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MILAN SONKA, Ph.D.

QUALIFICATIONS

- **M.S.** Electrical Engineering – Technical Cybernetics, Czech Technical University of Prague, Czechoslovakia, 1979
- **Ph.D.** Technical Cybernetics – Digital Image Analysis, Czech Technical University of Prague, Czechoslovakia, 1983, Thesis title: *Texture Recognition*

EMPLOYMENT

- College of Engineering, The University of Iowa
  2000 – now, Professor of Electrical and Computer Engineering
  2014 – now, Lowell C. Battershell Chair in Biomedical Imaging
  2019 – now, Director, Iowa Initiative for Artificial Intelligence, University-wide position
  2014 – 2019, Associate Dean for Graduate Programs, Research, and Faculty, College of Engineering
  2008 – 2014, Chair, Department of Electrical and Computer Engineering
  1994 – 2000, Associate Professor of Electrical and Computer Engineering
  1993 – 1994, Visiting Associate Professor
  1990 – 1993, Visiting Assistant Professor
- Iowa Institute for Biomedical Imaging
  2016 – now, Co-director
  2010 – 2016, Director
  2007 – 2010, Founding Co-director
- Iowa Initiative for Artificial Intelligence
  2019 – now, Founding Director
- Secondary appointments at the University of Iowa
  2001 – now, Professor of Applied Mathematical and Computational Sciences
  2006 – now, Professor of Ophthalmology and Visual Sciences
  2006 – now, Professor of Radiation Oncology
  2015 – now, Professor of Biomedical Engineering
- Department of Control Engineering, Czech Technical University of Prague
  1984–1990, Assistant Professor

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HIGHLIGHTS

- **IEEE Fellow** – 2002; for contributions to medical image analysis and computer vision.
- **Fellow, American Institute for Medical and Biological Engineering** – 2006.
- **Fellow, Medical Image Computing and Computer-Aided Intervention Society** – 2014.
- **Fulbright Specialist** – 2020.
- **IEEE EMBS Distinguished Service Award** "For contributions to biomedical imaging research and education" – 2020
- **Fellow, National Academy of Inventors** – 2021
- **Iowa Board of Regents Award for Faculty Excellence** – 2011, the highest award from the State Board of Regents of Iowa for "outstanding accomplishments and contributions to the Regents institutions as well as the State of Iowa".
- **Editor-in-Chief, IEEE Transactions on Medical Imaging**, 2009 – 2014.

RESEARCH

- **Research efforts** are directed at developing clinically applicable knowledge-based methods for semi-automated and automated analysis of medical images. Over the last several years, the following methods were developed and validated, and in some cases their main ideas adopted by other re- searchers in the field or resulted in commercialized FDA-approved products used in clinical research and/or clinical care.
- **Foundational Research in Quantitative Medical Image Analysis, Medical Image Segmentation:**
  - Long-term interdisciplinary research yielded a graph-based approach for simultaneous segmentation of multiple objects and surfaces (LOGISMOS), employing new optimal 3-D, 4-D, ..., n-D graph-search method for detection of multiple mutually interacting surfaces in n-D image data and producing results in low-polynomial time. Clinical utility of LOGISMOS was further extended by a novel "Just-Enough-Interaction" paradigm for efficient quantitative medical image analysis. The method's newest variant Deep LOGISMOS combines conventional and AI approaches to image analysis, combining advantages of both approaches.
  - Graph-based determination of cortical thickness in human brain MR images.
  - Segmentation of airway trees from 3D CT images. Three generations of methods were de- veloped with increasing performance. The first-generation approach used decision rules, the second was based on manually-designed fuzzy rules and fuzzy membership functions, the third generation was automatically designing the fuzzy rules and membership functions from exam- ples. Segmentation and characterization of lung nodules from pulmonary CT. Pulmonary tissue characterization from CT.
  - Quantitative analysis of ovarian ultrasound images.
  - Automated design of border detection criteria from manually traced border examples, a self-learning border property identification method that minimizes the need for manual design of border detection functions.
  - Computer-assisted methods for surgical planning of liver tumor resection, automated segmentation of the lower thoracic cavity, liver, liver tumor, and identification of the vascular trees, interactive surgical planning and quantitative outcome assessment tools to assist in the clinical decision making process.
  - Novel 3D image analysis techniques, including parallel 3D skeletonization, 3D smoothing without shrinkage, and 3D edge detection in anisotropic image data.

