

GUOHUA CAO, Ph.D.

Visiting Scientist, Department of Computer Science,
Virginia Polytechnic Institute and State University (Virginia Tech), and
Founder and CEO, ImagingX Inc., Blacksburg, VA
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EXECUTIVE SUMMARY

Career Accomplishments

	Total
Funded Research Total Amount	\$19,817,070
Funded Research (Candidate) Amount	\$2,089,012
External Funding Total Amount	\$19,549,561
External Funding (Candidate) Amount	\$1,956,758
Internal Funding Total Amount	\$267,509
Internal Funding (Candidate) Amount	\$133,255
Number of Grants	19
Number of External Grants	15
Peer-reviewed journal papers	46
Peer-reviewed conference proceedings	23
Ph.D. Students Graduated	3
M.S. Students Graduated	2
Undergrad Research Projects	31
Awards and Recognition	8
Postdocs	2
Courses Taught	7
Invited Presentations	19
NSF Grant Review Panels	6

Research Interests

Medical Imaging, Medical Physics, Machine Intelligence, Signal Processing, System Engineering, X-ray/CT, Novel X-ray Sources, Imaging Guidance for Surgery/Therapy

Education

UNC at Chapel Hill, Chapel Hill, NC	Medical Physics	Postdoc	2007-2008
Brown University, Providence, RI	Imaging Physics	Postdoc	2005-2007
Brown University, Providence, RI	Physical Chemistry	Ph.D.	2005
Univ. of Sci. & Tech. of China, China	Chemical Physics	B.S.	1999

Appointments

- 2019 - present, Visiting Scientist, Department of Computer Science, Virginia Tech, Blacksburg, VA
- 2018 - present, Founder and CEO, ImagingX Inc, Blacksburg, VA
- 2014 - present, Faculty of Health Sciences, Virginia Tech, Blacksburg, VA

- 2013 - present, Affiliate Faculty, Department of Radiology, Virginia Tech Carilion School of Medicine, Roanoke, VA
- 2011 - 2019, Assistant Professor (Tenure-Track), Department of Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, VA
- 2012 - 2019, Affiliate Faculty, Department of Mechanical Engineering, Virginia Tech, Blacksburg, VA
- 2009 - 2011, Assistant Professor (Research), Department of Physics and Astronomy, UNC at Chapel Hill, Chapel Hill, NC

Awards

- "Best Paper Award", 20th International Conference on Medical and Biomedical Engineering, 06/2018
- Innovator of the Month, 06/2016
- **NSF CAREER Award**, 2014
- Scholar of the Week, 04/2014
- "Best in Physics" Paper Award, Joint American Association of Physicists in Medicine (AAPM) and Canadian Organization of Medical Physicists (COMP) Meeting, 2011
- Honorable Mention Poster Award, SPIE-Medical Imaging Meeting, 2009
- University of North Carolina Postdoctoral Scholar Award for Research Excellence, 2008
- Outstanding Poster Award, National Cancer Institute Alliance for Nanotechnology in Cancer Investigators Meeting, 2007

Research

Publications

	Lead Author	Co-author	Total
Book chapters	0	1	1
Papers in refereed journals	17	29	46
Refereed Conference proceedings	14	9	23
Conference abstracts/posters	13	7	20
Total	44	46	90

Google Scholar: <https://scholar.google.com/citations?user=OdBCesYAAAAJ&hl=en>

Citation > 1200, H-index \geq 16, H10-index \geq 24

PubMed: <https://www.ncbi.nlm.nih.gov/sites/myncbi/guohua.cao.1/bibliography/57760490/public/?sort=date&direction=descending>

Paper number in journals with high impact factors (IF)

Journal	Number of articles
IEEE Transactions on Medical Imaging (2018 Impact Factor 7.816)	2
IEEE Access (2018 Impact Factor 4.098)	3
Medical Physics (2018 Impact Factor 3.177)	12
Physics in Medicine and Biology (2018 Impact Factor 3.03)	3

Summary: 1 with IF > 12; 10 with IF > 4.0; 24 with IF > 3.0

Patents

	Number
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Issued U.S. Patent	1
Pending U.S. Patent	1
Provisional U.S. Patent	7
Pre-Patent Disclosure	17
Total	26

Teaching

- Courses Taught**

BMES 3134 – “Introduction to Biomedical Imaging”, Virginia Tech
 BMES 6514 – “Medical Imaging II”, Virginia Tech
 BMES 5984 – “Radiation in Imaging and Therapy”, Virginia Tech
 BMES 5054 – “Quantitative Cell Physiology”, Virginia Tech
 TBMH 5024 – “Fundamentals of Cancer”, Virginia Tech
 MSTC 735– “Techniques in Materials Characterization”, UNC-Chapel Hill
 CH116 – “Physical Chemistry Laboratory”, Brown University

- New Courses Developed at Virginia Tech**

BMES 5984 – “Radiation in Imaging and Therapy”
 BMES 4984/3134 – “Introduction to Biomedical Imaging”

- Student Evaluation of Instruction at Virginia Tech**

	Overall Teaching Evaluations
Under-graduate courses	5.92 out of 6.00
All Courses	5.11 out of 6.00

Advising

- Summary of Student Advising at Virginia Tech**

Type	Number
PhD Theses Directed and Completed	3
MS Theses Directed and Completed	2
Total Undergraduate Research Projects Directed	25

- Special achievements of graduate student**

- Hao Gong, Recipient of Pratt Scholar 2012, and of Nano Technology Entrepreneurship Challenge 2015

Funding

- Summary of Total Funding**

Funding Category	Total	Candidate's Share
External	\$19,549,561	\$1,956,758
Internal	\$267,509	\$133,255
Total Funded Research	\$19,817,070	\$2,089,012

- Table of Ongoing External Funding**

Project Title	Sponsor	Period	Amount Awarded (share)	Role
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CAREER: Interior 5D Micro-CT to Analyze Atherosclerotic Plaques In Vivo	National Science Foundation	8/1/14-7/31/20 (extension)	\$400,000 (\$400,000)	PI: G. Cao (100%)
Computed Tomography Without Moving Parts for Portable Medical Imaging	Center for Innovative Technology (State Funding Agency in Virginia, <7% success rate)	7/1/17-12/31/19 (extension)	\$100,000 (\$100,000)	PI: G. Cao (100%)
Ultraportable Stroke CT Based on Stationary Carbon Nanotube X-ray Source and Deep Learning Image Formation	National Institute of Health	9/30/2019-8/31/2020	\$225,052 (\$225,052)	PI: G. Cao (100%)

Service

- **Outreach Activities (Selected)**
 - Moderator on Panel “BME Careers: alternative careers” at the Southeast Biomedical Engineering Career Conference, Washington DC. October 28, 2011.
 - Engaging in public media for reports on the candidate’s work.
 - Industry consulting/collaborations and technology commercialization.
 - Active participation in Virginia Tech’s Inclusive VT, CEED/STEP programs.
 - Active recruiter and mentor for female and underrepresented engineering students.
- **Professional Service (Selected)**
 - 2012 – present, mail reviewer for NSF CREST, EPSCoR, Smart and Connected Health, MPS/PHY programs.
 - 2014 – present, Panelist for NSF Major Research Instrument (MRI) program.
 - 2017-2019, Panelist for NSF Graduate Research Fellowship Program Panel (GRFP).
 - Chair of the “CT, PET and SPECT” session, Biomedical Engineering Society (BMES) Annual Conference, Tampa, Florida. October 2015.
 - Journal Reviewer for IEEE Trans. Medical Imaging, Medical Physics, Physics in Medicine and Biology, Scientific Report, etc.
 - X-ray imaging consulting and service to 50+ investigators at Virginia Tech, other universities and industries.

I. RESEARCH

A. List of publications

a. Peer-reviewed journal articles

Journal Description

IEEE Transactions on Medical Imaging – *IEEE Trans. Med. Imaging* (TMI) publishes original contributions on medical imaging achieved by modalities including ultrasound, x-rays, magnetic resonance, radio nuclides, microwaves, and optical methods. It accepts manuscripts on imaging of body structure, morphology and function, including cell and molecular imaging and all forms of microscopy. It encourages contributions describing novel acquisition techniques, medical image processing and analysis, visualization and performance, pattern recognition, machine learning, and related methods. The focus of the journal is on unifying the sciences of medicine, biology, and imaging. It emphasizes the common ground where instrumentation, hardware, software, mathematics, physics, biology, and medicine interact through new analysis methods. Strong

application papers that describe novel methods and studies that involve highly technical perspectives are most welcome. Impact Factor 2018: 7.816.

