Contact:

Jon D. Klingensmith, Ph.D.

Home: 108 Chattanooga Ct.
Edwardsville, IL 62025
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Citizenship: United States

Education:

Ph.D. **Biomedical Engineering**
Case Western Reserve University, Cleveland, OH

Predoctoral Fellow
American Heart Association Ohio Valley Affiliate

M.A.T. **Master of Arts in Teaching**
Southern Illinois University, Edwardsville, Edwardsville, IL

M.S. **Biomedical Engineering**
The Ohio State University, Columbus, OH

B.S.E.E. **Electrical Engineering**
Ohio Northern University, Ada, OH

Professional Experience:

8/2021 – present **Chair,** Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, Edwardsville, Illinois

7/2021 – present **Associate Professor,** Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, Edwardsville, Illinois

7/2021 – present **Founder,** Videre Medical Imaging Systems, LLC

8/2016 – 6/2021 **Assistant Professor,** Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, Edwardsville, Illinois

8/2015 – 8/2016 **Instructor,** Southern Illinois University Edwardsville, Edwardsville, Illinois

8/2012 – 8/2015 **Lecturer / Call Staff,** Southern Illinois University Edwardsville, Edwardsville, Illinois

8/2013 – 8/2014 **Teacher,** Triad High School, Troy, Illinois
Mathematics / Technology & Engineering Education

10/2007 – 3/2012 **Senior Director, R&D**, Volcano Corporation, Rancho Cordova, California.

4/2006 – 10/2007 **Director, Software and Signal Processing**, Volcano Corporation, Rancho Cordova, California.

9/2004 – 4/2006 **Manager, Signal Processing / Program Manager**, Volcano Corporation,

Rancho Cordova, California.

4/2004 – 9/2004 **Senior Scientist**, Volcano Corporation, Rancho Cordova, California.

7/2003 – 4/2004 **Research Associate Staff**, Department of Biomedical Engineering, Lerner Research Institute, The Cleveland Clinic Foundation, Cleveland, Ohio.

5/2002 – 4/2004 **Consultant,** Volcano Therapeutics, Inc., Rancho Cordova, California.

8/2000 - 5/2003 **Research Assistant,** Whitaker Biomedical Imaging Laboratory, Department of Biomedical Engineering, Lerner Research Institute, The Cleveland Clinic Foundation, Cleveland, Ohio.

10/1999 - 8/2000 **Research Engineer,** Whitaker Biomedical Imaging Laboratory, Department of Biomedical Engineering, Lerner Research Institute, The Cleveland Clinic Foundation, Cleveland, Ohio.

6/1997 - 9/1999 **Research Assistant,** Whitaker Biomedical Imaging Laboratory, Department of Biomedical Engineering, Lerner Research Institute, The Cleveland Clinic Foundation, Cleveland, Ohio.

6/1996 - 8/1996 **Research Experiences for Undergraduates Fellow,** National Science Foundation / Engineering Research Center for Emerging Cardiovascular Technologies, Department of Biomedical Engineering, Duke University, Durham, North Carolina.

5/1995 - 8/1995 **Co-Operative Education Student,** Closed Circuit Video Laboratory, OEM Integration Engineering Department, Diebold, Inc, Canton, Ohio.

Service:

SIUE:
Fall 2018-present, Faculty Advisor, Biomedical Engineering Society
Fall 2018-present, Board, Undergraduate Research and Creative Activities
Fall 2017-Spring 2018, Faculty Fellow, University Housing
Fall 2017-Spring 2022, Faculty Advisor, Society of Women Engineers
Fall 2016-Spring 2017, Faculty Fellow, University Housing
Fall 2015-Spring 2016, Faculty Fellow, University Housing
Fall 2015, Engineering/Physics Collaboration Committee, School of Engineering

Teaching Experience:

SIUE:

ME 192	Engineering Physics II
ECE 210	Circuit Analysis I
ECE 211	Circuit Analysis II
ECE 326	Electronic Circuits I
ECE 352	Engineering Probability and Statistics
ECE 375	Introduction to Communication Systems
ECE 436	Digital Signal Processing
ECE 437	Medical Imaging Systems
ECE 510	Engineering Research Methods
ECE 532	Applications of Digital Signal Processing

