Leo Grady

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CV last edited: 7/2/18

Overview

Technology leader bringing the latest machine learning, computer vision and medical imaging technology to market. My focus has been on developing advanced software products for medical imaging, 3D modeling and simulation by overcoming challenging technical and market barriers. I have a strategic focus on product and technology roadmap while being strongly involved in tactical execution.

In addition to product vision, product development and R&D, I have also built teams, established effective agile development practices and driven systematic innovation/intellectual property portfolio development.

Specialties: Executive leadership, machine learning, product/project management, software engineering, computer vision, medical imaging, medical software development, intellectual property.

Work Experience

- **HeartFlow** — Redwood City, CA
  Senior Vice President of Engineering — *July 2016 – Present*
  Vice President of Research and Development — *June 2012 – July 2016*
  - As SVP of Eng: HeartFlow is a Software as a Service (SaaS) company that provides large scale medical image analysis and cardiovascular modeling using the cloud that is accessed via a web interface. Led full stack technology and product development effort for HeartFlow, including scalable cloud development, web development, PACS/EMR integration, user interfaces, security, biophysical (blood flow) simulation, deep learning and image analysis software. Established agile software development processes, internal engineering infrastructure and maintained regulatory compliance of process for medical software development. Set strategic directions for product, technology and engineering roadmap while being strongly involved with tactical execution. Led group of ∼80 people.
  - As VP of R&D: Led technology development of core (regulated) medical imaging software product. This product provides advanced algorithms that leverage deep learning for automated cardiovascular image analytics and an interactive guided workflow for user visualization, editing and review of the results. The software produces a hyper-precise personalized 3D model of the heart and coronary vasculature which provides a substrate for blood flow simulation. A key challenge of the software was designing the workflow/visualization/tools to achieve reproducibility across users. Conceived the overall vision for the software, led the development, oversaw usability testing, full V&V, FDA 510(k) clearance and transition into operational usage. Led group of ∼20 people during course of the product development.
  - Represented HeartFlow externally by making presentations and forging academic, clinical and industrial collaborations.
  - Strategically and systematically drove development of Intellectual Property portfolio.

- **Siemens** — Princeton, NJ
  Line Manager — *Jan. 2010 – May 2012*
  Principal Research Scientist — *April 2010 – May 2012*
  Senior Research Scientist — *Sept. 2003 – April 2010 (senior since April 2008)*

- As Line Manager: Line management for a group of 20 people, including research scientists and software engineers.
- As Principal Research Scientist: Led projects and supervised junior scientists. Helped set strategic directions for technology development, hiring and acquisition. Represented Siemens Corporate Research internally and externally by making presentations and forging academic, clinical and industrial collaborations. Performed troubleshooting in crisis projects. Led research and development in areas of disruptive technologies.
- As Senior (Principal) Research Scientist: Wrote proposals, acquired projects and supervised junior research scientists, students and interns to meet software deliveries for the projects, as well as to advance research goals.
- As (Senior) Research Scientist: Researched, developed, patented, published and gave talks on computer vision, machine learning, 3D and medical imaging.
- As (Senior) Research Scientist: Designed and developed computer vision software for commercial products. Most applications of this software were in the area of medical image analysis, but also extended to non-medical projects such as airport security. Wrote software for approximately 20 different Siemens (and Siemens partner) products of varying scope.

Education

- **Boston University** — Boston, MA
  Ph.D., Cognitive and Neural Systems (Dr. Eric Schwartz, advisor) — *1999–2003*
- **University of Vermont** — Burlington, VT
  B.Sc., Electrical Engineering (Computer Engineering Focus) — *1995–1999*
  - Minors in applied mathematics and physics

Honors and Awards

- 2014: Inducted as a Fellow in the American Institute for Medical and Biological Engineering
- 2012: The **Edison Patent Award** for best patent in medical imaging was awarded for my Random Walker patent (7,460,709), due to its commercial impact and application to medical imaging. See the video https://www.youtube.com/watch?v=sbta_5zpVOA&list=PLWM4JZrnFZgx0wOKuGj5Uq9K4xAalRld8&index=15&feature=plpp_video

Press

- Podcast interview on Software Engineering Daily at:
  https://softwareengineeringdaily.com/tag/heartflow/

Software projects and products (HeartFlow)

- **FFRct**
  - HeartFlow is a Software as a Service (SaaS) company that provides large scale medical image analysis and cardiovascular modeling using the cloud (AWS) that is accessed via a web interface. Led full stack technology and product development effort for HeartFlow, including scalable cloud development, web development, security, PACS/EMR integration, user interfaces, biophysical (blood flow) simulation and image analysis software.