IEEE Transactions on Biomedical Engineering – publishes basic and applied papers dealing with biomedical engineering. Papers range from engineering development in methods and techniques with biomedical applications to experimental and clinical investigations with engineering contributions. Impact Factor 2018: 4.491.

IEEE Access – is an award-winning, multidisciplinary journal, continuously presenting the results of original research or development across all of IEEE's fields of interest. It emphasizes applications-oriented and interdisciplinary articles. Impact Factor 2018: 4.098.

Medical Physics – *Medical Physics* is an official science journal of the American Association of Physicists in Medicine (AAPM), the International Organization for Medical Physics (IOMP), and the Canadian Organization of Medical Physicists (COMP). It is a hybrid gold open-access journal. It publishes research concerned with the application of physics and mathematics to the solution of problems in medicine and human biology. Accepted research articles must include novel medical physics scientific or technical content or broadly applicable clinical physics innovations. The reviewers, editors, and editorial board members come from established experts focusing in the field of medical physics. Impact Factor 2018: 3.177.

Physics in Medicine and Biology – *PMB* is an international journal of biomedical physics and engineering. It is published by IOP Publishing on behalf of the Institute of Physics and Engineering in Medicine (IPEM). It publishes the application of theoretical and practical physics to medicine, physiology and biology. *PMB* is a high-quality, upper-quartile journal and the majority of submitted articles are rejected. Impact Factor 2018: 3.03.

List of peer-reviewed papers in reverse chronological order (46 total)

(Note: For each contribution, the candidate's name is always underlined, and the names of the candidate's former/current advisees are indicated by an asterisk following their names.)

46 Qing Tang, Jie Hu, Guwei Xie, Xunlai Yuan, Bin Wan, Chuanming Zhou, Xu Dong, Guohua Cao, Bruce S Lieberman, and Sally P Leys, "A problematic animal fossil from the early Cambrian Hetang Formation, South China". **Journal of Paleontology**: p. 1-11 (2019).

45 Xu Dong*, Cheng Chen, and Guohua Cao, "Improving Molecular Sensitivity in X-ray Fluorescence Molecular Imaging (XFMI) of Iodine Distribution in Mouse-Sized Phantoms via Excitation Spectrum Optimization", **IEEE Access** 6, 56966-56976 (2018). DOI: 10.1109/ACCESS.2018.2873500.

44 Guohua Cao, "Biomedical X-ray imaging enabled by carbon nanotube X-ray sources", **Chinese Journal of Chemical Physics** 31(4), 529-536 (2018).

43 Zhicheng Zhang*, Xiaokun Liang, Xu Dong*, Yaoqin Xie, and Guohua Cao, "A Novel Sparse-View CT Reconstruction Method Based on Combination of DenseNet and Deconvolution", **IEEE Trans. on Medical Imaging** 37(6), 1407-1417 (2018).

42 Shunli Zhang, Guohua Geng, Guohua Cao, Yuhe Zhang, Baodong Liu, and Xu Dong*, "Fast projection algorithm for LIM-based simultaneous algebraic reconstruction technique and its parallel implementation on GPU", **IEEE Access** 6, 23007-23018 (2018).

41 Xiaodong Yu, Hao Wang, Wu-chun Feng, Hao Gong*, and Guohua Cao, "GPU-Based Iterative Medical CT Image Reconstructions", **Journal of Signal Processing Systems**: p. 1-18 (2018).

- 40 Hao Gong*, Bin Li, Xun Jia, and Guohua Cao, "Physics Model Based Scatter Correction in Multi-Source Interior Computed Tomography". **IEEE Trans. Medical Imaging**, 37(20): p. 349-360 (2018).
- 39 Gong, H*. Yan, X. Jia, B. Li, G. Wang, and G. Cao, "X-ray scatter correction for multi-source interior computed tomography". **Medical Physics** 44(1): p. 71-83 (2017).
- 38 Lijuan Kan, Patrick Thayer, Huimin Fan, Benjamin Ledford, Miao Chen, Aaron Goldstein, Guohua Cao, and Jia-Qiang He, "Polymer microfiber meshes facilitate cardiac differentiation of c-kit+ human cardiac stem cells". **Experimental cell research** 347(1): p. 143-152 (2016).
- 37 Hao Gong*, Rui Liu, Hengyong Yu, Jianping Lu, Otto Zhou, Lijuan Kan, Jia-Qiang He, and Guohua Cao, "Interior tomographic imaging of mouse heart in a carbon nanotube micro-CT". **Journal of X-Ray Science and Technology** 24(4): p. 549-563 (2016).
- 36 Q. Zhang, S. H. Xiao, Y. H. Liu, X. L. Yuan, B. Wan, A. D. Muscente, T. Q. Shao, H. Gong*, and G. H. Cao, "Armored kinorhynch-like scalidophoran animals from the early Cambrian". **Scientific Reports** 5: p. 16521 (2015).
- 35 Shengqi Tan, Yanbo Zhang, Xuanqin Mou Ge Wang, Guohua Cao, Zhifang Wu, and Hengyong Yu, "Tensor-based dictionary learning for dynamic tomographic reconstruction". **Physics in Medicine and Biology** 60(7): p. 2803-2818 (2015).
- 34 Dustin L Crouch, Ian D Hutchinson, Johannes F Plate, Jennifer Antoniono, Hao Gong*, Guohua Cao, Zhongyu Li, and Katherine R Saul, "Biomechanical Basis of Shoulder Osseous Deformity and Contracture in a Rat Model of Brachial Plexus Birth Palsy". **J Bone Joint Surg Am** 97(15): p. 1264-1271 (2015).
- 33 Shunli Zhang*, Dinghua Zhang, Hao Gong*, Omid Ghasemalizadeh*, Ge Wang, and Guohua Cao, "Fast and accurate computation of system matrix for area integral model-based algebraic reconstruction technique". **Optical Engineering** 53(11): p. 113101-113101 (2014).
- 32 Kriti Sen Sharma*, Hao Gong*, Omid Ghasemalizadeh*, Hengyong Yu, Ge Wang, and Guohua Cao, "Interior micro-CT with an offset detector". **Medical Physics** 41(6): p. 061915 (2014).
- 31 Alex MT Opie, James R Bennett*, Michael Walsh, Kishore Rajendran, Hengyong Yu, Qiong Xu, Anthony Butler, Philip Butler, Guohua Cao, and Aaron M Mohs, "Study of scan protocol for exposure reduction in hybrid spectral micro-CT". **Scanning** 36(4): p. 444-455 (2014).
- 30 Mike Hadsell, Guohua Cao, Jian Zhang, Laurel Burk, Torsten Schreiber, Eric Schreiber, Sha Chang, Jianping Lu, and Otto Zhou, "Pilot study for compact microbeam radiation therapy using a carbon nanotube field emission micro-CT scanner". **Medical Physics** 41(6): p. 061710 (2014).
- 29 Guohua Cao, Baodong Liu, Hao Gong*, Hengyong Yu, and Ge Wang, "A Stationary-Sources and Rotating-Detectors Computed Tomography Architecture for Higher Temporal Resolution and Lower Radiation Dose". **IEEE Access** 2: p. 1263-1271 (2014).
- 28 James R Bennett*, Alex MT Opie, Qiong Xu, Hengyong Yu, Michael Walsh, Anthony Butler, Patrick Butler, Guohua Cao, Aaron Mohs, and Ge Wang, "Hybrid spectral micro-ct: System design, implementation, and preliminary results". **IEEE Transactions on Biomedical Engineering** 61(2): p. 246-253 (2014).
- 27 Ge Wang, Feng Liu, Fenglin Liu, Guohua Cao, Hao Gao, and Michael W Vannier, "Marriage of CT and MRI for vulnerable plaque characterization". **Imaging in medicine** 5(2): p. 95-97 (2013).
- 26 L. Zhang, M. Hadsell, L. Burk, J. Zhang, G. Cao, J. Lu, S. Chang, and O. Zhou, "TH-E-218-10: Feasibility Demonstration and Initial Construction of an Integrated Carbon Nanotube Micro-CT System for Compact Microbeam Radiation Therapy Image Guidance". **Medical Physics** 39(6Part31): p. 4019-4019 (2012).