Triad HS: 2013-2014, Teacher, Advanced Algebra and Trigonometry, Exploring Technology, PLTW: Engineering Design and Development

Collinsville HS: Spring 2013, Student Teacher, Calculus, Statistics, Paced Algebra

Triad MS: Fall 2012, Observer / Student Teacher, 8th Grade Math

CWRU: 2000-2001, Teaching Assistant, EBME 409 Systems and Signals in Biomedical Engineering (Graduate Level), EBME 461 Biomedical Image Processing and Analysis, EBME 308 Biomedical Signals and Systems

ONU: 1996-1997, Teaching Assistant, EE 312 Digital Electronics 3, EE 311 Digital Electronics 2, EE 213 Digital Electronics 1

Thesis Supervision:

Colin Gibbons, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *MRI-derived Cardiac Adipose Tissue Modeling for Use in Ultrasound Tissue Labeling and* Classification

Bradley Bates, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Identification of Cardiac Adipose Tissue with Attenuation Coefficient Estimation*

Michaela Kulasekara, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Evaluation of Two-Dimensional and Three-Dimensional Deep Learning Architectures for Segmentation of Adipose Tissue in Cardiac Magnetic Resonance Images*. May 2021

Miranda Fulton, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Segmentation of Epicardial Adipose Tissue in Cardiac MRI using Deep Learning.* May 2020

Goksu Avdan, M.S., Department of Mechanical and Industrial Engineering, Southern Illinois University Edwardsville, *3D Modeling and Stress Analyses for Coronary Arteries with Multiple Plaque Types*. May 2019

Mete Naz, M.S., Department of Mechanical and Industrial Engineering, Southern Illinois University Edwardsville, *3D Modeling and Regional Assessment of Cardiac Adipose Tissue Distribution Based on Cardiac MRI Images*. May 2019

Addison Elliott, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Development and Validation of Adipose Tissue Segmentation Algorithms in Dixon MRI and Echocardiograms*. May 2019

Akhila Karlapalem, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Differentiating Cardiac Adipose Tissue Using Spectral Analysis of Raw Ultrasound Radiofrequency Data.* December 2018

Saygin Sop, M.S., Department of Mechanical and Industrial Engineering, Southern Illinois University Edwardsville, *MRI-Based Three-Dimensional Modeling and Assessment of Cardiac Adipose Tissue.* May 2018

Asher Haggard, M.S., Department of Electrical and Computer Engineering, Southern Illinois University Edwardsville, *Identification of intercostal vessels using spectral analysis of ultrasound radiofrequency signals.* December 2017

Memberships:

IEEE (Institute of Electrical and Electronics Engineers)
BMES (Biomedical Engineering Society)
AHA (American Heart Association)

ASEE (American Society of Engineering Education)

Grants:

$11,650.15 (7/2021 to 6/2022), Co-PI, SIUE Research Equipment and Tools Program, *"A Multi-Processor Computer for the SIUE Computer Vision and Image Processing Laboratory"*

$16,000 (7/2021 to 6/2022), PI, SIUE Seed Grant for Transitional and Exploratory Projects, *"Electro-Thermal Imaging: Feasibility for Breast Tumor Detection"*

$433,367 (8/2020 to 7/2023), PI, NIH 1R15HL145576-01A1, *"Model-based assessment of cardiac adipose tissue volume and distribution"*

$12,500 (7/2020 to 6/2021), PI, SIUE Vaughnie Lindsay New Investigator Award, *"Segmentation and modeling of adipose tissue and coronary arteries in cardiac magnetic resonance images"*

$154,000 (7/2017 to 6/2019), PI, American Heart Association, Institutional Research Enhancement Award, *"Volumetric assessment of epicardial adipose tissue using echocardiography"*

$9,996 (11/2017 to 12/2018), Co-PI, Washington University School of Medicine, Institute of Clinical and Translational Sciences, JIT Program, *"Effects of Exercise Mode in Obesity"*