- FFRct is the central product of HeartFlow, which calculates functional information from cardiac CT images to guide therapy decisions. Specifically, the product builds a patient-specific 3D model of the coronary arteries and performs a fluid simulation of the blood flow to calculate a fractional flow reserve (FFR). The core scientific software consists of three pieces: A deep-learning based image analysis to create a patient-specific 3D coronary artery modeling from a vendor-neutral CT image, a workstation used by internal HeartFlow technicians to review, validate and correct the 3D models and a blood flow simulation engine. Once validated 3D models are obtained, these models are used for the fluid simulations and the results sent to the customer physician.
- The key challenge of the automated image analytics is to leverage HeartFlow's large data repository to produce fast, accurate and robust algorithms. The key challenge of the internal workstation is to design a guided workflow and interactive tools that enables a technician to quickly check the 3D model and to reproducibly make edits. Reproducibility was a large challenge due to the variation among technicians and the need to deliver a reproducible service in a regulated environment. The team I led was responsible for delivering both the automated image analytics piece and the internal workstation software. My role as VP of R&D was to design and lead the execution of the software development as well as oversee usability testing, V&V, FDA submission and deployment.

Software projects and products (Siemens)

- **Cardiovascular**
  - Automatic calculation of Proximal Isovelocity Surface Area (PISA) via analysis of Doppler and B-mode ultrasound
  - Automatic left ventricle segmentation in CT and MRI for calculation of ejection fraction and determination of heart efficiency.
  - Automatic determination of the standard cardiac views for display from CT images to improve the efficiency of the radiologist workflow.
  - Automatic four-chamber segmentation in CT images. Various diagnostic quantities can be determined from this calculation which open the door for further clinical research.
  - Automatic aorta segmentation in CT images, which is used as a preliminary step for coronary artery segmentation.
  - Automatic heart isolation in CT to improve coronary artery visualization on the heart surface.
  - Left atrium segmentation in CT for EP planning (atrial defibrillation).
  - Simulated CathLab visualization from CT images by suppressing the intensity of all non-coronary voxels.
  - Automatic myocardial wall thickness measurement of the left ventricle in CT data to provide guidance duration ablation procedures.
  - Interactive measurement of abdominal aortic aneurysms and thrombus for monitoring and treatment planning.
  - Automatic detection and localization of bleeding in the images obtained from a novel ultrasound device. This project (supported by DARPA) allowed us to build a device that can be used by a soldier with no medical background to cauterize bleeding in the extremities at the location of injury (e.g., in battlefield conditions). For press on this project, see: `http://www.sonoworld.com/Client/ModuleContent/ModuleContent.aspx?ContentId=1901`.