- 25 Wenxiang Cong, Haiou Shen, Guohua Cao, Hong Liu, and Ge Wang, "X-ray fluorescence tomographic system design and image reconstruction". **Journal of X-Ray Science and Technology** 21(1): p. 1-8 (2013).
- 24 O. Zhou, J. Lu, X. Calderon-Colon, X. Qian, G. Yang, G. Cao, E. Gidcumb, A. Tucker, J. Shan, D. Spronk, and F. Sprenger, "TU-E-110-02: Multibeam X-Ray Source Array Based on Carbon Nanotube Field Emission". **Medical Physics** 38(6Part29): p. 3773-3773 (2011).
- 23 J. Zhang, M. Hadsell, G. Cao, P. Laganis, F. Sprenger, E. Schreiber, G. Tracton, S. Chang, J. Lu, and O. Zhou, "MO-G-BRB-04: Feasibility Study of a Nanotechnology-Enabled Desktop Image-Guided Microbeam Radiation Therapy System". **Medical Physics** 38(6Part27): p. 3735-3735 (2011).
- 22 Baodong Liu, Ge Wang, Erik L Ritman, Guohua Cao, Jianping Lu, Otto Zhou, Li Zeng, and Hengyong Yu, "Image reconstruction from limited angle projections collected by multisource interior x-ray imaging systems". **Physics in Medicine and Biology** 56(19): p. 6337 (2011).
- 21 Yueh Lee, Laurel M Burk, Ko-han Wang, Guohua Cao, Jonathan Volmer, Jianping Lu, and Otto Zhou, "Prospective respiratory gated carbon nanotube micro computed tomography". **Academic Radiology** 18(5): p. 588-593 (2011).
- 20 Yueh Lee, Laurel Burk, Ko-han Wang, Guohua Cao, Jianping Lu, and Otto Zhou, "Carbon nanotube based X-ray sources: Applications in pre-clinical and medical imaging". **Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment** 648: p. S281-S283 (2011).
- 19 M. Hadsell, J. Zhang, G. Cao, E. Schreiber, J. Lu, S. Chang, and O. Zhou, "TH-C-220-01: Pilot Study for the Development of Clinical Microbeam Radiation Therapy Using a Carbon Nanotube Field Emission Micro-CT Scanner". **Medical Physics** 38(6Part35): p. 3862-3862 (2011).
- 18 M. Hadsell, J. Zhang, G. Cao, P. Laganis, F. Sprenger, E. Schreiber, S. Chang, J. Lu, and O. Zhou, "TH-C-220-04: Development and Characterization of a Prototype Compact Microbeam Radiation Therapy Device Based on Carbon Nanotube Field Emission X-Ray Source Technology". **Medical Physics** 38(6Part35): p. 3863-3863 (2011).
- 17 Ko-Han Wang, Laurel M Burke, Eunice Kang, Yueh Z Lee, Guohua Cao, Jianping Lu, Mauricio Rojas, Monte S Willis, and Otto Zhou. "Carbon nanotube micro-computed tomography imaging of myocardial infarction using delayed contrast enhancement". 122(Suppl 21): p. A18892-A18892, **Circulation**, American Heart Association, Inc. (2010).
- 16 Yang Lu, Hengyong Yu, Guohua Cao, Jun Zhao, Ge Wang, and Otto Zhou, "Multibeam field emission x-ray system with half-scan reconstruction algorithm". **Medical Physics** 37(7): p. 3773 (2010).
- 15 Guohua Cao, Laurel M Burk, Yueh Z Lee, Xiomara Calderon-Colon, Shabana Sultana, Jianping Lu, and Otto Zhou, "Prospective-gated cardiac micro-CT imaging of free-breathing mice using carbon nanotube field emission x-ray". **Medical Physics** 37(10): p. 5306 (2010).
- 14 Junguo Bian, Xiao Han, Emil Y Sidky, Guohua Cao, Jianping Lu, Otto Zhou, and Xiaochuan Pan, "Investigation of sparse data mouse imaging using micro-CT with a carbon-nanotube-based X-ray source". **Tsinghua Science & Technology** 15(1): p. 74-78 (2010).
- 13 Hengyong Yu, Guohua Cao, Laurel Burk, Yueh Lee, Jianping Lu, Pete Santago, Otto Zhou, and Ge Wang, "Compressive sampling based interior reconstruction for dynamic carbon nanotube micro-CT". **Journal of X-Ray Science and Technology** 17(4): p. 295 (2009).
- 12 Kathryn E deKrafft, Zhigang Xie, Guohua Cao, Sylvie Tran, Liqing Ma, Otto Z Zhou, and Wenbin Lin, "Iodinated nanoscale coordination polymers as potential contrast agents for computed tomography". **Angewandte Chemie** 121(52): p. 10085-10088 (2009).
- 11 G. Cao, T. Hamilton, C. M. Laperle, C. Rose-Petruck, and G. J. Diebold, "X-ray phase contrast imaging: Transmission functions separable in cylindrical coordinates". **Journal of Applied Physics** 105(10): p. 102002 (2009).

10. Guohua Cao, Jian Zhang, Otto Zhou, and Jianping Lu, "Temporal multiplexing radiography for dynamic x-ray imaging". *Review of Scientific Instruments* 80(9): p. 093902 (2009).
9. G Cao, YZ Lee, R Peng, Z Liu, R Rajaram, X Calderon-Colon, L An, P Wang, T Phan, and S Sultana, "A dynamic micro-CT scanner based on a carbon nanotube field emission x-ray source". **Physics in Medicine and Biology** 54(8): p. 2323 (2009).
8. Xiomara Calderón-Colón, Huaizhi Geng, Bo Gao, Lei An, Guohua Cao, and Otto Zhou, "A carbon nanotube field emission cathode with high current density and long-term stability". **Nanotechnology** 20(32): p. 325707 (2009).
7. G. Cao, R. Peng, Y. Lee, R. Rajaram, X. Calderon-Colon, L. An, T. Phan, D. Lalush, J. Lu, and O. Zhou, "SU-GG-J-16: A Physiologically Gated Micro-CT Scanner for Dynamic Small Animal Imaging Based On a Carbon Nanotube X-Ray Source". **Medical Physics** 35(6Part5): p. 2682-2682 (2008).
6. Guohua Cao, Sorasak Danworaphong, and Gerald J Diebold, "A search for laser heating of a sonoluminescing bubble". **The European Physical Journal-Special Topics** 153(1): p. 215-221 (2008).
5. G Yang, R Rajaram, J Zhang, S Sultana, G Cao, D Lalush, J Lu, and O Zhou, "SU - FF - I - 40: A Novel Gantry - Free DBT System Using a Stationary Multi - Beam Field Emission X - Ray Source Array Based On Carbon Nanotubes (CNTs)". **Medical Physics** 34(6): p. 2347-2347 (2007).
4. Guohua Cao, Theron J Hamilton, Christoph Rose-Petruck, and Gerald J Diebold, "X-ray phase-contrast imaging: transmission functions separable in Cartesian coordinates". **JOSA A** 24(4): p. 1201-1208 (2007).
3. C Rose-Petruck, Y Jiang, T Lee, and G Cao. "Ultrafast lasers and x-ray absorption spectroscopy: Investigating molecular structure and dynamics of solvated molecules". **Abstracts of Papers of the American Chemical Society**, 223: p. C67-C67 AMER CHEMICAL SOC 1155 16TH ST, NW, WASHINGTON, DC 20036 USA (2002).
2. Y Jiang, T Lee, G Cao, and C Rose-Petruck. "Molecular structure of solvated molecules measured using an ultrafast laboratory-based x-ray source". **Abstracts of Papers of the American Chemical Society**, 223: p. C63-C63 AMER CHEMICAL SOC 1155 16TH ST, NW, WASHINGTON, DC 20036 USA (2002).
1. C Rose-Petruck, Y Jiang, W Li, G Ketwaroo, G Cao, and Cr Wu. "Generation and application of x-radiation by interaction of ultrashort high-intensity laser pulses with condensed matter". **Abstracts of Papers of the American Chemical Society**, 221: p. U290-U290 AMER CHEMICAL SOC 1155 16TH ST, NW, WASHINGTON, DC 20036 USA (2001).

b. Peer-reviewed conference papers

Proceedings of the Computing Frontiers Conference – ACM International Conference on Computing Frontiers in 2017 has an acceptance rate of 42%.

IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing – has a paper acceptance rate of 23% in 2016.

SPIE-Medical Imaging - is the premier multidisciplinary forum that seeks to advance medical imaging technologies. It attracts thousands of participants to the conference each year. All proceeding papers must be peer reviewed by the conference organization committee members, who are internationally well-known experts in the field of medical imaging.

List of peer-viewed conference proceedings in reverse chronological order (23 total)

23. Zhicheng Zhang, Xu Dong, Swapnil Vekhande, and Guohua Cao. "Deep Learning based Reconstruction Methods for Sparse-view CT". IEEE International Symposium on Biomedical Imaging (ISBI) Paper Number 805, (2019).
22. Xu Dong, Swapnil Vekhande, and Guohua Cao. "Sinogram interpolation for sparse-view micro-CT with deep learning neural network". Medical Imaging 2019: Physics of Medical Imaging, 10948: p. 109482 International Society for Optics and Photonics (2019).
21. Xu Dong, Olga V Pen, Zhicheng Zhang, and Guohua Cao. "An improved physics model for multi-material identification in photon counting CT". Medical Imaging 2019: Physics of Medical Imaging, 10948: p. 109484O International Society for Optics and Photonics (2019).
20. Zhicheng Zhang, Xu Dong, Swapnil Vekhande, and Guohua Cao. "A Deep Learning Based Reconstruction Method for Sparse-view CT". 40th International Conference of the IEEE Engineering in Medicine and Biology Conference (EMBC), (2018).
19. Hao Gong, Bin Li, Xun Jia, and Guohua Cao. "Journal Paper: Physics Model Based Scatter Correction in Multi-Source Interior Computed Tomography". IEEE International Symposium on Biomedical Imaging Paper Number 681, (2018).
18. Guohua Cao and Xu Dong. "X-ray Fluorescence Molecular Imaging with Improved Sensitivity for Biomedical Applications". 20th International Conference on Medical and Biomedical Engineering, Toronto, Canada (2018).
17. Xiaodong Yu, Hao Wang, Wu-Chun Feng, Hao Gong, and Guohua Cao. "An Enhanced Image Reconstruction Tool for Computed Tomography on CPUs". Proceedings of the Computing Frontiers Conference: p. 97-106, ACM (2017).
16. Xiaodong Yu, Hao Wang, Wu-Chun Feng, Hao Gong, and Guohua Cao. "cuART: Fine-Grained Algebraic Reconstruction Technique for Computed Tomography Images on GPUs". Proceedings of the 2016 IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, CCGrid 16: p. 165-168, (2016).
15. Hao Gong, Jianping Lu, Otto Zhou, and Guohua Cao. "Implementation of interior micro-CT on a carbon nanotube dynamic micro-CT scanner for lower radiation dose". SPIE Medical Imaging: p. 94124N International Society for Optics and Photonics (2015).
14. Hao Gong, Chuang Miao, Hengyong Yu, Ge Wang, and Guohua Cao. "Real phantom datasets for the evaluation of reconstruction algorithms at various dose conditions". Biomedical Imaging (ISBI), 2014 IEEE 11th International Symposium on: p. 65-68 IEEE (2014).
13. Ge Wang, Feng Liu, Fenglin Liu, Guohua Cao, Hao Gao, and Michael W. Vannier. "Top-Level Design of the First CT-MRI Scanner". The 12th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine, (2013).
12. Guohua Cao, Jianping Lu, and Otto Zhou. "X-ray fluorescence molecular imaging with high sensitivity: feasibility study in phantoms". Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 8313: p. 25 (2012).
11. Guohua Cao, Baodong Liu, Hengyong Yu, and Ge Wang. "A new CT architecture with stationary x-ray sources". SPIE Optical Engineering+ Applications: p. 850613 International Society for Optics and Photonics (2012).
10. Shabana Sultana, Xiomara Calderón-Colón, Guohua Cao, Otto Zhou, and Jianping Lu, "Design and Characterization of a Carbon Nanotube based Micro-Focus X-Ray Tube for Small Animal Imaging". Proc. of SPIE Vol 7622: p. 76225G-76221 (2010).
9. Guohua Cao, Xiomara Calderon-Colon, Laurel Burk, Yueh Z Lee, Shabana Sultana, Jianping Lu, and Otto Zhou. "Desktop micro-CT with a nanotube field emission x-ray source for high-resolution cardiac imaging". Proc. of SPIE Vol, 7622: p. 76222B-76221 (2010).
8. H. Yu, G. Cao, L. Burk, Y. Lee, J. Lu, P. Santago, C. Wyatt, O. Zhou, and G. Wang. "Compressive sampling based interior tomography for dynamic carbon nanotube Micro-CT". The 10th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine, (2009).

7. Guohua Cao, Xiomara Calderon-Colon, Peng Wang, Laurel Burk, Yueh Z Lee, Ramya Rajaram, Shabana Sultana, David Lalush, Jianping Lu, and Otto Zhou. "A dynamic micro-CT scanner with a stationary mouse bed using a compact carbon nanotube field emission x-ray tube". SPIE Medical Imaging: p. 72585Q-72585Q-72587 International Society for Optics and Photonics (2009).
6. J Bian, X Han, Ey Sidky, G Cao, J Lu, O Zhou, and X Pan, "Investigation of sparse-data mouse imaging using micro-CT with a carbonnanotube X-ray source". Proceedings of the 10th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine: p. 410-413 (2009).
5. Guang Yang, Ramya Rajaram, Guohua Cao, Shabana Sultana, Zhijun Liu, David Lalush, Jianping Lu, and Otto Zhou. "Stationary digital breast tomosynthesis system with a multi-beam field emission x-ray source array". Proc. SPIE, 6913(1): p. 69131A (2008).
4. Guohua Cao, Yueh Z Lee, Zejian Liu, Ramya Rajaram, Rui Peng, Xiomara Calderon-Colon, Lei An, Peng Wang, Tuyen Phan, and David Lalush. "Respiratory-gated micro-CT using a carbon nanotube based micro-focus field emission X-ray source". Medical Imaging: p. 691304-691304-691311 International Society for Optics and Photonics (2008).
3. Christopher M Laperle, Guohua Cao, Theron J Hamilton, Christoph Rose-Petruck, and Gerald J Diebold. "Photothermal modulation of x-ray phase contrast images". Proc. of SPIE Vol, 6437: p. 64371N-64371 (2007).
2. Theron J Hamilton, Guohua Cao, Shougang Wang, Claude J Bailat, Cuong K Nguyen, Shengqiong Li, Stephan Gehring, Jack Wands, Vitalyi Gusev, and Christoph Rose-Petruck. "Ultrasonically modulated x-ray phase contrast and vibration potential imaging methods". Biomedical Optics 2006: p. 608601-608601-608611 International Society for Optics and Photonics (2006).
1. Theron J Hamilton, Guohua Cao, Claude J Bailat, Jack Wands, Stephan Gehring, Christoph Rose-Petruck, and Gerald J Diebold. "Ultrasonically modulated X-ray phase contrast imaging". Biomedical Imaging: Nano to Macro, 2006. 3rd IEEE International Symposium on: p. 1108-1111 IEEE (2006).

c. Meeting Abstracts (in reverse chronological order: 20 total)

20. Zachary Kozar, Guohua Cao, Albert Kozar, David Woodson, and Vincent Wang. "Quantitative Analysis of Sonographic Images of Patellar Tendons in Collegiate Women's Basketball Players Using Grayscale and Shear Wave Elastography Techniques". BMES Annual Conference, Philadelphia, Pennsylvania (2019).
19. Xu Dong, Olga V. Pen, Zhicheng Zhang, and Guohua Cao. "Material Identification from Spectral CT Using Effective Atomic Number and Electron Density". BMES Annual Conference, Atlanta, Georgia (2018).
18. Xu Dong, Olga V. Pen, Zhicheng Zhang, and Guohua Cao. "Quantitative Imaging of Electron Density and Effective Atomic Number Using Spectral CT". BMES Annual Conference, Phoenix, Arizona (2017).
17. Olga V. Pen and Guohua Cao. "Improving Iodine Contrast Agent Sensitivity in Spectral Computed Tomography via Rho-Z Mapping". BMES Annual Conference, Minneapolis, Minnesota (2016).
16. Hao Gong and Guohua Cao. "Measurement-based and model-based scatter correction in multi-source interior computed tomography". BMES Annual Conference, Minneapolis, Minnesota (2016).
15. Hao Gong and Guohua Cao. "A scheme of multi-source interior computed tomography". Virginia-Nordic Neuroscience conference, Roanoke, Virginia (2016).