$2,200 (7/2017 to 6/2018), PI, SIUE Emeriti Faculty Fund, *"Enhancement of Digital Signal Processing Course with Hardware Implementation of Digital Filters"*

$27,000 (7/2017), PI, SIUE Research Equipment and Tools Program, *"Portable Ultrasound Imaging System"*

$13,700 (7/2017 to 6/2018), PI, SIUE Seed Grant for Transitional and Exploratory Projects, *"Three-dimensional segmentation of epicardial adipose tissue in magnetic resonance images"*

$34,000 (7/2001 to 6/2003), PI, Predoctoral Fellowship, American Heart Association, Ohio Valley Affiliate

Licenses:

Patent 6,381,350 was licensed to Volcano Therapeutics, Inc., Rancho Cordova, CA, April 2002.

Selected Honors and Awards:

2021	Annette and Henry Baich Award Winner, Best STEP Proposal, Southern Illinois University Edwardsville
2021	Outstanding Researcher, School of Engineering, Southern Illinois University Edwardsville
2020	Vaughnie Lindsay New Investigator Award, Graduate School, Southern Illinois University Edwardsville
2018	Outstanding Teacher, Department of Electrical and Computer Engineering, School of Engineering, Southern Illinois University Edwardsville
2016	Outstanding Adjunct Instructor, School of Engineering, Southern Illinois University Edwardsville
2011	Volcano Corp Research Award, Technology used in PROSPECT Trial and Published in the New England Journal of Medicine

2001	Student Paper Award, Applied Research and Development, Lerner Research Institute, Cleveland Clinic Foundation
2001	2nd Place Poster Presentation, Case Western Reserve University, Department of Biomedical Engineering, Research Day 2001
1998	Graduate Fellowship, The Ohio State University
1997	Archer Design Award, Department of Electrical and Computer Engineering, Ohio Northern University
1997	Department Honors (highest graduating GPA), Department of Electrical and Computer Engineering, Ohio Northern University
1995	Tau Beta Pi Engineering Honorary
1994	Ohio Athletic Conference 1st Team All-Academic Soccer, Ohio Northern University
1993-1997	Dean's List, Ohio Northern University
1993	Salutatorian, Northwest High School
1993	Outstanding Senior Student, Northwest High School
1992	"I Dare You" Leadership Award, Northwest High School

Publications:

Peer-reviewed Journal Articles:

1. **Klingensmith JD**, Vince DG, Kuban BD, Tuzcu EM, Shekhar R, Nissen SE, Cornhill JF. *Assessment of coronary compensatory enlargement by three-dimensional intravascular ultrasound*. International Journal of Cardiac Imaging, 2000. 16(2):87-98.

2. **Klingensmith JD**, Shekhar R, Vince DG. *Evaluation of three-dimensional segmentation algorithms for the identification of luminal and medial-adventitial borders in intravascular ultrasound images.* IEEE Transactions on Medical Imaging, 2000. 19(10):996-1011.

3. Tsutsui H, Ziada KM, Schoenhagen P, Iyisoy A, Magyar WA, Crowe TD, **Klingensmith JD**, Vince DG, Rincon G, Hobbs RE, Yamagishi M, Nissen SE, Tuzcu EM. *Lumen loss in transplant coronary artery disease is a biphasic process involving early intimal thickening and late constrictive remodeling: results from a 5-year serial intravascular ultrasound study.* Circulation, 2001. 104(6):653-657.

4. Tsutsui H, Schoenhagen P, **Klingensmith JD**, Vince DG, Nissen SE, Tuzcu EM. *Regression of a donor atheroma after cardiac transplantation: serial observations with intravascular ultrasound.* Circulation, 2001. 104(23):2874.

5. **Klingensmith JD**, Vince DG. *B-spline methods for interactive segmentation and modeling of lumen and vessel surfaces in three-dimensional intravascular ultrasound.* Computerized Medical Imaging and Graphics, 2002. 26(6):429-438.

6. Tsutsui H, Schoenhagen P, Crowe TD, **Klingensmith JD**, Vince DG, Nissen SE, Tuzcu EM. *Influence of coronary pulsation on volumetric intravascular ultrasound measurements performed without ECG-gating. Validation in vessel segments with minimal disease.* International Journal of Cardiovascular Imaging, 2003. 19(1):51-57.