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- **Quantitative Assessment of Cardiovascular Disease:**
  - Coronary border detection, the first method reported in literature that determines both coronary borders simultaneously. Introduction of this idea improved the segmentation success rate in clinical angiograms four-fold.
  - Endothelial function quantification from ultrasound imaging, the only method that uses patient-specific border detection quality control to automatically identify and discard non-reliable measurements, successfully commercialized and used in more than 400 leading cardiovascular research laboratories around the world.
  - Methodology for separation of arteries and veins, vessel labeling, and quantification of disease in image data sets from contrast-enhanced magnetic resonance angiography.
  - Development of a 2D+time Active Appearance Motion Model (AAMM) representing cardiac cycle dynamics in combination with the shape and specific imaging modality appearance of the heart, applied to clinical MR and echocardiography image sequence analysis in clinical setting. Development of a 3D Active Appearance Motion and 3D Spatial Model with application to volumetric cardiac MR and transthoracic echo image data.
  - Methods for 3D and 4D analysis of aortic MR and CT datasets, methods for wall thickness and plaque type analysis from X-ray CT Angiography data, aortic disease progression.
  - Methods for simultaneous detection of multiple surfaces in intracoronary IVUS and OCT image pullbacks, machine learning methods for prediction of vulnerable plaque types in coronary IVUS, methods for assessment of thin-cap fibroatheroma from IVUS and OCT.
  - Methods for machine-learning/deep-learning analysis of heart-transplant OCT and biomarkers data for prediction of cardiac allograft vasculopathy complications.
- **Pulmonary Image Analysis:**
  - Developed approaches for 3D segmentation of pulmonary airway trees.
  - Analysis of airway wall in complete intrathoracic trees and across bifurcations.
  - Identification of pulmonary fissures, contributing to segmentation of lung lobes.
  - Separation of arteries and veins in pulmonary vasculature.
  - Automated labeling of airway tree segments according to the international nomenclature.
- **Ophthalmic Image Analysis:**
  - Multi-layer segmentation of 3D retinal OCT images – up to 13 layers reliably segmented for the macular as well as peripapillary OCT scans.
  - Segmentation of SEADs – symptomatic exudate-associated derangements of the retina in presence of age-related macular degeneration and diabetic macular edema.
  - Early detection of retinal changes on diabetic retinopathy.
  - Image-guided therapy development for age-related macular degeneration.
  - Image analysis of optic nerve head morphology for quantitative assessment of glaucoma.
  - Structural assessment of visual function from passive 3D OCT imaging bypassing active tests of visual function.
- **Orthopaedic Image Analysis:**
  - 3D and 4D (longitudinal 3D) segmentation of bones and cartilages, morphologic analysis of bones and cartilages for all three knee-joint bones (tibia, femur, patella).

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- Automated analysis of meniscal morphology from MR.
- Osteophyte image analysis.

- **Artificial Intelligence and Machine Learning (AI/ML):**
  - Development of new and employing established AI/ML techniques to answer a broad spectrum of data-driven research questions.
  - ML-based prediction of disease outcomes.
  - ML-based learning of image analysis method parameters from examples.
  - Modeling teaching/learning processes to develop generally-applicable AI-augmented education paradigms and test them in K-20 environments.

BOOKS

- **Image Processing, Analysis, and Machine Vision**
  - Four (4) editions of a successful comprehensive graduate-level text *Image Processing, Analysis, and Machine Vision (Sonka, Hlavac, Boyle)*, 1st edition 1993, 2nd edition 1998, 3rd edition 2007, 4th edition 2014.

- **Handbook of Medical Imaging**
  - Edited (with J. M. Fitzpatrick, Vanderbilt University) a volume entitled *Medical Image Pro- cessing and Analysis* of a 3-volume Handbook of Medical Imaging, published by SPIE in 2000. This Handbook has become a defining publication of the rapidly developing field. An excellent group of authors was attracted to work on this comprehensive project. Our 1250-page volume contains 14 chapters.