14. Xu Dong and Guohua Cao. "Experimental Investigation of the Impact of Excitation Beam on Chemical Concentration Sensitivity for X-ray Fluorescence Computed Tomography (XFCT)". BMES Annual Conference, Minneapolis, Minnesota (2016).
13. H. Gong, O. Pen, and G. Cao. "Scatter reduction and correction in multi-source cardiac computed tomography". BMES Annual Conference, Tampa, Florida (2015).
12. H. Gong and G. Cao. "Interior micro-CT for radiation dose reduction". BMES Annual Conference, San Antonio (2014).
11. Hao Gong, Baodong Liu, Omid Ghasemalizadeh, Hengyong Yu, Ge Wang, and Guohua Cao. "Cardiac CT Architecture with Lower Radiation Dose and Higher Temporal Resolution". BMES Annual Conference, Seattle, Washington (2013).
10. P. Wang, S. Sultana, G. Cao, X. Calderon-Colon, J. Lu, and O. Zhou. "Design and characterization of a portable field emission micro-focus x-ray tube for micro-CT". Medical Imaging: Physics of Medical Imaging, San Diego, CA (2009).
9. Guohua Cao, Yueh Z. Lee, Rui Peng, Ramya Rajaram, Xiomara Calderon, Lei An, Tuyen Phant, Jianping Lu, and Otto Zhou. "A physiologically gated micro-CT scanner based on a carbon nanotube x-ray source". The Carolina Center of Cancer Nanotechnology Excellence Investigators Meeting, Chapel Hill, North Carolina (2008).
8. G. Cao, Y. Lee, R. Rajaram, X. Calderon, L. An, J. Lu, and O. Zhou. "A physiologically gated micro-CT scanner for dynamic small animal imaging based on a carbon nanotube x-ray source". AAPM annual meeting, Houston, Texas (2008).
7. G. Cao, Y. Lee, J. Lu, and O. Zhou. "Dynamic imaging of free breathing mice using carbon nanotube micro-CT". Biomedical Research Imaging Center Small Animal Imaging Workshop, Chapel Hill, North Carolina (2008).
6. G. Yang, R. Rajaram, J. Zhang, G. Cao, S. Sultana, Y. Lee, D. Lalush, J. Lu, and O. Zhou. "Stationary digital breast tomosynthesis system using nano X-ray source". NCI Nanotechnology Alliance Investigators Meeting, Chapel Hill, North Carolina (2007).
5. Christoph Rose-Petruck, Christopher Laperle, Theron Hamilton, Guohua Cao, Philip Wintermeyer, Gerald Diebold, and Jack Wands. "Medical Applications of X-Ray Phase Contrast Imaging". APS Meeting Abstracts, 1: p. 19005 (2007).
4. G. Cao, Y. Lee, R. Rajaram, R. Peng, X. Calderon, L. An, T. Phant, J. Lu, and O. Zhou. "From Carbon Nanotubes to Respiratory-Gated in vivo X-ray Imaging of Small Animals". NCI Nanotechnology Alliance Investigators Meeting, Chapel Hill, North Carolina (2007).
3. Guohua Cao and Gerald Diebold. "Laser Induced Concentration Shockwave". Gordon Research Conference: Photoacoustic & Photothermal Phenomena, New London, New Hampshire (2003).
2. Christoph Rose-Petruck, Yan Jiang, Wei Li, Guohua Cao, Taewoo Lee, Gyanprakash Ketwaroo, and Christoph G Rose-Petruck. "Ultrafast lasers and x-ray absorption spectroscopy in chemical research: observing molecular structures of solvated molecules". Applications of High Field and Short Wavelength Sources: p. TuD3 Optical Society of America (2001).
1. Yan Jiang, Wei Li, Guohua Cao, Taewoo Lee, Gyanprakash Ketwaroo, and Christoph G Rose-Petruck. "Ultrafast x-ray absorption spectroscopy: observing the equilibrium structure and structural dynamics of solvated molecules". International Symposium on Optical Science and Technology: p. 42-48 International Society for Optics and Photonics (2001).

d. Book chapters

1. Otto Zhou, Guohua Cao, Yueh Z Lee, and Jianping Lu, "*Carbon Nanotube X-Ray for Dynamic Micro-CT Imaging of Small Animal Models*". In "Nanoplatfrom-Based Molecular Imaging", p. 139-158 (2011).

B. Patents

a. Issued Patents

1. Jianping Lu, Otto Zhou, Guohua Cao, and Jian Zhang, "Systems and Methods For Temporal Multiplexing X-Ray Imaging". US8358739B2 (2010)

b. Pending Patents

1. Guohua Cao and Ge Wang, "Stationary source computed tomography and ct-mri systems". US14429835 (2015)

c. Provisional Patents

Available upon request.

d. Disclosures (pre-patent)

Available upon request.

II. FUNDING

A. Summary of total funding

Funding Category	Total	Candidate's Share
External	\$19,549,561	\$1,956,758
Internal	\$267,509	\$133,255
Total Funded Research	\$19,817,070	\$2,089,013

B. Table of current external funding

Project Title	Sponsor	Period	Amount Awarded (share)	Role
CAREER: Interior 5D Micro-CT to Analyze Atherosclerotic Plaques In Vivo	National Science Foundation	8/1/14-7/31/20 (extension)	\$400,000 (\$400,000)	Role: PI (100%)
Computed Tomography Without Moving Parts	Center for Innovative Technology (State Funding Agency in Virginia, <7% success rate)	7/1/17-12/31/19 (extension)	\$100,000 (\$100,000)	Role : PI (100%)
Industrial X-ray inspection	Various Industrial Companies	1/1/13-present	\$16,200 (\$16,200)	Role: PI (100%)
Ultraportable Stroke CT Based on Stationary Carbon Nanotube X-ray Source and Deep Learning Image Formation	National Institute of Health	9/30/2019-8/31/2020	\$225,052 (\$225,052)	PI: G. Cao (100%)

C. Table of completed external funding

Project Title	Sponsor	Period	Amount Awarded (share)	Role
ARRA – Nanotechnology enabled desktop image-guided microbeam radiation therapy system	NIH	9/30/09-9/29/11	\$1,839,402 (\$257,516)	Role: Co-I PI: O. Zhou
Carolina Center of Cancer Nanotechnology Excellence	NIH	9/1/10-8/31/15	\$16,476,046 (\$576,662)	Role: Co-I PI: J. Desimone
Dual energy field emission micro-focus x-ray tube for micro-CT	NIH	12/1/10-5/31/13	\$79,261 (\$79,261)	Role: Co-I PI: O. Zhou
A dynamic micro-CT scanner based on carbon nanotube field emission x-ray source	NIH	1/1/11-12/31/12	\$80,000 (\$80,000)	Role: Co-PI PI: O. Zhou
Single source dual energy micro-CT	NIH	9/1/11-8/31/13	\$81,022 (\$81,022)	Role: Co-PI PI: O. Zhou
Carbon Nanotube Interior Micro-CT	NIH	1/1/12-6/30/12	\$15,000 (\$15,000)	Role: PI (100%)
Using μ CT to study amphibian morphology and systematics	4-VA	1/1/16-5/30/16	\$10,000 (\$5,000)	Role: Subcontract PI@VT (50%) PI: D. McLeod@JMU
A Smart Device for Mine Dust Characterization and Diagnosis	Alpha Foundation	8/15/17-2/14/19	\$175,000 (\$68,467)	Role: Co-PI (30%) PI: C. Chen
Design of a gated carbon nanotube X-ray tube	A Confidential Company	5/10/19-8/9/19	\$57,033 (\$57,033)	Role: PI (100%)