7. **Klingensmith JD**, Tuzcu EM, Nissen SE, Vince DG. V*alidation of an automated system for luminal and medial-adventitial border detection in three-dimensional intravascular ultrasound.* International Journal of Cardiovascular Imaging, 2003. 19(2):93-104.

8. Tsutsui H, Schoenhagen P, Ziada KM, Crowe TD, **Klingensmith JD**, Vince DG, Bott-Silverman C, Starling R, Hobbs RE, Young J, Nissen SE, Tuzcu EM. *Early constriction or expansion of the external elastic membrane area determines the late remodeling response and cumulative lumen loss in transplant vasculopathy: an intravascular ultrasound study with 4-year follow-up.* J Heart Lung Transplant, 2003. 22(5):519-525.

9. **Klingensmith JD**, Schoenhagen P, Tajaddini A, Halliburton SS, Tuzcu EM, Nissen SE, Vince DG. *Automated three-dimensional assessment of coronary artery anatomy using intravascular ultrasound.* [Review] American Heart Journal, 2003. 145(5):795-805.

10. **Klingensmith JD**, Elliott AL, Fernandez-Del-Valle M, Mitra S. *Automated segmentation of cardiac adipose tissue in Dixon magnetic resonance images*. J Biomed Graph Comput, 2018, 8(1):1-13.

11. **Klingensmith JD**, Sop S, Naz M, Fernandez-Del-Valle M, Lee HF. *Three-dimensional modeling and assessment of cardiac adipose tissue distribution*. J Biomed Graph Comput, 2018, 8(1):14-28.

12. **Klingensmith JD**, Haggard A, Fedewa RJ, Qiang B, Cummings III K, DeGrande S, Vince DG, Elsharkawy H. *Spectral analysis of ultrasound radiofrequency backscatter for the detection of intercostal blood vessels.* Ultrasound Med Biol, 2018, 44(7):1411-1422.

13. Fernandez-Del-Valle M, Gonzalez J, Kloiber S, Mitra S, **Klingensmith JD**, Larumbe-Zabala E. *Effects of resistance training on MRI-derived epicardial fat volume and arterial stiffness in women with obesity: a randomized pilot study.* Eur J Appl Physiol, 2018, 118(6):1231-1240.

14. **Klingensmith JD**, Elliott A, Givan A, Faszold Z, Mahan C, Doedtman A, Fernandez-Del-Valle M. *Development and evaluation of a method for segmentation of cardiac, subcutaneous, and visceral adipose tissue from Dixon magnetic resonance images*. J Med Imaging, 2019, 6(1), 014004.

15. **Klingensmith JD**, Haggard AL, Ralston JT, Qiang B, Fedewa RJ, Elsharkawy H, Vince DG. *Tissue classification in intercostal and paravertebral ultrasound using spectral analysis of radiofrequency backscatter*. J Med Imaging, 2019, 6(4), 047001.

16. **Klingensmith JD**, Karalapalem A, Kulasekara MM, Fernandez-Del-Valle M. *Spectral analysis of ultrasound radiofrequency backscatter for the identification of epicardial adipose tissue*. J Med Imaging, 2022, 9(1), 017001.

17. Gunasekara J, Avdan G, Lee HF, Kweon S, **Klingensmith JD**. *Investigating the effects of external pressure on coronary arteries with plaques and its role in coronary artery disease*. J Med Eng Technol. 2022, DOI: 10.1080/03091902.2022.2081736.

18. Kulasekara MM, Dinh VQ, Fernandez-del-Valle M, **Klingensmith JD**. *Comparison of two-dimensional and three-dimensional U-net architectures for segmentation of adipose tissue in cardiac magnetic resonance images.* Med Biol Eng Comput, DOI: 10.1007/s11517-022-02612-1.

Book Chapters:

1. Nair A, **Klingensmith** JD, Vince DG. *Real-time plaque characterization and visualization with spectral analysis of intravascular ultrasound data*. In: Plaque Imaging: Pixel to Molecular Level. Jasjit Suri, et al., eds. IOS Press, 2005. Invited.