- **Oncology**
  - Interactive 2D and 3D tumor segmentation method for monitoring tumor volume in CT, MRI, diffuse optical tomography and ultrasound.
  - Developed interactive organ segmentation system for radiation therapy planning in CT and MRI images.
  - Developed a prostate segmentation module in MRI.
  - Interactive lymph node segmentation in MRI images for measurement and surgery planning.
  - Automatic liver and kidney segmentation in CT images for calculating tumor burden of these organs.
- **Skeletal**
  - Developed system to isolate and visualize the fetal skeleton in ultrasound images to provide an early warning of improper fetal development.
  - Developed a system for automatic and interactive segmentation of bone fragments in fracture cases for replacement and surgery planning.
  - Developed an interactive system for segmenting sinus cavities that was used to calculate the percentage of fluid fill.
  - Assisted development of rib unfolding visualization from CT acquisitions.
- ***In Vitro* Diagnostics**
  - Developed a system to predict Gleason score (cancer staging) from H&E stained prostate slices, obtained from a digital pathology system.
  - Developed a system to find and measure diagnostic pads for chemical urinalysis.
  - Developed a system to detect and classify virally infected cells.
  - Assisted development of a system for determining whether an H&E stained breast biopsy was malignant or benign. For press on this project, see:
    http://www.siemens.com/innovation/pool/en/publikationen/publications_pof/pof_fall_2011/machine_learning/pof0211_ml_medizin_en.pdf
- **Neural**
  - Using MRI and resting state fMRI, built a system which used network analytics to quantitatively assess if children have ADHD.
  - Built a system to quickly and accurately find point correspondence between cortical surfaces.
- **Compressed Sensing**
  - Developed a system for MRI image reconstruction from incomplete (sparse) samples acquired in k-space.
- **Security**
  - Developed a system that performed segmentation of the items inside luggage that was scanned using a CT machine.
- **Code online**
  - Designed, implemented and documented the Graph Analysis Toolbox for MATLAB, available freely (along with a complete demo package) at `http://cns.bu.edu/~lgrady/software.html`. The purpose of the software is to allow for the manipulation and analysis of data associated with graphs (e.g., images). The toolbox has been downloaded over ten thousand times since being made available online in 2003.

– Research code from several papers written at Siemens is made available online.

Grant support

NIH R01 HL094557-01A2 Improved Cardiac and Vascular Magnetic Resonance Imaging Using a Combination of Parallel Imaging and Compressed Sensing Concepts. Jan. 2010 – Jan. 2015

Total award: $3,490,481 Role: Co-Investigator, funded at 2.5% of the total award.

PI: Mark Griswold, Case Western Reserve University

Security Screening Segmentation Challenge (ALERT) . March 2011 – Dec. 2011

Total award: $70,000 Role: Principal Investigator, funded at 100% of the total award.

PI: Leo Grady, Siemens Corporate Research

NIH R01-CA-134493-01A1 A Platform for Cancer Biomarker Validation: Image Fusion using NIR Fluorescence. Jan. 2009 – Jan. 2014.

Total award: $745,852 Role: Co-Investigator, funded at 14% of the total award.

PI: John Frangioni, BIDMC

DARPA HR0011-08-3-0004 Deep Bleeder Acoustic Coagulation (DBAC) — Phase II. Aug. 2008 – Aug. 2010.

Total award: $11,256,966 Role: Technical Contributor, funded at 0.1% of the total award.

PI: Michael Sekins, Siemens Ultrasound

Professional activities

Journal Editor: Editorial board for the SIAM Journal on Imaging Sciences, editorial board for the Journal of Mathematical Imaging and Vision

Area Chair: Area chair for MICCAI 2012–2016 and CVPR 2013–2014.

Grant boards: Served on grant board for NIH small business grants and NSF computer vision grants.

Associations: Member of IEEE, the MICCAI society and Tau Beta Pi (engineering honors fraternity).

Committees: Planning committee member for MICCAI 2017. Program committee member for the conferences: European Conference on Computer Vision (ECCV); Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR) and International Conference on Distributed Smart Cameras. Program committee member for the workshops: Medical Computer Vision (MCV) on big Data, deep Learning and novel Representations; Interactive Computer Vision; Perceptual Organization for Computer Vision; Structured Models in Computer Vision; Information Theory in Computer Vision and Pattern Recognition.

Tutorials:

CVPR 2007: *Fundamentals linking discrete and continuous approaches to computer vision - A topological view.* The course page is at `http://www.cns.bu.edu/~lgrady/Short_Course.html` and slides (from a similar, abbreviated coarse) are available at:
`https://www.ipam.ucla.edu/publications/gc2008/gc2008_7718.zip`.

ECCV 2008: *Combinatorial Calculus in Computer Vision: Formulating and Solving Continuous PDEs on Graphs*. The course page is at
`http://cns.bu.edu/~lgrady/Short_Course_ECCV08.html` and slides are available at:
`http://cns.bu.edu/~lgrady/ECCV08_tutorial_grady_bougleux.zip`.

