Greeshma A. Agasthya agasthyaga@ornl.gov

Research Interests:
Medical imaging and neutron imaging.
Multi-scale modeling and simulations for medical imaging, radiation dosimetry and precision cancer therapy.
Machine learning and artificial intelligence for decision support, patient trajectories and outcomes research for healthcare.

Education:

Duke University, Durham, NC, USA **Aug 2009 – Mar 2013**
- Ph.D in Biomedical Engineering
- Dissertation: "Low-dose imaging of liver diseases through neutron stimulated emission computed tomography: Simulations in GEANT4"

Duke University, Durham, NC, USA **Jan 2008 – Dec 2011**
- M.S. in Biomedical Engineering
- Awarded an academic scholarship

Dr. Ambedkar Institute of Technology, Bangalore, India **Jun 2001 – Jun 2005**
Affiliated to Visvesvaraya Technological University, Belgaum, India
- B.E. in Medical Electronics
- Graduated with first class and distinction

Work Experience:

Research Scientist **2019 –Present**
Advanced Computing for Health Sciences, Oak Ridge National Laboratory
- Research:
  - Developing machine learning and deep learning pipelines for outcomes research, patient trajectories and clinical decisions
  - Multiscale modeling and simulation for neutron imaging, radiation dosimetry, medical imaging, and cancer therapy
- Management:
  - Technical lead: Leading a team of scientists on multiscale modeling of low-dose radiation effects on human health
  - Leading planning and development of a strategic partnership program with Cincinnati Children's Hospital Medical Center to study patient trajectories in pediatric patients with mental health based adverse outcomes
  - Co-organizing a national DOE-NCI Precision Radiation Oncology workshop series

Staff Scientist **2017 – 2018**
Department of Imaging Science and Innovation, Geisinger
- Research:
  - Developed machine learning pipelines for echocardiography and cardiac MRI based outcomes research
  - Cardiac MRI based statistical shape modeling as part of feature engineering for a machine learning pipeline

Research Fellow **2015 – 2016**
Carl E. Ravin Advanced Imaging Laboratories, Department of Radiology, Duke University
- Research:
  - Modality: Whole body CT, radiography, tomosynthesis and fluoroscopy
  - Developed a Monte-Carlo simulation based virtual CT system for personalized dosimetry and image quality studies
  - Implemented and tested techniques for breast dose saving in chest CT
  - Developed an analytical CT simulator for virtual clinical studies
  - Developed a Monte-Carlo simulation-based toolkit for radiography, tomosynthesis and fluoroscopy dosimetry
  - Studied effects of contrast agents on dose to patients during contrast-enhanced CT
  - Wrote an American association of Physicists in Medicine seed grant to study contrast enhanced CT dosimetry
- Mentoring and Management:
  - Mentored and managed six graduate students with research focus on simulations and dosimetry.
  - Responsible for editing, guiding and reviewing student manuscripts, presentations and posters.
  - Attended a two day leadership retreat to develop techniques to manage and lead research teams.
  - Lead and conducted periodic group meetings to establish meaningful collaborations among group members and facilitate project progress.
  - Planned and conducted open house showcasing lab research activities for prospective students.

Postdoctoral Fellow **2013 – 2015**

Winship Cancer Institute, Department of Radiology and Imaging Sciences, Emory University School of Medicine

- Research:
  - Modality: Breast tomosynthesis and mammography
  - Executed two IRB approved HIPAA compliant patient studies to find the relationship between breast compression, pain and tissue coverage during breast imaging examinations.
  - Performed a 3-D optical scanner based IRB approved patient study to develop realistic breast volume phantoms from compressed and uncompressed patient breast images for dose optimization, scatter correction and surgical outcomes.
  - Performed an observer study to optimize breast tomosynthesis reading times by implementing a slabbing technique.
  - Developed and managed a software tool in MATLAB to perform observer studies.
  - Wrote an internal seed grant to study breast and tumor volume estimation for improving surgical outcomes.
- Mentoring and Management:
  - Mentored a medical student with an IRB approved patient study
  - Managed two patient studies and a long term observer study
  - Managed large image databases
  - Developed and managed a software tool to perform observer studies with 170+ cases
- Teaching:
  - Delivered a guest lecture as part of the physics course for nuclear medicine residents and nuclear cardiology fellows on basics of non-scintillation detectors.
  - Delivered two guest lectures at Georgia Institute of Technology for a graduate level class on nuclear physics. Topics covered: X-ray production, dosimetry and computed tomography instrumentation.