Conference Proceedings:

1. Davis G, Geisheimer J, Holbrook B, **Klingensmith JD**, Thede L, Woodruff WM. *MATLAB and Visual Basic methodologies in the design of medical image processing software*. Proceedings of the American Society for Engineering Education, North Central Section, 1997:66-77

2. **Klingensmith JD**, Vince DG, Shekhar R, Kuban BD, Tuzcu EM, Cornhill JF. *Quantification of coronary arterial plaque volume using 3D reconstructions formed by fusing intravascular ultrasound and biplane angiography*. SPIE Medical Imaging, 1999. 3660:343-350.

3. Veress AI, Vince DG, Anderson PM, Cornhill JF, Herderick EE, **Klingensmith JD**, Kuban BD, Greenberg NL, Thomas JD. *Vascular mechanics of the coronary artery*. Z Kardiol, 2000. 89 Suppl 2:92-100.

4. **Klingensmith JD**, Vince DG. *Respiratory motion correction for geometrically correct three-dimensional reconstructions of coronary arteries.* Proceedings of Computers in Cardiology, 2002. 29:545-548.

5. **Klingensmith JD**, Nair A, Kuban BD, Vince DG. *Volumetric coronary plaque composition using intravascular ultrasound: three-dimensional segmentation and spectral analysis.* Proceedings of Computers in Cardiology, 2002. 29:113-116.

6. **Klingensmith JD**, Sop S, Naz M, Fernandez-Del-Valle M, Lee HF. *MRI-Based Three-Dimensional Modeling and Assessment of Epicardial Adipose Tissue*. Proceedings of SPIE Medical Imaging, 2018. 105781P.

7. Haggard A, **Klingensmith JD**, Fedewa RJ, Cummings K, DeGrande S, Vince DG, Elsharkawy H. *Spectral analysis of ultrasound radiofrequency backscatter for the identification of five tissue types found in and around the paravertebral space*. Proceedings of SPIE Medical Imaging, 2018. 1058016.

8. Karlapalem A, Fulton MR, Givan AH, Fernandez-Del-Valle M, **Klingensmith JD**. *Classification of cardiac adipose tissue using spectral analysis of ultrasound radiofrequency backscatter*. Proceedings of SPIE Medical Imaging, 2019. 10955.

9. Fulton MR, Givan AH, Fernandez-Del-Valle M, **Klingensmith JD**. *Segmentation of epicardial adipose tissue in cardiac MRI using deep learning*. Proceedings of SPIE Medical Imaging, 2020. 11317.

10. Gibbons C, **Klingensmith JD**. MRI-derived cardiac fat modelling for use in ultrasound tissue labelling and classification. Proceedings of SPIE Medical Imaging, 2022. 12032.

Published Abstracts:

1. **Klingensmith JD**, Vince DG, Tuzcu EM, Crowe T, Shekhar R, Nissen SE, Cornhill JF. *Three-dimensional segmentation of intravascular ultrasound image sequences: a clinical validation*. Circulation, Supplement I, 1999. 100(18):I-229.

2. Tsutsui H, Ziada KM, Schoenhagen P, Rincon G, Bott-Silverman C, Iyisoy A, **Klingensmith JD**, Vince DG, Nissen SE, Tuzcu EM. *Mechanisms of coronary lumen loss in transplant vasculopathy: A 5-year serial intravascular ultrasound study*. Circulation, Supplement II, 2000. 102(18):II-490.

3. Tajaddini A, **Klingensmith JD**, Vince DG. *An intravascular ultrasound study of coronary artery compliance in the diabetic population*. Circulation, Supplement II, 2000. 102(18):II-636.