D. Table of completed internal funding

Project Title	Sponsor	Period	Amount Awarded (share)	Role
Cardiovascular Computed Tomography with Stationary Carbon Nanotube X-ray Sources	ICTAS/JFC at Virginia Tech	7/1/13-6/30/15	\$120,000 (\$108,000)	Role: PI (90%) Co-PI: J. Robertson (10%)
Cardiac Tissue Regeneration: integrating drug delivery, cells and 4D in situ imaging	ICTAS/JFC at Virginia Tech	7/1/15-6/30/17	\$120,000 (\$6,000)	Role: Co-PI (5%) PI: J. He
New Faculty Mentorship Grant	Provost's Office at Virginia Tech	1/1/12-12/31/13	\$1,500 (\$1,500)	Role: PI (100%)
Carbon nanotube interior micro-CT	ICTAS/NTEC at Virginia Tech	1/1/15-5/31/15	\$2,500 (\$2,500)	Role: PI (100%)
High performance computing in biomedical imaging	SEEC at Virginia Tech	1/1/16-5/30/16	\$16,509 (\$8,255)	Role: PI (50%) Co-PI: W. Feng (50%)

The natural history of the stented coronary heart disease	Carilion Clinic at VTCRI	5/10/13-8/9/13	\$6,000 (\$6,000)	Role: Subcontract PI (100%) PIs: J. Foerst
Postdoctoral Research Excellence Award	University of N. Carolina	5/1/08-12/31/08	\$1,000 (\$1,000)	Role: PI (100%)

III. TEACHING

A. Courses taught

Semester	Course	Course Name	Credit Hours	Course Enrollment	Percent Responsible
Spring 2006 ^a	CH 116	Physical Chemistry Laboratory	3	12	100%
Spring 2008 ^b	MSTC 735	Techniques in Materials Characterization	3	4	7%
Fall 2011	BMES 5014	Quantitative Cell Physiology	3	24	25%
Fall 2012	BMES 5054	Quantitative Cell Physiology	3	35	25%
Fall 2013	BMES 5054	Quantitative Cell Physiology	3	26	25%
Fall 2013	BMES 5984	Radiation in Imaging & Therapy	3	4	100%
Fall 2014	BMES 5054	Quantitative Cell Physiology	3	20	33%
Spring 2015	BMES 5984	Radiation in Imaging & Therapy	3	3	100%
Fall 2015	BMES 5054	Quantitative Cell Physiology	3	34	25%
Fall 2015	BMES 4984	Introduction to Biomedical Imaging	3	4	75%
Spring 2016	TBMH 5024	Fundamentals of Cancer	8	3	7%
Spring 2016	BMES 6514	Medical Imaging II	3	5	28%
Fall 2016	BMES 5054	Quantitative Cell Physiology	3	11	33%
Fall 2016	BMES 3134	Intro to Biomedical Imaging	3	7	75%
Fall 2017	BMES 5054	Quantitative Cell Physiology	3	40	33%
Fall 2017	BMES 3134	Intro to Biomedical Imaging	3	11	75%
Fall 2018	BMES 3134	Intro to Biomedical Imaging	3	8	75%

^a Course taught at Brown University

^b Course taught at UNC-Chapel Hill

Student evaluations of instruction at Virginia Tech

Semester	Course Number	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree	Total Responses	Total Enrollment	Overall Teaching effectiveness from SPOT Survey (Full Score is 6)
Fall 2011	BMES 5014	4	29	4	4	0	0	17	24	4.53
Fall 2012	BMES 5054	3	3	6	2	1	0	16	35	4.33
Fall 2013	BMES 5054	9	7	6	1	1	0	24	26	4.92
Fall 2013	BMES 5984	1	1	0	0	0	0	2	2	5.50
Fall 2014	BMES 5054	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spring 2015	BMES 5984	3	0	0	0	0	0	3	3	6.00
Fall 2015	BMES 5054	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fall 2015	BMES 4984	3	0	0	0	0	0	3	3	6.00
Spring 2016	BMES 6514	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spring 2016	TBMH 5024	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fall 2016	BMES 5054	3	4	4	2	0	0	13	20	4.62
Fall 2016	BMES 3134	5	1	0	0	0	0	6	6	5.83
All Courses	Totals	28	45	20	9	2	0	81	116	5.11
Under-graduate courses	Totals	8	1	0	0	0	0	9	9	5.92

Course Lectures Taught

1. "Research Live!" Class, Virginia Tech Carilion School of Medicine, March 23, 2012.
2. "Research Live!" Class, Virginia Tech Carilion School of Medicine, Nov 2, 2012.

B. New courses developed

1. BMES 5984 - "Radiation in Imaging and Therapy", Virginia Tech

This semester-long course is an advanced survey in the field of radiation-based imaging and therapy. The course was taught from both the fundamental and the technological points of view. The course encompassed three areas of focus: (1) x-ray physics, (2) x-ray imaging, and (3) radiation therapy. Major topics include a brief history of x-rays, technologies in production and detection of x-rays, physics in x-ray matter interaction, principles of x-ray image formation, and physics of radiation therapy.

Students were introduced to various x-ray based imaging modalities and major radiation therapy techniques. The candidate (100%) taught this special-topics course to VT-WFU SBES graduate students in both 2014 and 2015.

2. BMES 4984/3134 – “Introduction to Biomedical Imaging”, Virginia Tech

This semester-long course introduces engineering undergraduate students to the major biomedical imaging modalities including X-rays, CT, MRI, Ultrasound, PET, SPECT, and Optical Imaging. The students are presented the essential physics and the underlying engineering principles behind these imaging modalities, along with their applications in clinical settings. This course was team-taught (with Dr. Stephen LaConte) to VT engineering undergraduate students in 2015 and 2016, and it will be offered in every Fall semester. The candidate is responsible for 75% of the lectures.

C. Non-credit courses, workshops, and other related outreach and/or extension teaching

- 1) “Introduction to Biomedical X-ray Imaging”, Education Presentation for undergraduate research society, Virginia Tech. Fall 2013.
- 2) “Introduction to Biomedical X-ray Computed Tomography Imaging”, Course Seminar for ENGR 1014: Engineering Research Seminar, Virginia Tech. Fall 2014.
- 3) “Emerging CT technologies for biomedical applications”, Workshop Presentation for Zeiss X-ray Workshop, Blacksburg, Virginia. April 6, 2017.
- 4) “Introduction to Computed Tomography”, Education Seminar for Student Transition Engineering Program (STEP), July 2017.

IV. ADVISING

A. Graduate advising

• **PhD Theses Directed and Completed**

1. Xu Dong, VT-WFU School of Biomedical Engineering and Sciences, Virginia Tech, 2014-2019 (PhD in BME May, 2019).
Thesis: Material-Specific Computed Tomography for Molecular X-ray Imaging in Biomedical Research
2. Hao Gong, VT-WFU School of Biomedical Engineering and Sciences, Virginia Tech, 2012-2017 (PhD in BME January 18, 2017).
Thesis: A Scheme for Ultra-Fast Computed Tomography Based on Stationary Multi-Beam X-ray Sources
3. James Bennett, VT-WFU School of Biomedical Engineering and Sciences, Virginia Tech, 2010-2014 (PhD in BME).
Thesis: Hybrid Spectral Micro-CT: System Implementation, Exposure Reduction, K-edge Imaging Optimization, and Content Management

Kriti Sen Sharma⁺, Electrical and Computer Engineering, Virginia Tech, 2007-2013 (PhD in ECE).

Thesis: Compressed Sensing Based Micro-CT Methods and Applications

⁺The candidate advised Kriti for one semester (Spring 2013) after his original advisor left Virginia Tech. Kriti’s research in Spring 2013 formed one of the three chapters in

his PhD thesis, and it was published in a journal paper with the candidate as the corresponding author.

- **MS Theses Directed and Completed**

1. Swapnil Vekhande, Computer Engineering, Virginia Tech, 2017-2019 (MSc in ECE).
Thesis: Deep Learning Neural Network based Sinogram Interpolation for Sparse-View CT Reconstruction
2. Olga V. Pen, School of Biomedical Engineering and Sciences, Virginia Tech, 2014-2016 (MSc in BME).
Thesis: Calculation of the Effective Atomic Number for the Iodine Contrast Agent of the Varying Concentrations

Sourav Mishra⁺⁺, Electrical and Computer Engineering, Virginia Tech, 2010-2013 (MSc in ECE).

Thesis: Collimator Width Optimization in X-ray Luminescent CT

⁺⁺After his original advisor left VT in January 2013, the candidate advised Sourav for one semester (Spring 2013).

Omid Ghasemalizadeh⁺⁺⁺, Mechanical Engineering, Virginia Tech, 2011-2013 (PhD candidate).