EDUCATIONAL ACTIVITIES

- 19 Ph.D. students and 18 M.S. students successfully graduated.
- Research-mentored 6 visiting faculty members, 22 postdoctoral associates and 10 international graduate students.
- In 1996, developed a Quantitative Imaging Electronic Classroom (QIEC), a specialized facility for collaborative interactive image systems engineering instruction, funded by a series of grants by Hewlett Packard. This teaching facility became the primary place for hands-on engineering instruction, far exceeding the area of image processing.
- To support image systems engineering instruction in QIEC, developed a new lecture strategy consisting of interactive teaching approach of theory–example–experiment. Applied this strategy to teaching three new or modified image processing courses offered in the computer classroom. This (at that time – 1996) pioneering educational development was well received by students and is reported in IEEE Transactions on Education.

- Courses Taught:
  - Core courses
    - 57:012, Linear System Analysis
    - 57:017, Computers in Engineering
    - 57:008, Electronic Circuits

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- Advanced undergraduate and graduate courses
  - 55:042, Signals and Systems
  - 55:060, Control Systems
  - 55:148, Digital Image Processing
  - 55:247, Image Analysis and Understanding
  - 55:248, Advanced Image Processing
  - 55:295, Pattern Recognition / Machine Learning

GRANTS

- **1996 – 1998**, principal investigator, American Heart Association – Iowa Affiliate: Automated 3D analysis of plaque morphology and composition in IVUS images, $45,000.
- **1996–1998**, principal investigator, NSF: Automated Learning in Knowledge-Based Image Analysis, $50,000.
- **1996**, principal investigator (MPI), Hewlett Packard Co., Image Systems Engineering curriculum development, $890,000.
- **1997**, principal investigator, Hewlett Packard Co., Image Systems Engineering curriculum development, $110,000.
- **1998**, principal investigator, Hewlett Packard Co., Image Systems Engineering, $462,000.
- **1997 – 1998**, principal investigator, Bowman Gray School of Medicine, Automated analysis of brachial ultrasound, $10,000.
- **1997 – 1998**, principal investigator, Boston Scientific Corporation, Geometrically Accurate 3D Reconstruction of Vessel Morphology, $44,637.
- **1998 – 1999**, co-investigator, Whitaker Foundation, A Collaborative Educational Environment for Functional Cardiovascular Image Analysis, $350,000.
- **1998 – 2000**, principal investigator, American Heart Association, Iowa Affiliate, Automated Analysis of Echo Images: Imaging of the Left Ventricle from the Right Ventricle using 2D and 3D Techniques, $55,000.
- **1998 – 1999**, principal investigator, The University of Iowa, Quantitative Medical Imaging: Collaborative Research between the University of Iowa and the Iowa State University, $20,000.
- **1998 – 1999**, principal investigator (MPI), The University of Iowa, Assessing the Malignant Potential of Cancers by Magnetic Resonance Imaging of Microcirculation, $30,000.
- **1998 – 2003**, co-investigator responsible for image analysis, NIH, Arterial Endothelial Function - An Epidemiologic Study, $3,404,221, image analysis part $58,000/year.
- **1998 – 1999**, principal investigator, EPIX Medical, Boston MA, Highly Automated Segmentation of Venous and Arterial Trees from Three-Dimensional MR Angiography, $93,600.
- **1999 – 2004**, principal investigator, NIH, 3D & 4D Coronary Hemodynamics and Local Atherosclerosis, $1,036,557.
- **1999–2002**, principal investigator of Univ. of Iowa subcontract, Astra Medical - subcontract for Harvard Medical School, Pilot Study of Candesartan to Reduce Coronary In-Stent Restenosis and Progression of Atherosclerosis $30,000, (Complete grant $96,000, P. Stone PI at Harvard).