4. Tsutsui H, Ziada KM, Schoenhagen P, Crowe TD, Magyar WA, Iyisoy A, **Klingensmith JD**, Vince DG, Rincon G, Nissen SE, Tuzcu EM. *Progression of Intimal Thickening is Greatest Early After Cardiac Transplantation and Not Directly Related to Changes in Vessel Size (Remodeling): A 4-Year Serial Intravascular Ultrasound* Study. Journal of the American College of Cardiology, 2001. 37 (2 Suppl A):648A

5. Neubeck P, Jeremias A, Schoenhagen P, Tsutsui H, **Klingensmith JD**, Vince DG, Magyar WA, Nissen SE, Tuzcu EM. *Compensatory remodeling in early coronary artery disease – A volumetric IVUS analysis*. Journal of the American College of Cardiology, 2002. 39(5 Suppl A): 61A.

6. Schoenhagen P, Magyar WA, Kapadia S, Ziada KM, Tsutsui H, Haji SA, **Klingensmith JD**, Nissen SE, Tuzcu EM. *Negative remodeling frequently occurs in mildly stenotic native coronary lesions and is unrelated to plaque size*. Journal of the American College of Cardiology, 2002. 39(5 Suppl A):246A.

Abstracts in Conference Proceedings:

1. Vince DG, **Klingensmith JD**, Kuban BD, Shekhar R, Tuzcu EM, Nissen SE, Cornhill JF. *Three-dimensional reconstruction of intravascular ultrasound images for the determination of coronary compensatory enlargement*. 2nd International Congress on Coronary Artery Disease, Florence, Italy. 1998.

2. **Klingensmith JD**, Shekhar R, Vince DG. *Three-dimensional segmentation of intravascular ultrasound image sequences.* Case Western Reserve University Department of Biomedical Engineering Annual Research Day and Open House. Cleveland, Ohio. February 2001.

3. **Klingensmith JD**, Shekhar R, Vince DG. *Three-dimensional segmentation of intravascular ultrasound image sequences.* NASA National Center for Microgravity Research. Workshop on Diagnostics, Imaging and Spectroscopy: Potential for Biomedical and Industry Applications, Cleveland, Ohio. April 2002.

4. **Klingensmith JD**., Nair A, Kuban BD, Vince DG. *Analysis and visualization of three-dimensional coronary plaque composition.* 3rd International Conference on Ultrasound Biomedical Microscanning, Westkapelle, The Netherlands, September 2002.

5. Tajaddini A, **Klingensmith** JD, Vince DG. *Assessment of coronary biomechanics using intravascular ultrasound: influence of age and diabetes.* 2nd International Interdisciplinary Conference on Cardiovascular Medicine, Surgery, Science, and Mechanics. Bethesda, MD, July 2003.

6. Vince DG, **Klingensmith JD**, Nair A, Kuban BD, Margolis MP, Tuzcu EM, Erbel R, Wijns W. *Determination of plaque composition in human coronary arteries using IVUS virtual histology*. European Society of Cardiology Congress, Vienna, Austria, September 2003.

7. **Klingensmith JD**, Maddali NSK, Alluri V, Lee HF. *Biphasic Analysis of Coronary Arterial Shear Stress Using IVUS-derived Borders and CFD Analysis*. Phoenix, AZ: Biomedical Engineering Society. 2017.

8. Haggard A, **Klingensmith JD**, Fedewa RJ, Cummings K, DeGrande S, Vince DG, Elsharkawy H. *Spectral Analysis of Radiofrequency Ultrasound Signals for the Identification of Intercostal Nerves*. Phoenix, AZ: Biomedical Engineering Society. 2017.

9. Givan A, Sullivan C, Doedtman A, Elliott A, Klingensmith J, Larumbe-Zabala E, Fernandez-del-Valle M. *Effects of high-intensity resistance training on regional abdominal fat in women with Obesity*. Nashville, TN: Obesity Week. 2018.

10. Avdan G, Lee HF, **Klingensmith JD**, Celik S, Alluri V, Maddali N. *Stress Analyses of 3D Coronary Plaque Models Based On Intravascular Ultrasound Images*. Atlanta, GA: Biomedical Engineering Society. 2018.

11. Elliott AL, Karlapalem A, Givan AH, Fernandez-Del-Valle M, **Klingensmith JD**. *Endocardium Segmentation in Parasternal Short-Axis Echocardiograms Using Dynamic Programming*. Atlanta, GA: Biomedical Engineering Society. 2018.