⁺⁺⁺The candidate advised Omid for the first two years of his PhD study at Virginia Tech (from 2011 to 2013). During this time, Omid and the candidate co-authored two journal papers. Omid moved to Prof. Saied Taheri's group at VT's Department of Mechanical Engineering in 2013 and completed his PhD in 2016.

- **Graduate student advisory committee**

1. Chuang Miao (Advised by Hengyong Yu), School of Biomedical Engineering and Sciences (SBES), Wake Forest University, PhD 2015.
2. Rui Liu (Advised by Hengyong Yu), School of Biomedical Engineering and Sciences (SBES), Wake Forest University, PhD 2016.
3. Xuelin (Nick) Cui (advised by Lamine Mili), Electrical and Computer Engineering, Virginia Tech, PhD 2018.
4. Kyle S. Song (advised by Yang Liu), Mechanical Engineering, Virginia Tech, PhD 2019

- **Positions held by the candidate's masters and doctoral recipients**

1. Dr. Hao Gong, PhD, Research Fellow at Mayo Clinic
2. Dr. James Bennett, PhD, Postdoc at Yale University after graduation and now president of Clement-Tech, LLC
3. Ms. Olga Pen, MSc, PhD Candidate at Wake Forest University

- **Special achievements of current/former undergraduate and graduate students**

1. Hao Gong, Recipient of Pratt Scholar 2012, and NTEC- Nano Technology Entrepreneurship Challenge 2015

At UNC department of physics and astronomy, the candidate co-advised (with Prof. Otto Zhou) the following two graduate students:

1. Laurel Burk – Graduate student in physics. Laurel joined UNC Physics and Astronomy in 2008. The candidate has been directing her to perform both *in vivo* and *ex vivo* micro-CT scans on small animal models and guiding her through the fundamental physics of medical imaging.
2. Mike Hadsell – Graduate student in physics. Mike joined UNC Physics and Astronomy in 2009. The candidate supervised him to perform a pilot study for treating mouse tumor with carbon nanotube x-rays.

B. Undergraduate advising

At Virginia Tech, following VT undergraduate students carried out their research projects in the candidate's lab for either earning credits:

Name	Department	Graduation Yr.
1. Amy Wang	Chemical Engineering	2014
2. Brian Choe	Chemical Engineering	2014
3. Tyler Blevins	Engineering Sciences & Mechanics	2014
4. Max DaVee	Chemistry	2014
5. Sepehr Ghassemi	Mechanical Engineering	2014
6. Scott Saverot	Biological Systems Engineering	2015
7. Suphassorn Eaksen	Engineering Sciences & Mechanics	2015
8. Dylan Hesse	Mechanical Engineering	2015
9. Nicholas Zempolich	Mechanical Engineering	2015
10. Sarah Chaikind	Biological Systems Engineering	2017
11. Gina Muan	Biological Systems Engineering	2017
12. Stephen Slay	Mechanical Engineering	2017
13. Andrew Davis	Chemical Engineering	2017
14. Alexandra Groen	Biological Systems Engineering	2018
15. Lan N. Le,	Electrical Engineering	2017
16. Caroline Koshuta,	Computational Neuroscience	2018
17. Wayne Glore	Nanoscience	2018
18. Srinidhi Rao	Electrical Engineering	2020
19. Shiva Challa	Biological Systems Engineering	2018
20. Colleen McDonald	Biological Systems Engineering	2018
21. Wayne Glore	Nanoscience	2018
22. Jan Saraum	Mechanical Engineering	2020
23. Zhu Zhao	Biological System Engineering	2020
24. Max McGrath	Electrical Engineering	2019
25. Lowell Weissman	Electrical and Computer Eng	2021

At UNC department of physics and astronomy, the candidate formally advised the following 6 undergraduate students.

1. Dwight Springthorpe – Junior undergraduate in physics. In 2007, the candidate interviewed and recruited Dwight into Dr. Zhou's group as an undergraduate research assistant, and has been directing him design and execute several independent research

projects, including field emission measurement, material processing for ultrahigh vacuum conditions, and generating x-ray radiations from carbon nanotubes.

2. Bernie Shieh – Senior undergraduate in physics. From 2008-2010, the candidate has been directing Bernie's research in our group and his senior thesis project in physics.
3. Ankit Gupta – Junior undergraduate in biomedical engineering. In 2008, the candidate has been directing Ankit in designing and building electronics and computer interfaces that were used to control the unique carbon nanotube x-ray source.
4. Alex Mastro – Senior undergraduate in biomedical engineering. During 2009-2010, the candidate recruited Alex as an undergraduate research assistant in our group, and has been supervising his works on improving the system integration and user experiences of a carbon nanotube micro-CT scanner.
5. Jennifer Dixon – Senior undergraduate in physics. In 2010, the candidate has been directing Jennifer for her senior thesis project in physics. Jennifer won the best senior thesis from this project.
6. Gregory Pereira – Freshman and Pogue Scholar at UNC. In 2010-2011, the candidate has been directing Greg for his research in the Zhou group in the department of Physics and Astronomy.

C. Postdoctoral training

- **Visiting Scholars/Postdoctoral Trainee**

1. Graduate Student: Zhicheng Zhang
Institution: Institute of Biomedical and Health Engineering, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China
Duration: 2017-2018
Publications: 1
2. Postdoc Trainee: Dr. QiuHong Huang
Degree and Institution: Ph.D., Mechanical Engineering, Xi'an University of Technology, China
Duration: 2013-2014
Publications: 1
Employment after leaving postdoctoral position: faculty at Xi'an University of Technology, China.
3. Postdoc Trainee: Dr. Shunli Zhang
Degree and Institution: Ph.D., Computer Science, Xianyang Normal University, China
Duration: 2013-2014
Publications: 1
Employment after leaving postdoctoral position: faculty at Northwest University, China.
4. Visiting Scholar: Dr. Biao Wei
Degree and Institution: Ph.D., Opto-Electrical Engineering, Chongqing University, China
Duration: 06/2013-07/2013
Employment after leaving the position: professor at Chongqing University, China.

V. SERVICE

A. Professional meetings, workshops, etc., led or organized

1. Organization for Zeiss X-ray Workshop, Virginia Tech, Blacksburg, Virginia. April 6, 2017.
2. Chair on the “CT, PET and SPECT” session, Biomedical Engineering Society (BMES) Annual Conference, Tampa, Florida. October 2015.
3. Organization for Small Animal Imaging Workshop, UNC-Chapel Hill, Chapel Hill, NC. September 2008.

B. Grant review panels severed

NSF Panels

1. Graduate Research Fellowship Program (GRFP), 2017, 2019.
2. Major Research Instrument (MRI) program, X-ray Panel, Division of Materials Research, May 10-11, 2018.
3. Major Research Instrument (MRI) program, Division of Chemical, Bioengineering, Environmental & Transport Systems (CBET), April 16-17, 2018.
4. Major Research Instrument (MRI) program, X-ray Panel, Division of Materials Research, May 11-12, 2016.
5. Major Research Instrument (MRI) program, Division of Chemical, Bioengineering, Environmental & Transport Systems (CBET), April 25-26, 2016.
6. Major Research Instrument (MRI) program, Division of Chemical, Bioengineering, Environmental & Transport Systems (CBET), March 30-31, 2015.
7. Major Research Instrument (MRI) program, Division of Chemical, Bioengineering, Environmental & Transport Systems (CBET), May 9-10, 2014.

Ad-hoc Grant Reviews for Other Panels

1. Centers of Research Excellence in Science and Technology (CREST), NSF, April 2017.
2. Experimental Program to Stimulate Competitive Research (EPSCoR), NSF, February, 2017.
3. Centers of Research Excellence in Science and Technology (CREST), NSF, August 2016.
4. Smart and Connected Health program, Division of Information & Intelligent Systems Computer and Information, NSF, March 2016.
5. Centers of Research Excellence in Science and Technology (CREST), NSF, August 2015.
6. Division of Physics (PHY), Mathematical & Physical Sciences (MPS), NSF, 2012.