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- **1999–2001**, principal investigator, University Hospital Bern, Switzerland, 3D Assessment of Coronary Geometry using Non-Sheathed Catheters, $30,000.
- **2000–2005**, co-investigator, NIH, Image and Model-Based Analysis of Lung Diseases, $7,044,907, Hoffman PI, Sonka's image analysis part $275,000.
- **1999 – 2003**, principal investigator (MPI), NIH, Vascular Analysis Workstation, $840,000.
- **2002 – 2005**, co-investigator, NIH, Large Scale Digital Cell Analysis System, $1,583,273, Mackey PI, Sonka's image analysis part $210,000.
- **2003 – 2008**, principal investigator, NIH, Highly Automated Analysis of 4-D Cardiovascular MR Data, $1,470,000.
- **2004 – 2009**, co-investigator responsible for image analysis, NIH, Arterial Endothelial Function - An Epidemiologic Study, $3,700,000, Sonka's image analysis part $416,000.
- **2004 – 2008**, co-investigator responsible for image analysis, NIH, Regulation of Coronary Vessel Assembly and Growth, $1,000,000, Sonka's image analysis part $80,000.
- **2004 – 2009**, co-investigator responsible for image analysis, NIH, Epidemiology of Carotid Artery Atherosclerosis in Youth, $3,200,000, Sonka's image analysis part $250,000.
- **2003 – 2005**, principal investigator, Philips Medical Systems, Quantitative Analysis of Coronary CT images, $160,000.
- **2005**, principal investigator (MPI), NIH – conference organization grant, Information Processing in Medical Imaging 2005, $10,000.
- **2005**, principal investigator (MPI), Whitaker Foundation – conference organization grant, Information Processing in Medical Imaging 2005, $10,000.
- **2005 – 2009**, principal investigator (MPI), NIH, 3D Analysis of MR-imaged Articular Cartilage, $900,000.
- **2005 – 2010**, principal investigator, NIH, 3-D and 4-D Coronary Hemodynamics and Local Atherosclerosis, $1,350,000.
- **2006 – 2009**, principal investigator, NIH, Graph-Based Medical Image Segmentation in 3D and 4D, $1,070,000.
- **2006–2010**, co-investigator, NIH, Image and Model-Based Analysis of Lung Diseases, $10,000,000, Hoffman PI, Sonka's image analysis part $375,000.
- **2006 – 2007**, principal investigator, Philips Medical Systems, Quantitative Analysis of Vascular CT images, $118,000.
- **2007 – 2012**, co-investigator, NIH, University of Iowa Clinical and Translational Science Award, $33,800,000, Hunninghake PI.
- **2007 – 2008**, principal investigator (MPI), Zeiss Meditec, Quantitative Analysis of Optic Nerve Head from 3D OCT Images, $80,000.
- **2009 – 2012**, principal investigator (MPI), NIH, Focal Structure-Function Relationships in Macular Layers from 3D Spectral OCT, $1,100,000.
- **2009 – 2011**, co-investigator, NIH, Expediting Patient-Specific Assessment of Chronic Contact Stress Exposure, $210,000, Anderson PI.

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- **2009 – 2014**, principal investigator, NIH, Graph-Based Medical Image Segmentation in 3D and 4D - Phase II, $1,530,000.
- **2009 – 2014**, co-investigator, Veterans Administration, VA Center of Excellence for the Prevention and Treatment of Visual Loss, $5,500,000, Kardon PI.
- **2010 – 2016**, principal investigator (MPI), NIH, Retinal Therapy Guided by 3-D OCT Image Analysis, $2,800,000
- **2010 – 2015**, principal investigator (MPI), NIH, Quantitative Imaging to Assess Response in Cancer Therapy Trials, $2,900,000.
- **2012 – 2015**, co-investigator, NIH, Expanding Objective CT-based Phenotyping to Lungs with Enhanced Radiodensities, $1,100,000. Beichel PI.
- **2012 – 2016**, principal investigator (MPI), NIH, Focal Structure-Function Relationships in Macular Layers from 3D Spectral OCT, $1,500,000.
- **2013 – 2018**, principal investigator of subcontract, Christian Doppler Society Austria. OPTIMA – Approaches for large-throughput analyses of retinal AMD-OCT, $2,500,000 – Iowa part $600,000.
- **2013 – 2018**, co-investigator of subcontract, NIH, Quantitative Image Informatics for Cancer Research (QIICR), $4,000,000 – Iowa part $350,000.
- **2014 – 2019**, principal investigator, NIH, Graph-Based Medical Image Segmentation in 3D and 4D - Phase III, $1,600,000.
- **2016 – 2019**, principal investigator of subcontract from Charles University Prague, Ministry of Health Czech Republic, Impact of lipids on atherosclerosis assessed by IVUS, $41,000.
- **2016 – 2019**, principal investigator of subcontract from Institute of Clinical and Experimental Medicine (IKEM), Ministry of Health Czech Republic, Assessment of cardiac allograft vasculopathy by OCT, $45,000.
- **2015 – 2020**, principal investigator (MPI), NIH, Quantitative Imaging to Assess Response in Cancer Therapy Trials - Phase II (continuously funded since 2010), $3,000,000.
- **2019 – 2020**, principal investigator, Lenovo, Preventing Future Heart Attacks using AI: Deep Learning-based Identification of Vulnerable Plaque in Coronary Arteries in Vivo, $50,000 + $80,000 hardware award.
- **2019 – 2024**, principal investigator of subcontract from University of Virginia/ NIH — Id3 and VSMC in Murine and Human Atherosclerosis, $429,000.
- **2019 – 2023**, principal investigator, NIH, Deep LOGISMOS — Graph-Based Medical Image Segmentation in 3D and 4D - Phase IV (continuously funded since 2006), $1,820,000.
- **2020 – 2023**, principal investigator of subcontract from Regeneron/Neox, Image analysis part of clinical trial: Efficacy and Safety of Alirocumab to Prevent Early Cardiac Allograft Vasculopathy in Recent Heart Transplant Recipients, $223,000.
- **2021 – 2022**, principal investigator, Iowa OVPR, Iowa Initiative for Scientific Imaging and Conservation of Cultural Artifacts (IISICCA), $150,000.
- **2022-2028**, co-investigator, NIH – Iowa Summer Institute for Research Education in Biostatistics and Data Science (ISIB), $1,280,000.