Invited talks:

- Medical Computer Vision on big Data, deep Learning and novel Representations (in conjunction with CVPR 2018), Jun. 2018.
- Facebook AI Research (FAIR), May 2018
- Oxford University, Jan 2017.
- Oxford Centre for Innovation, May 2016.
- University College London, Institute of Healthcare Engineering, May 2016.
- Imperial College London, Dept of Computing, May 2016.
- École Polytechnique de Montral, Mar 2016.
- Technical University of Munich, Computer Vision Group, Oct. 2015.
- Medical Computer Vision on big Data, deep Learning and novel Representations (in conjunction with CVPR 2015), Jun. 2015.
- University of Iowa, Iowa Institute for Biomedical Engineering, Dec. 2014.
- University of California Berkeley, Simons Institute, Nov. 2014.
- **Keynote speaker at the SIAM Conference on Imaging Science, May 2014.**
- MIT, May 2014.
- Microsoft Research, Cambridge UK, Dec. 2013.
- **Keynote speaker at the Workshop on Medical Computer Vision, in conjunction with MICCAI 2013, Sept. 2013.**
- **Keynote speaker at the Workshop on Mesh Processing in Medical Image Analysis, in conjunction with MICCAI 2013, Sept. 2013.**
- INRIA Rocquencourt, Mathematical Modeling and Numerical Solutions of Biological Flows, May 2013.
- University of Tokyo, May 2013.
- UC Berkeley, Department of Electrical Engineering and Computer Sciences, Sept. 2012.
- Technical University of Munich, Department of Computer Aided Medical Procedures and Augmented Reality, March 2012.
- New York University/Courant Institute of Mathematical Sciences, Department of Computer Science, Feb. 2012.
- University of Pennsylvania, Department of Computer Science, Dec. 2011.
- Rutgers University, Department of Computer Science, Dec. 2011.
- University of Pennsylvania, Department of Radiology, Nov. 2011.
- Banff International Research Station, Workshop on Geometry for Anatomy, Aug. 2011.
- **Keynote speaker at the International Symposium on Mathematical Morphology, July 2011.**
- Cornell University, Department of Computer Science, June 2011.
- University of Toronto, Fields Institute, June 2011.
- University of Twente, Institute for Biomedical Technology and Technical Medicine, Jan. 2011.
- University of Wisconsin, Department of Computer Science, Dec. 2010.

- **Keynote speaker at the International Conference on Image and Signal Processing, June 2010.**
- Université Paris 13, Département de Mathématiques, May 2010.
- Mitsubishi Electric Research Lab (MERL), July 20th, 2009.
- Workshop on Histology Image Analysis (talk and panel discussion), Ohio State University, July 6th, 2009.
- SPIE Photonics West '09: Multimodal Biomedical Imaging, International Symposium on Biomedical Optics, Jan. 24th, 2009.
- Drexel University, Department of Computer Science, Jan. 12th, 2009.
- MIT/MGH, Martinos Center for Biomedical Imaging, Dec. 3rd, 2008.
- Université Paris-Est, ESIEE, Oct. 17th, 2008.
- Microsoft Research, Cambridge UK, Oct. 11th, 2008.
- Imperial College of London and GlaxoSmithKline, Clinical Imaging Center, Oct. 9, 2008.
- University College London, Department of Computer Science, Oct. 8th, 2008.
- Université de Caen Basse-Normandie, GREYC Lab, Oct. 6th, 2008.
- Boston University, Department of Computer Science, Aug. 13th, 2008.
- University of California Los Angeles, Institute for Pure and Applied Mathematics, in conjunction with the "Graph Cuts and Related Discrete or Continuous Optimization Problems" program, Feb. 25th, 2008.
- University of Maryland, Norbert Weiner Center for Harmonic Analysis and Applications, in conjunction with the "February Fourier Talks", Feb. 21st, 2008.
- Johns Hopkins University, Center for Imaging Science, Oct. 2nd, 2007.
- **Keynote speaker at the "6th IAPR-TC-15 Workshop on Graph-based Representations in Pattern Recognition", Universidad de Alicante, June 12th, 2007**
- University of Minnesota, Institute for Mathematics and Applications, Feb. 22nd, 2006
- Université Paris Dauphine, in conjunction with "Mathematics and Image Analysis 2006", Sept. 19th, 2006
- Stevens Institute of Technology, Department of Computer Science, Mar. 28th, 2005
- University of Utah, Scientific Computing and Imaging Institute, Jan. 14th, 2005