C. Editor and reviewer

Editorial boards

2014-present, editorial board of JSM Biomedical Imaging Data Papers

Peer-reviewed Journals

IEEE Transactions on Medical Imaging, IEEE Access, Medical Physics, Nanotechnology, Scientific Report, PLOS ONE, IEEE Journal of Selected Topics in Signal Processing, Journal of Medical Imaging, Journal of Medical Imaging and Health Informatics, Journal of X-ray Sci. & Tech., Sensors, Microscopy and Microanalysis, Computer Methods and Programs in Biomedicine, Computer Methods in Biomechanics and Biomedical Engineering, Journal of Vacuum Science & Technology, Optical Engineering, Diamond and Related Materials, Advanced Functional Materials, Polymer Composites, etc.

D. Invited presentations

Invited presentations in conferences

1. "Integrating Novel Hardware and Intelligent Software for Smart Medical Imaging Future", USTC International Forum of Medicine and Engineering, Hefei, China. July, 2018.
2. **(Best Paper Award)** "X-ray Fluorescence Molecular Imaging with Improved Sensitivity for Biomedical Applications", The 20th International Conference on Medical and Biomedical Engineering, Toronto, Canada, June, 2018.
3. "Integrating Hardware and Software Toward Smart Medical CT Imaging", The 1st International Symposium on Intelligent Precision Medicine, Ningbo, China. April, 2018.
4. **(Keynote)** "Exploration of a new CT architecture with stationary distributed x-ray sources", SPIE Optics+Photonics Conference - Developments in X-Ray Tomography VIII, San Diego, California, August, 2012,
5. "X-ray fluorescence molecular imaging with high sensitivity: feasibility study in phantoms", San Diego, Canlifornia, February, 2012,
6. "Respiratory-gated micro-CT using a carbon nanotube x-ray source", SPIE-Medical Imaging, San Diego, California, February 2008,.

Invited seminars in universities

1. "Toward Smart Medical CT Imaging: Integrating Novel Hardware with Intelligent Software", University of Science and Technology of China, Hefei, China. May, 2018.
2. "Integrating Hardware and Software Toward Smart Medical CT Imaging", Institute of High-energy Physics, Chinese Academy of Sciences, Beijing, China. May, 2018.
3. "Innovations in Biomedical CT Imaging", Wenzhou University, Wenzhou, China. May, 2018.
4. "The Promise and Challenge of Multi-Source Interior CT", Shanghai Jiao Tong University, Shanghai, China. June 2017.
5. "Multi-Source Interior CT Architecture", Suzhou Institute of Biomedical Engineering and Technology, Chinese Academy of Science, Suzhou, Jiangsu, China. June 2017.
6. "Progress for a Novel CT Architecture for Higher Temporal Resolution and Lower Radiation Dose", Chongqing University, Chongqing, China. July 2015.
7. "CT Architecture for Higher Temporal Resolution and Lower Radiation Dose", Xi'an University of Technologies, Xi'an, Shanxi, China. June 2015.
8. "Biomedical X-ray Imaging Using Carbon Nanotube X-ray Sources", Department of Biomedical Engineering, University of Texas-Arlington, Arlington, Texas, October 2014.
9. "Introduction to Biomedical X-ray Imaging", Undergraduate Research Society, Virginia Tech. September 2013.
10. "A New CT Architecture for Higher Temporal Resolution and Lower Radiation Dose", Shenzhen Institute of Advanced Technologies, Chinese Academy of Sciences, Shenzhen, Guangdong, China. August 2012.
11. "Nanotube-based Dynamic Micro-CT Scanner for Small-Animal Imaging", Department of Radiology, University of Iowa, Iowa City, IA. March 2011.
12. "New Imaging Capabilities Enabled by Carbon Nanotube X-rays", Joint School of Nanoscience and Nanoengineering - NCAT/UNC-G, Greensboro, North Carolina, 2011
13. "Dynamic micro-CT imaging using carbon nanotube x-ray", Department of Physics and Astronomy, UNC-Chapel Hill, Chapel Hill, NC. October 2010.

E. University service

- a. **Department, college, and university service, including administrative responsibilities**

1. 2011-2019, Committee Member for graduate student qualifying exam, Department of Biomedical Engineering and Mechanics, Virginia Tech.
2. 2011-2019, Usher or Marshal for University/College commencement or graduation, Virginia Tech.
3. 2011-2019, Faculty Host for annual graduate student recruiting weekend, Department of Biomedical Engineering and Mechanics, Virginia Tech
4. 2011-2019, Faculty host for faculty candidates, Department of Biomedical Engineering and Mechanics, Virginia Tech.
5. 2013-2019, Director of Multi-Scale Computed Tomography Lab (SAM-CT Lab) at Virginia Tech, providing X-ray imaging service to investigators in Virginia Tech and beyond.

F. Outreach and diversification

a. Public media engagement

The candidate has engaged with the following media in disseminating his research work, including the “Discover Magazine” and “MIT Technology Review” in the U.S., “Economist” magazine and “Nature News” in the U.K., Deutschlandfunk Radio (equivalent to the NPR Radio in U.S.) in Germany, and KIJK magazine in Netherland, etc.

1. Ge Wang, Feng Liu, G Cao, H Gao, and M Vannier, "*Design proposed for a combined MRI/computed-tomography scanner*". SPIE Newsroom (2013).
2. Eliza Strickland, "*9 Ways Carbon Nanotubes Just Might Rock the World*". in *Discover*: U.S.A. (2009).
3. Von Arndt Reuning, "*Nanotechnologie ermöglicht neuartige Computertomographen*". in *Deutschlandfunk*: Germany (2009).
4. Prachi Patel, "*Nanotube-Powered X-Rays*". in *MIT Technology Review*: U.S.A. (2009).
5. Zeeya Merali, "*Nanotubes sharpen X-ray vision*". in *Nature News*: U.K. (2009).
6. Jean-Paul Keulen, "*Better Röntgenscans Door Koolstofbuisjes*". in *KIJK*: Netherland (2009).
7. "*Another look inside*". in *The Economist*: U.K. (2009).
8. Guang Yang, Ramya Rajaram, Guohua Cao, Shabana Sultana, David Lalush, Jianping Lu, and Otto Zhou, "*Stationary digital breast tomosynthesis for breast cancer detection*". SPIE Newsroom DOI 10.1200802: p. 1042 (2008).

b. Workshop presentations

1. “Emerging CT technologies for biomedical applications”, Presentation in Zeiss X-ray Workshop, Virginia Tech, Blacksburg, Virginia. April 6, 2017.
2. “Carbon Nanotube Micro-CT for Small Animal Imaging”, Presentation in UNC Small Animal Imaging Workshop, UNC-Chapel Hill, September, 2008.

c. Professional service

1. Developed, installed, and commissioned the first out-of-lab carbon nanotube micro-CT scanner at UNC Biomedical Research Imaging Center (BRIC) as a fee-generating imaging facility, Chapel Hill, NC, as well as a second carbon nanotube micro-CT scanner at University of Iowa Carver College of Medicine as a core imaging facility, Iowa City, IA. 2010-2011.
2. Free consultation for various industrial companies, for example Dow Chemicals on compact x-ray source technologies (05/2013).

d. Additional outreach and diversification activities

Advising undergraduate student organizations

1. Presentation for Undergraduate Research Society, Virginia Tech. September 2013. Title: "Introduction to Biomedical X-ray Imaging".
2. Presentation for incoming students at the Student Transition Engineering Program (STEP), Virginia Tech. July 2017. Title: "Introduction to Computed Tomography".
3. Presentation at University Research Day, UNC-Chapel Hill, Chapel Hill, NC. March 2008. Title: "A physiologically gated micro-CT scanner for small animal imaging based on a carbon nanotube x-ray source".

Advising K-12 students

1. Advised on the research project of Kathryn Fink, a female sophomore high-school student from the Roanoke Valley Governor's School of Math and Science in summer 2015.
2. Supervision on Declan Butler, a high school sophomore student research volunteer from Northern Virginia. The student received research experience in the candidate's lab in the summer on medical imaging analysis in summer 2017.

Recruiting underrepresented students

1. 2011-2019, faculty host for prospective underrepresented engineering students to the biomedical engineering graduate program, department of biomedical engineering and mechanics, Virginia Tech, Blacksburg, VA.
2. 2008-2010, Host for lab tours for prospective student to Department of Physics and Astronomy at UNC-Chapel Hill, Chapel Hill, NC.
3. 2007-2008, Organization for Open House events in Department of Physics and Astronomy at UNC-Chapel Hill, Chapel Hill, NC.

Personal Interests: running, violin