12. Karlapalem A, Givan AH, Fernandez-Del-Valle M, Fulton MR, **Klingensmith JD**. *Differentiating Cardiac*

Tissue Types Using Spectral Analysis of Raw Ultrasound Backscatter. Atlanta, GA: Biomedical Engineering Society. 2018.

Patents:

1. **Klingensmith JD**, Vince DG, Shekhar R. Intravascular ultrasonic analysis using active contour method and system. U.S. Patent Number 6,381,350.

2. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method of characterizing vascular tissue. US Patent Number 7,074,188.

3. Vince DG, Nair A, **Klingensmith JD**. Non-Invasive tissue characterization system and method. US Patent Number 7,175,597.

4. **Klingensmith JD**, Nair A, Kuban B, Vince DG. System and method for vascular border detection. US Patent Number 7,215,802.

5. **Klingensmith JD**, Vince DG, Nair A, Kuban BD. System and method for identifying a vascular border. US Patent 7,359,554.

6. **Klingensmith JD**, Nair A, Kuban B, Vince DG. System and method for vascular border detection. US Patent Number 7,463,759.

7. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method for determining a transfer function. US Patent Number 7,874,990.

8. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method of characterizing vascular tissue. US Patent Number 7,899,224.

9. Huennekens RS, Fry SM, Walker BD, **Klingensmith JD**, Pool NP, Burgess VJ, Kanz WR. Vascular image co-registration. US Patent Number 7,930,014.

10. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method for characterizing vascular tissue. US Patent Number 7,940,969.

11. **Klingensmith JD**, Vince DG, Nair A, Kuban BD. System and method for identifying a vascular border. US Patent Number 7,978,916.

12. Hossack NH, Davies SC, Mamayek D, Huennekens RS, Fry SM, Mott EV, Smith P, Brownlie S, **Klingensmith JD**, Klosinski R, Oliver E, Ahmed M, Litzza GL. Apparatus and method for use of RFID catheter intelligence. US Patent Number 7,988,633.

13. **Klingensmith JD**, Vince DG, Nair A, Kuban BD. System and method for identifying a vascular border. US Patent Number 8,233,718.

14. Huennekens RS, Burgess VJ, Margolis MP, Walker BD, **Klingensmith JD**, Pool NP, Hanson RK. Three-dimensional co-registration for intravascular diagnosis and therapy. US Patent Number 8,298,147.

15. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method of characterizing vascular tissue. US Patent Number 8,303,503.

16. Nair A, Vince DG, Kuban BD, **Klingensmith JD**. System and method for characterizing vascular tissue. US Patent Number 8,449,465.

17. Kuban BD, **Klingensmith JD**, Vince DG, Nair A. System and method for acquiring blood-vessel data. US Patent Number 8,622,910.

18. **Klingensmith JD**, Vince DG, Nair A, Kuban BD. System and method for identifying a vascular border. US Patent Number 8,630,492.

19. Nair A, Vince DG, **Klingensmith JD**, Kuban BD. System and method for determining a transfer function. US Patent Number 8,808,183.

20. Hossack NH, Davies SC, Mamayek D, Huennekens RS, Fry SM, Mott EV, Smith P, Brownlie ST, **Klingensmith JD**, Klosinski RC, Oliver EA, Ahmed M, Litzza GL. Apparatus and method for use of RFID catheter intelligence. US Patent Number 9,101,298.

21. Huennekens RS, Fry SM, Walker BD, **Klingensmith JD**, Pool NP, Burgess VJ, Kanz WR. Vascular image co-registration. US Patent Number RE46,562.

22. Hossack NH, Davies SC, Mamayek D, Huennekens RS, Fry SM, Mott EV, Smith P, Brownlie ST, **Klingensmith JD**, Klosinski RC, Oliver EA, Ahmed M, Litzza GL. Apparatus and method for use of RFID catheter intelligence. US Patent Number 10,052,082.

23. Rajguru N, Zagrodsky V, Goodwin D, **Klingensmith JD**, Blanz WE, Sturm B. Method for visualizing blood and blood-likelihood in vascular images. US Patent Number 10,292,676.