Graduate Research **Jun 2008 – May 2013**

Carl E. Ravin Advanced Imaging Laboratories, Department of Biomedical Engineering, Duke University

- Research:
  - Modality: Neutron Stimulated Emission Computed Tomography (NSECT)
  - Wrote a Department of Defense Breast Cancer Research Program predoctoral grant to study the application of neutron imaging for breast cancer diagnosis.
  - Developed and implemented a novel dose reduction technique, neutron time resolved imaging (n-TRI), a quantitative elemental imaging technique.
  - Optimized n-TRI system parameters and dose using Monte-Carlo simulations
  - Implemented a MLEM based iterative image reconstruction algorithm followed by image correction techniques to improve image quality for n-TRI
  - Developed a 3-D computational phantom cohort and conducted a virtual patient study to optimize n-TRI system parameters for the diagnosis of liver diseases
  - Conducted experiments at Triangle universities nuclear laboratory's (TUNL) tandem Van-de-Graaff accelerator to test time-of-flight capabilities of LaBr3 gamma detectors for n-TRI
  - Conducted neutron dosimetry experiments with human phantoms to determine dose from fast neutrons to organs of interest and peripheral organs
- Teaching:
  - Teaching Assistant, Department of Biomedical Engineering (2011).
    - Conducted weekly recitation sessions on principles of medical imaging (Graduate and undergraduate level course)
    - In addition to teaching, duties involved: preparing solution manuals for class assignments and exams, and grading
  - Teaching Assistant, Department of Biomedical Engineering (2009).
    - Conducted Biomedical Electronics and Measurements laboratory sessions (Undergraduate level course).
    - In addition to experimental guidance, duties involved: preparing solution manuals for class assignments and exams, and grading.

Lecturer **Aug 2007 – Dec 2007**

Medical Electronics Department, Dr. Ambedkar Institute of Technology, Bangalore, India

- Teaching:
  - Taught courses on basics of pattern classification, image processing (IP) and digital signal processing (DSP) concepts and conducted IP and DSP laboratories.
  - In addition to teaching, duties involved: setting exams, assignments, lab manuals, solution manuals and grading.

Research Associate **Apr 2007 – Jul 2007**

M.S. Ramaiah School of Advanced Studies, Bangalore, India

- Research:
  - Research focus: Satellite image processing.

- Performed a comparative analysis of various pattern classification algorithms as part of the RESPOND project funded by Indian Satellite Research Organization (ISRO), Bangalore.

Software Engineer **Oct 2005 – Oct 2006**

Automotive and Aerospace, Infosys Technologies Limited, Bangalore, India

- Worked in a quality and performance software development and maintenance team for Daimler Chrysler; diagnosed problems in the performance feedback system software (COBOL), implemented viable solutions.

Computer skills:

Operating systems: Unix, Linux, Windows; Computer languages: Phython, C/C++, Matlab, IDL, Perl; Monte-Carlo simulation software: GEANT4; Statistics software: R, JMP, JAFROC.

Awards and Honors:

2012, 2011, 2010, 2009	IEEE Nuclear Science Symposium and Medical Imaging Conference Traineeship Award
2012, 2011	Duke University Conference Travel Fellowship
2008	Academic Scholarship, Biomedical Engineering Department, Duke University
2005	Certificate of Academic Excellence, Visvesvaraya Technological University
2005	2nd place in state level technical paper presentation at E-congregation-05, KVGCE, Sullia, India

Certificates:

Certificate in Molecular Biology for Imaging Scientists (2012)

Service:

- Abstract reviewer for American Association of Physicists in Medicine, since 2019
- Manuscript reviewer for IEEE Transactions on Medical Imaging, Medical Physics, Physics in Medicine and Biology, Academic Radiology, IEEE Transactions on Nuclear Science since 2011
- Consultant for the American Association of Physicists in Medicine task group on Dosimetry in Tomosynthesis Imaging since 2015-2017