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- **2022 – 2023**, principal investigator, NIH, Deep LOGISMOS: Hippocampal Plasticity in Alzheimer's Disease, $370,000.
- **2023 – 2027**, principal investigator (MPI), NIH, MMP-9 based immune-driven mechanisms of neo-vascular AMD, $2,161,000.

PROFESSIONAL ACTIVITIES

- Editor in Chief, IEEE Transactions on Medical Imaging, 2009–2014.
- Associate Editor, IEEE Transactions on Medical Imaging, 1995–2008.
- Editorial Board member, The International Journal of Cardiac Imaging, 1998 - 2009.
- Associate Editor, Medical Image Analysis, 2001 - now.
- Boerhaave Visiting Professor at the Leiden University, The Netherlands (prestigious named visiting professorship, one invitation per year) May–June 1999.
- SPIE International Symposium on Medical Imaging, Symposium Chair, 2006–2008.
- SPIE International Symposium on Medical Imaging – Image Processing, Conference Chair, 2001–2004.
- Information Processing in Medical Imaging, Conference Chair, 2005.
- IEEE International Symposium on Medical Imaging (ISBI), General Chair, 2016.
- Keynote speaker
    1. International Conference Medical Imaging - Image Processing, 1998
    2. Computer Assisted Fundus Image Analysis (CAFIA) 2000
    3. International Conference Biosignal 2000
    4. Computer Assisted Radiology and Surgery – International Symposium on Cardiovascular Imaging 2001
    5. Computer Assisted Fundus Image Analysis (CAFIA) 2001
    6. 25th Anniversary Symposium LKEB – Clinical and Experimental Image Analysis 2002
    7. Southwest Symposium on Image Analysis and Interpretation 2004
    8. Computer-Based Medical Systems 2004
    9. MICCAI Intravascular Ultrasound workshop 2006
    10. IEEE International Symposium on Biomedical Imaging 2010
    11. The Dutch R&D-Landscape of Biomedical Imaging 2010
    12. MICCAI International Workshop on Machine Learning in Medical Imaging 2010
    13. Dutch NWO Governmental Workshop Investing in Technology for Sustainable Healthcare 2010
    14. SPIE Medical Imaging - Image Processing 2011
    15. IAPR Graph-based Representations in Pattern Recognition 2011
    16. IEEE-EMBS International Conference on Biomedical and Health Informatics 2012
    17. MMBIA - Mathematical Methods in Biomedical Image Analysis 2012
    18. EuRETINA - Quantitative Analysis of 3-D Retinal OCT 2013
    19. SCIA - Workshop on Farm Animal and Food Quality Imaging 2013