Student supervision

- **PhD: As thesis committee member**
  - Clara Jaquet, ESIEE, Paris (co-advisors: Hugues Talbot and Laurent Najman). Expected graduation in 2019. Supervised internship at HeartFlow in 2015-2016.
  - Herve Lombaert, École Polytechnique, Montreal (advisor: Farida Cheriet). Graduated in June 2012. Supervised internship at Siemens Corporate Research in 2010.
  - Daniel Weller, MIT (advisor: Vivek Goyal). Graduated in Jan. 2012. This collaboration also included Prof. Elfar Adalsteinsson (MIT) and Lawrence Wald (MGH).

- Camille Couprie, ESIEE, Paris (co-advisors: Hugues Talbot and Laurent Najman). Graduated in October, 2011. Supervised internship at Siemens Corporate Research in 2008. Camille's thesis won the EADS prize for best PhD thesis in an inter-discplinary space and second place in the Gilles Kahn prize.

- **PhD: As thesis examiner**

  - Pierre-Yves Baudin, Ecole Centrale de Paris (advisor: Nikos Paragios). "Graph-Based Segmentation of Skeletal Striated Muscles in NMR Images", May 2013.

  - Ahmed Besbes, Ecole Centrale de Paris (advisor: Nikos Paragios). "Image Segmentation using MRFs and Statistical Shape Modeling", Sept. 2010.

Publications

Bibliometrics —
I have published a number of scientific and technical works, ranging from journal and conference articles to books. These numbers describe the amount of that work and the number of times that body of work has been cited in the scientific and technical literature.
Approx. total citations: **7,300**
h-index: **35**
i10-index: **93** (Google Scholar)
Books: **2**
Journal papers: **21**
Book chapters: **4**
Top-tier conference papers: **31**
Other conferences and tech reports: **45**

Books:

1. Olivier Lezoray and Leo Grady, "Image Processing and Analysis with Graphs: Theory and Practice", CRC Press. Release date: July 3rd, 2012.
   `http://www.amazon.com/Image-Processing-Analysis-Graphs-Practice/dp/1439855072/`

2. Leo Grady and Jonathan R. Polimeni, "Discrete Calculus: Applied Analysis on Graphs for Computational Science", 2010, Springer.
   `http://www.amazon.com/Discrete-Calculus-Applied-Analysis-Computational/dp/1849962898`

Journal:

1. Rine Nakanishi, Sethuraman Sankaran, Leo Grady, Jenifer Malpeso, Razik Yousfi, Kazuhiro Osawa, Indre Ceponiene, Negin Nazarat, Sina Rahmani, Kendall Kissel, Eranthi Jayawardena, Christopher Dailing, Christopher Zarins, Bon-Kwon Koo, James K. Min, Charles A. Taylor, Matthew J. Budoff, "Automated estimation of image quality for coronary computed tomographic angiography using machine learning", Accepted to European Radiology, 2018.

2. Joo Myung Lee, Gilwoo Choi, Bon-Kwon Koo, Doyeon Hwang, Jonghanne Park, Jinlong Zhang, Kyung-Jin Kim, Yaliang Tong, Hyun Jin Kim, Leo Grady, Joon-Hyung Doh, Chang-Wook Nam, Eun-Seok Shin, Young-Seok Cho, Su-Yeon Choi, Eun Ju Chun, Jin-Ho Choi, Bjarne L. Norgaard, Evald Christiansen, Koen Niemen, Hiromasa Otake, Martin Penicka, Bernard de Bruyne, Takashi Kubo, Takashi Akasaka, Jagat Narula, Pamela S. Douglas, Charles A. Taylor and Hyo-Soo Kim, "Identification of High Risk Plaques for Acute Coronary Syndrome Using Coronary CT Angiography and Computational Fluid Dynamics", Accepted to JACC Imaging, 2018.