Journal Papers:

- I. Danciu, S. Erwin, G.A. Agasthya, T. Janet, B. McMahon, G. Tourassi, A. Justice. *Using longitudinal PSA values and machine learning for predicting progression of early stage prostate cancer in veterans*, in Journal of Clinical Oncology. 2020.
- S. D. Mann, A. Joshi, M. Shonyo, J.R. Wells, J. Hoye, G. A. Agasthya, R. Reiman, E. Samei. *Improved Dose Estimates for Fluoroscopically Guided Lumbar Epidural Injections,* in Pain Medicine. 2019.
- G.A. Agasthya, Y-J. Kim, E. D'Orsi, P. Handa, C. Ho, C.J. D'Orsi, I. Sechopoulos. *Can breast compression be reduced in digital mammography and breast tomosynthesis?,* in American Journal of Roentgenology. 2017.
- K. Michielsen, A. Rodriguez-Ruiz, G.A. Agasthya, I. Sechopoulos, I, *Artifact reduction in breast tomosynthesis by including prior knowledge of the compressed breast shape,* in Proc. Intl. Mtg. on Fully 3D Image Recon. in Rad. and Nuc. Med, 2017.
- A. Rodriguez-Ruiz, G.A. Agasthya, I. Sechopoulos. *The compressed breast during mammography and breast tomosynthesis: in vivo shape characterization and modeling,* in Physics in Medicine and Biology. 2017.
- E. Samei, M. Robins, B. Chen, G. A. Agasthya. *Estimability index for volume quantification of homogeneous spherical lesions in computed tomography,* in Journal of Medical Imaging. 2017.
- J. Hoye, Y. Zhang Y, G.A. Agasthya, G.M. Sturgeon, A.J. Kapadia, W. P. Segars, E. Samei. *Organ dose variability and trends in tomosynthesis and radiography,* in Journal of Medical Imaging. 2017.
- W. Fu, X. Tian, G.A. Agasthya, G. Sturgeon, W.P. Segars, E. Samei. *Breast Dose Reduction with organ-based, wide-angle tube current modulated CT,* in Journal of Medical Imaging. 2016.
- M.N. Lakshmanan, B.P. Harrawood, G. Rusev, G.A. Agasthya, A.J. Kapadia. *Simulations of nuclear fluorescence in Geant4*, in Nuclear instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment. 2014.
- B.P. Harrawood, G.A. Agasthya, M.N. Lakshmanan, G. Raterman, A.J. Kapadia, *Geant4 distributed computing for compact clusters*, in Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment. 2014.
- M.N. Lakshmanan, B.P. Harrawood, G.A. Agasthya, A.J. Kapadia. *Simulations of Breast Cancer Imaging Using Gamma-Ray Stimulated Emission Computed Tomography*, in IEEE Transactions on Medical Imaging. 2014.
- R.S.S. Viana, G.A. Agasthya, H. Yoriyaz, A.J. Kapadia. *3D element imaging using NSECT for the detection of renal cancer: A simulation study in MCNP*, in Physics in Medicine and Biology. 2013. **(Featured on Medical Physics Web)**

- G.A. Agasthya, B.C. Harrawood, J.P. Shah, and A.J. Kapadia. *Sensitivity analysis for liver iron measurement through neutron stimulated emission computed tomography: a Monte Carlo study in GEANT4,* in Physics in Medicine and Biology. 2012.