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20. MIUA - Medical Image Understanding & Analysis 2013
21. ISCA - International Symposium on Computational Anatomy 2014
22. BHI - International Conference on Biomedical and Health Informatics 2014
23. IEEE - International Symposium on Biomedical Imaging 2016
24. World Conference on Biomedical Engineering 2018
25. International Congress on Heart & Cardiology 2019
26. 2nd International Forum on Artificial Intelligence in Ophthalmology 2022
27. 3rd International Forum on Artificial Intelligence in Ophthalmology 2023

- Tutorials

  1. ISBI 2008 Paris, France – Segmentation of biomedical images
  2. IEEE International Summer School Ile Berder, France – Knowledge-based Approaches in Cardiovascular Image Analysis, 2008
  3. MICCAI 2010 Beijing, China – Graph Algorithmic Techniques for Biomedical Image Segmentation (with Wu and Garvin)
  4. Biomedical Image Analysis Summer School: Modalities, Methodologies & Clinical Research, Ecole Centrale Paris. Graph Algorithmic Techniques for Ophthalmic Image Analysis, 2012

- Co-guest editor of Special Issue of Computer Vision and Image Understanding on Analysis of Volumetric Images, Dec. 1999; co-guest editor of Special Issue on Image Analysis in Drug Discovery and Clinical Trials, IEEE Transactions on Medical Imaging, October 2002; co-guest editor of Special Issue on Advances in Modality-Oriented Medical Image Processing, EURASIP Applied Signal Pro- cessing, 2002; co-guest editor of Special Issue on Pulmonary Imaging, IEEE Transactions on Medical Imaging, April 2006.

- Institute of Electrical and Electronics Engineers, member 1994, senior member 2000, Fellow 2002; IEEE Image Systems working group coordinator, 1996 – 2001; International Association for Pattern Recognition, member 1992 – now; Joint IEEE Computer Society/ACM Task Force on the Year 2001 Model Curricula for Computing (CC-2001) - focus group on Computing at the Interface, member, 1999-2001.

- Program committee member: SPIE Medical Imaging – Image Processing 1995–2004; Symposium on computer graphics, image processing, and vision SIBGRAPI'98; Iowa Cardiovascular Symposium 1998; Information Processing in Medical Imaging IPMI 1999-now; Software Seminar SOFSEM'00. Track Co-chair, Radiographic Imaging track of the 20th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 1997 - 1998. International jury member – Cardiovascular Imaging Award of the 1998 International Symposium in Cardiovascular Imaging, Leiden, The Netherlands. Technical Program Co-Chair - IEEE Southwest Symposium on Image Analysis and Interpretation, Austin TX, April 2000.

- 2005-2010, RSNA (Radiological Society of North America) Physics Program Committee.

- Reviewing conference papers: International SPIE Conference Medical Imaging, International IMEKO Biosignal conference, International Conference Database and Expert Systems Applications, Conference Computer Analysis of Images and Patterns, IEEE/ECLA/IFIP International Conference on Architecture and Design Methods for Balanced Automation Systems, SIPGRAPI, IPMI, SSIAI, CVPR, MICCAI.

- Reviewing book proposals: Chapman and Hall, IEEE Press, Prentice Hall, Springer Verlag.

