathy -- I.S.M. Ajwahir,Kumar Rajamani, and S.I. Sadhar **MIUA '17**
- Gaussian Process Density Counting from Weak Supervision -- Matthias Borstel, Kumar Rajamani, Melih Kandemir **ECCV '16**, `https://rdcu.be/b5ygA`
- Variational Weakly-Supervised Gaussian Processes -- Manuel Haussmann, Kumar Rajamani, Melih Kandemir **BMVC '16**, `https://dx.doi.org/10.5244/C.30.71`
- On the Relevance of Very Deep Networks for Diabetic Retinopathy Diagnostics -- Akilesh B, Tanya M, Kumar Rajamani and Vineeth N.B, **IBM I-CARE '16**,
- Statistical Deformable Bone Models for Robust 3D Surface Extrapolation from Sparse Data -- Kumar Rajamani, Martin Styner, H. Talib, L.P. Nolte, and M. A. Gonzalez **MEDIA '07**, `https://doi.org/10.1016/j.media.2006.05.001`
- Accurate and Robust Reconstruction of Proximal Femur from Sparse Intra- operative Data and Dense Point Distribution Model for Surgical Navigation -- G. Zheng, Kumar Rajamani, X. Dong, X. Zhang, M.A. Gonzalez and M. Styner, **IEEE TBME '07**, `https://doi.org/10.1109/TBME.2007.895736`
- Evaluation of 3D Correspondence Methods for Model Building -- M. Styner,Kumar Rajamani, G. Zsemlye, G. Szekely, C. J. Taylor and R. H.Davies, **IPMI '03** `https://rdcu.be/b5ygD`

Selected Patents

- System and Method for detection of motion in dynamic 4D medical images `https://patents.google.com/patent/US10362992B2/`
- Noninvasive Imaging System to understand analyze and interpret radiation pattern of heart sounds `https://patents.google.com/patent/US8419652`
- Device and Method for Automatically Identifying the Location for Auscultation Method and apparatus for Asthma detection from physical symptoms. `https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2009053913`

Honors & Awards

2006-	**10 Patents (Invention Disclosures), 60+ International Journal, Conference Papers,** Intellectual Property	*Bosch, GE, Philips*
2005	**Best Technical Podium Presentation ,** CAOS 2005	*Helsinki, Finland*
2007	**First Prize in Healthcare Track ,** Innovation Day	*Philips*
2000	**Gold Medal,** M.Sc (Mathematics) and B.Sc (Mathematics	*Sathya Sai Institute*

Hobbies

- Long Distance Runner (Completed Five Full Marathons)
- Swimming (3 km swim across Murten Lake, Switzerland)
- Cycling (200 km Brevet cycling event)