Conference Proceedings:

- G.A. Agasthya, R. Yip, A. Jirapatnakul, C. Henschke, D. Yankelevitz, G. Tourassi, *Prediction of baseline lung cancer from structured, imbalanced dataset,* in AI and Big data in Cancer (Postponed). 2020.
- I. Danciu, S. Erwin, G.A. Agasthya, T. Janet, B. McMahon, G. Tourassi, A. Justice. *Using longitudinal PSA values and machine learning for predicting progression of early stage prostate cancer in veterans*, in MVP Science Summit. 2020. **(Oral Presentation)**
- G.A. Agasthya, L. Jing, E. Alvaro, M. Samad, C. W. Good, B. D. Terry, C. M. Haggerty, B. K. Fornwalt, *Machine Learning Models Show That Global Longitudinal Strain is a Strong Predictor of Survival After Echocardiography That is Superior to Ejection Fraction*, in American Heart Association. 2018.
- J Hoye, Y Zhang, G. A. Agasthya, G. M. Sturgeon, W. P. Segars, Carl, E Samei. *An atlas-based organ dose estimator for tomosynthesis and radiography*, in SPIE 2017.
- W Fu, G. M. Sturgeon, G. A. Agasthya, W. P. Segars, E.Samei. *Estimation of breast dose reduction potential for organ-based tube current modulated CT with wide dose reduction arc*, in SPIE 2017.
- E Abadi, G. M. Sturgeon, G. A. Agasthya, B.P. Harrawood, A.J. Kapadia, W. P. Segars, E. Samei. *Airways, vasculature, and interstitial tissue: anatomically-informed computational modeling of human lungs for virtual clinical trials,* selected for presentation at SPIE 2017.
- E Abadi, J Sanders, G.A. Agasthya, W.P. Segars, E. Samei. *Contrast-Enhanced CT: Correlation of Radiation Dose and Biological Effect*. In Medical Physics. 2016. (**Oral presentation**)
- W Fu, X Tian, G Sturgeon, G.A. Agasthya, W.P. Segars, M.M. Goodsitt, E.A. Kazerooni, E. Samei. *Estimation of Breast Dose Saving Potential Using a Breast Positioning Technique for Organ-based Tube Current Modulated CT,* in SPIE Medical Imaging. 2016.
- P. Sahbaee, E. Abadi, G.A. Agasthya, Y. Zhang, M. Becchetti, P. Segars, E. Samei. *A technique for multi-dimensional optimization of radiation dose, contrast dose, and image quality in CT imaging*, in SPIE Medical Imaging. 2016.
- G.A. Agasthya, C. D'Orsi, A. Holbrook, C. Ho, M. Piraner, M. Newell, L. Gilliland, I. Sechopoulos. *Reduction in digital breast tomosynthesis interpretation time by slabbing of the reconstructed slices,* in European Congress of Radiology. 2016. **(Oral presentation)**
- Y-J. Kim, G.A. Agasthya, C. Ho, A. Holbrook, M. Newell, M. Fleming, M. Hamlin, P. Handa, N. Braykov, I. Sechopoulos, C. D'Orsi. *Comparison of 3-View Screening Digital Mammography to Screening Digital Breast Tomosynthesis,* in SBI/ACR Breast Imaging Symposium. 2016.
- G. A. Agasthya, I. Sechopoulos. *Analysis of the 3-D shape of patient's breast for breast imaging and surgery planning,* in Medical Physics, 2015. **(Oral presentation)**
- G. A. Agasthya, C. D'Orsi, E. D'Orsi, I. Sechopoulos. *A study on the impact of decreased breast compression during mammography on perceived pain, breast thickness and tissue coverage,* in Medical Physics, 2015. **(Oral presentation)**
- D-J. Rhee, G.A. Agasthya, A.J. Kapadia. *Neutron stimulated emission computed tomography for brain cancer imaging*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2013.
- R.S.S. Viana, M.N. Lakshmanan, G.A. Agasthya, H. Yoriyaz, A.J. Kapadia. *Detection of renal cell carcinoma using neutron time of flight spectroscopy*, in Proceedings of International Nuclear Atlantic Conference – INAC. 2013.
- M.N. Lakshmanan, B.P. Harrawood, G.A. Agasthya, G. Rusev, A.J. Kapadia. *Nuclear resonance fluorescence (NRF) in GEANT4: Development, validation, and testing,* in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2012.
- Q. Magana, A.J. Kapadia, G.A. Agasthya. *Spectra Analysis Automation for Hemochromatosis Using Neutron-Stimulated Emission Data,* in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2012.
- A.J. Kapadia, A. Crowell, B. Fallin, C. Howell, G.A. Agasthya, M.N. Lakshmanan, J. Newton, T. Juang, M. Oldham, M. *3D Measurement of Neutron Dose from a Novel Neutron Imaging Technique*, in Medical Physics. 2012.
- G.A. Agasthya, J.P. Shah, B.P. Harrawood, A.J. Kapadia. *Neutron Time-of-Flight spectrocscopy for depth-resolved quantification through NSECT*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2011.
- G.A. Agasthya, J.P. Shah, B.P. Harrawood, L.W. Nolte, A.J. Kapadia. *Computerized detection of low SNR cases in NSECT: An ROC-based sensitivity analysis*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2011.
- G.A. Agasthya, J.P. Shah, B.P. Harrawood, A.J. Kapadia. *Low dose, non-tomographic estimation of lesion position and trace element concentration in NSECT*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2011.
- A.J. Kapadia, Q. Ye, G.A. Agasthya. *Elemental quantification through Gamma-Stimulated Spectroscopy in GEANT4*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2011.
- A.J. Kapadia, J.P. Shah, G.A. Agasthya. *Quantitative elemental imaging with neutrons for breast cancer diagnosis: a GEANT4 study*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2010.