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- Reviewing journal papers: IEEE Transactions on Medical Imaging, IEEE Transactions on Biomed- ical Engineering, IEEE Transactions on Image Processing, IEE Proceedings - Vision, Image and Signal Processing, Clinical Cardiology, The American Journal of Cardiology, Annals of Biomedical Engineering, Journal of Electronic Imaging, Academic Radiology, Graphical Models and Image Pro- cessing, Machine Vision and Applications, International Journal on Cardiac Imaging, IEEE Signal Processing Letters, Computer Vision – Image Understanding, Proceedings of the IEEE.
- Reviewing grant proposals: NSF Knowledge Models and Cognitive Systems panel reviewer; NSF Neuroscience, Computer and Mathematical Sciences and Engineering; STW - Dutch Technology Foundation Applied Research; GACR - Grant Agency of the Czech Republic; NSE-RCC - Natural Sciences and Engineering, Research Council of Canada; NATO - North Atlantic Treaty Organiza- tion, Scientific and Environmental Affairs Division; GAAS - Grant Agency of the Czech Academy of Sciences; NOW - Netherlands Organization for Scientific Research; U.S. Civilian Research and Development Foundation (CRDF).
- Reviewing research conducted by the computing departments (DTU Compute) of the Technical University of Denmark - member of a 5-person international panel.
- Student paper awards (supervised or co-supervised research)
  - IEEE EMBS 1992, 1993, 2 awards in 1997
  - SPIE Medical Imaging 1995, 1996, 1998, 1999
  - Information Processing in Medical Imaging IPMI'99
  - Michael B. Merickel Award for Best Student Paper at SPIE Medical Imaging 2002, 2007
  - Cornelius Dyke Award for "Artificial Intelligence Driven Differentiation of Glioblastoma, Metastatic Disease and CNS Lymphoma: A Comparison of Machine and Deep Learning Models," AJNR 2023
- Visiting Professor at the University of Hawaii, January – February 2000.
- Visiting Professor at the Technical University of Graz, Austria, March – May 2000.
- Visiting Professor at the University of Bremen, Germany, June 2000.
- Visiting Professor at the University of Copenhagen, Denmark, October 2002.
- Visiting Professor at the University of Calgary, Canada, February 2003.
- Visiting Professor, Chinese Academy of Sciences, Beijing China, November 2010.
- Visiting Professor, Soochow University, Suzhou China, 2012.
- Visiting Professor, Soochow University, Suzhou China, 2013.
- Chinese Academy of Sciences Visiting Professorship for Senior international Scientists, 2014.
- Serving on Ph.D. committees at Chalmers University of Technology, Gothenburg, Sweden (June 1999); University of Leiden, Leiden, The Netherlands (October 1999); Technical University of Den- mark, Denmark (December 2000); Technical University Graz (May 2005); ITU Copenhagen, Denmark (December 2006); University of Utrecht, the Netherlands (December 2006); Chalmers University of Technology, Gothenburg, Sweden (June 2008), ITU Copenhagen, Denmark (May 2012).
- Marquis Who's Who – Who's Who in Science and Engineering, listed, 1996-now.
- Marquis Who's Who in Medicine and Healthcare, listed, 2002-now.

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- Marquis Who's Who in America, listed, 2005-now.
- International Professional of the Year 2005 - International Biographic Center, Cambridge, England.
- Outstanding Intellectuals of the 21st Century - listed, 2005-now.

PATENTS

1. US Patent 6,148,095, Apparatus and method for determining three-dimensional representations of tortuous vessels. Inventors: G P M Prause and M Sonka.
2. US Patent 6,466,687, Method and apparatus for analyzing CT images to determine the presence of pulmonary tissue pathology. Inventors: R Uppaluri, T Mitsa, E A Hoffman, G McLennan, M Sonka.
3. US Patent 7,885,438, Methods and apparatuses for analyzing images. Inventors: R Uppaluri, T Mitsa, E A Hoffman, G McLennan, M Sonka.
4. US Patent 7,995,810, System and Methods for image segmentation in N-dimensional space. Inventors: K Li, X. Wu, D Z Chen, M. Sonka.
5. US Patent 8,073,210 Methods of smoothing segmented regions and related devices. Inventors: J M Reinhardt, M Sonka, G McLennan, E A Hoffman, S Ukil.
6. US Patent 8,155,403 Methods and devices for airway tree labeling and/or matching. Inventors: J Tschirren, M Sonka, J M Reinhardt, G McLennan, E A Hoffman.
7. US Patent 8,189,885 Apparatus and method for computing regional statistical distribution over a mean anatomic space. Inventors: P K Saha, M Sonka.
8. US Patent 8,358,819 B2, System and Methods for image segmentation in N-dimensional space (CIP-1). Inventors: X Wu, M Garvin, M D Abramoff, M Sonka.
9. US Patent 8,571,278, System and methods for multi-object multi-surface segmentation (CIP-2). Inventors: M Sonka, Y Yin, X Wu, X Zhang.
10. US Patent 9,545,196 Automated assessment of glaucoma loss from optical coherence tomography. Inventors: M D Abramoff, M Sonka.
11. US Patent 9,820,651, Methods and devices for labeling and/or matching. Inventors: J Tschirren, M Sonka, J Reinhardt, G McLennan, E Hoffman.
12. US Patent 9,924,867, Automated determination of arteriovenous ratio in images of blood vessels. Inventors: M D Abramoff, M Niemeijer, X Xu, M Sonka, J M Reinhardt.
13. US Patent 10,354,384, Automated assessment of glaucoma loss from optical coherence tomography. Inventors: M D Abramoff, M Sonka.
14. Japanese Patent JP-2014-504523, Automated determination of arteriovenous ratio in images of blood vessels. Inventors: M D Abramoff, M Niemeijer, X Xu, M Sonka, J M Reinhardt.
15. European Patent EP-2,665,406 B1, Automated determination of arteriovenous ratio in images of blood vessels. Inventors: M D Abramoff, M Niemeijer, X Xu, M Sonka, J M Reinhardt.
16. US Patent 11,638,522, Automated determination of arteriovenous ratio in images of blood vessels. Inventors: M D Abramoff, M Niemeijer, X Xu, M Sonka, J M Reinhardt.
17. US Patent 11,972,568, Automated assessment of glaucoma loss from optical coherence tomography. Inventors: M D Abramoff, M Sonka.

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18. US Patent 12,035,971-B2, Automated determination of arteriovenous ratio in images of blood vessels. Inventors: M D Abramoff, M Niemeijer, X Xu, M Sonka, J M Reinhardt.

INDUSTRIAL EXPERIENCE

- 1998–now – Founder, Medical Imaging Applications LLC (currently close to 100% market share in software tools for ultrasound-based assessment of endothelial function in research setting and clinical/epidemiologic trials). MIA-LLC markets FDA-approved software environment for carotid artery IMT and brachial artery FMD analysis, 3D analysis of articular cartilage in osteoarthritis imaged by MR, and Aortic CT/MR image analysis.
- 2001–now – Founder, VIDA Diagnostics Inc. (pulmonary imaging and image analysis, software suite of 3D pulmonary analysis tools for assessment of intrathoracic airway trees, vascular trees, lung lobes, pulmonary parenchyma, bronchoscopic navigation, computer-guided pulmonary interventions). VIDA markets FDA-approved software environment for quantitative pulmonary image analysis.
- 2002–2006 – Expert Witness in 2 medical image analysis – mammography patent cases.
- 2012–2013 – Expert Witness in an International Trade Commission smartphone patent case.
- 2015 – Expert witness in medical image analysis – Endoscopy case
- 2017–2019 – Expert witness in medical image analysis – 3D oral cavity mapping/visualization case
- 2019–2021 – Expert witness in medical image analysis – image-guided surgical planning case
- 2019–2024 – Expert witness in medical image analysis – ophthalmic 3D retinal analysis case
- 2019–2024 – Expert witness in medical image analysis – 3D dental analysis case
- **Small business research grants**
  - (1999–2000) NIH R43 – SBIR Phase I – Arterial Ultrasound Analysis Software Package ($100k, Sonka Co-PI)
  - (2001–2003) NIH R44 – SBIR Phase II – Vascular Ultrasound Analysis Workstation ($740k, Sonka Co-PI)
  - (2005–2006) NIH R43 – SBIR Phase I – 3D Analysis of MR-imaged Articular Cartilage ($100k, Sonka Co-PI)
  - (2006–2008) NIH R44 – SBIR Phase II – 3D Analysis of MR-imaged Articular Cartilage ($800k, Sonka Co-PI)

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Publications

- h-index Google Scholar = 84 (= 43 over past 5 years, Jan 2024)
- total number of citations > 47, 000 (> 15, 000 in past 5 years)
- i10 index = 313 (143 over past 5 years)
- h-index Web of Science = 58
- total number of citations > 17, 000

1.1 Books and monographs. (Limit to textbooks, research monographs, conference/ symposium/congress proceedings, handbooks, etc., of which you are an author or an editor. Do not include articles or chapters in such media.)

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1.2 Articles in technical journals with rigorous review procedures. (Include notes, discussions, letters to editor, etc., which are published in such journals and those articles or chapters in a meeting's printed record if that record utilizes review procedures equivalent to those for archive journals.)

1.2.1 Journal Papers

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