- A.J. Kapadia, G.A. Agasthya, L. Cumberbatch, C. Howell. *In-Vivo Iron Measurement through Nuclear Resonance Fluorescence*, in Medical Physics. 2010.
- G.A. Agasthya, A.J. Kapadia. *Locating stored iron in the liver through attenuation measurement in NSECT*, in IEEE NSS/MIC Nuclear science symposium and Medical imaging conference. 2009.
- A.J. Kapadia, G.A. Agasthya, G.D. Tourassi. *Detection of iron overload through neutron stimulated emission computed tomography: a sensitivity analysis study*, in SPIE Symposium on Medical Imaging. 2009.

Textbook Chapters:

G.A. Agasthya, A. Rodriguez-Ruiz, I. Sechopoulos, *Digital Breast Tomosynthesis*, Handbook of X-ray Imaging: Physics and Technology. 2017

Selected Presentations:

- G. A Agasthya. *Ideas and challenges in biomedical research that can be impacted by AI,* for AI Initiative, Oak Ridge National Laboratory. 2020. **(Invited talk)**
- G.A Agasthya. *A machine learning approach to medical imaging based outcomes research,* in Biomedical Science, Engineering and Computation Group, Oak Ridge National Laboratory. 2018. **(Invited talk)**
- G.A Agasthya. *3D breast imaging: Improving the quality and safety of the imaging experience,* in Imaging Research Lab, University of Pittsburgh. 2016. **(Invited talk)**
- G.A Agasthya. *Limited angle imaging: Introduction to neutron imaging and x-ray tomosynthesis,* in CT clinical innovation center, Mayo Clinic. 2015. **(Invited talk)**
- G.A Agasthya. *Optimization and 3-D Characterization of Breast Compression for Mammography & Tomosynthesis Imaging,* in Research in progress series, Department of Radiology and Imaging sciences, Emory University. 2015. **(Invited talk)**
- G.A. Agasthya, and A.J. Kapadia. *Locating Stored Iron in the Liver Through Attenuation Measurement in NSECT*, in Duke Medicine Research Day, Duke University. 2011.
- G.A. Agasthya, J.P. Shah, B.P. Harrawood, and A.J. Kapadia. *Neutron Time-of-Flight spectroscopy for depth-resolved quantification through NSECT*, in Imaging the essence: From medical diagnosis to art restoration, Center for molecular and biomolecular imaging, Duke University. 2011.
- A.J. Kapadia, G.A. Agasthya, H. Bilheux, F.X. Gallmeier. *Biological neutron imaging using SNAP: an MCNPX Simulation Study*, in ORNL Neutron Scattering Users Symposium, Oak Ridge National Laboratory. 2011.
- G.A. Agasthya, and A.J. Kapadia. *Non-invasive detection of iron overload through neutron spectroscopy: a sensitivity analysis study*, in Biomedical Engineering Students Retreat, Duke Marine Lab, NC. 2008.