3. Noha El-Zehiry and Leo Grady, "Contrast Driven Elastica for Image Segmentation", IEEE Trans. on Image Processing, Vol. 25, No. 6, pp. 2508-2518, 2016.

4. Sethuraman Sankaran, Leo Grady, Charles A. Taylor, "Impact of geometric uncertainty on hemodynamic simulations using machine learning", Computer Methods in Applied Mechanics and Engineering, 2015.

5. Sethuraman Sankaran, Leo Grady, Charles A. Taylor, "Fast computation of hemodynamic sensitivity to lumen segmentation uncertainty", IEEE Trans. on Medical Imaging, Vol. 34, No. 12, pp. 2562-2571, 2015.

6. Herve Lombaert, Leo Grady, Xavier Pennec, Nicholas Ayache, Farida Cheriet, "Spectral Log-Demons - Diffeomorphic Image Registration with Very Large Deformations", International Journal of Computer Vision, Vol. 107, pp. 254–271, 2014.

7. Camille Couprie, Leo Grady, Laurent Najman, Jean-Christophe Pesquet, and Hughes Talbot, "Dual Constrained TV-based regularization on graphs", SIAM Journal on Imaging Sciences, Vol 6, No. 3, pp. 1246-1273, 2013.

8. Daniel S. Weller, Jonathan Polimeni, Leo Grady, Larry Wald, Elfar Adalsteinsson and Vivek K Goyal, "Sparsity-Promoting Calibration for GRAPPA Accelerated Parallel MRI Reconstruction", IEEE Trans. on Medical Imaging, Vol. 32, No. 7, pp. 1325-1335, July 2013.

9. Herve Lombaert, Leo Grady, Jonathan R. Polimeni and Farida Cheriet, "FOCUSR: Feature Oriented Correspondence using Spectral Regularization — A Method for Precise Surface Matching", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol 35, No. 9, pp. 2143-2160, Sept. 2013.

10. Noha El-Zehiry and Leo Grady, "Combinatorial Optimization of the Multiphase Mumford-Shah Functional", International Journal of Computer Vision, Vol 104, No. 3, pp. 270-285, Sept. 2013.

11. Jason W. Bohland, Sara Saperstein, Francisco Pereira and Leo Grady, "Network, anatomical, and non-imaging measures for the prediction of ADHD diagnosis in individual subjects", Frontiers in Systems Neuroscience, Vol. 6, Dec. 2012.

12. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Denoising Sparse Images from GRAPPA using the Nullspace Method (DESIGN)", Magnetic Resonance in Medicine, Vol. 68, No. 6, pp. 1176-1189, 2011.

13. Parmeshwar Khurd, Leo Grady, Rafiou Oketokoun, Hari Sundar, Tejas Gajera, Summer Gibbs-Strauss, John V. Frangioni and Ali Kamen, "Global Error Minimization in Image Mosaicing Using Graph Connectivity and its Applications in Microscopy", Journal of Pathology Informatics, Vol. 2, No. 8, 2011.

14. Camille Couprie, Leo Grady, Laurent Najman and Hugues Talbot, "Combinatorial Continuous Max Flow", SIAM J. on Imaging Sciences, Vol. 4, No. 3, pp. 905–930, 2011.

15. Kambiz Frounchi, Lionel C. Briand, Leo Grady, Yvan Labiche, Rajesh Subramanyan, "Automating Image Segmentation Verification and Validation by Learning Test Oracles", Information and Software Technology, Vol. 53, No. 12, pp. 1337–1348, Dec. 2011.

16. Camille Couprie, Leo Grady, Laurent Najman and Hugues Talbot, "Power Watersheds: A Unifying Graph Based Optimization Framework", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 33, No. 7, pp. 1384–1399, July 2011

17. Leo Grady, "Minimal Surfaces Extend Shortest Path Segmentation Methods to 3D", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 32, No. 2, pp. 321–334, Feb. 2010.

18. Leo Grady and Christopher Alvino, "The Piecewise Smooth Mumford-Shah Functional on an Arbitrary Graph", IEEE Trans. on Image Processing, Vol. 18, No. 11, pp. 2547–2561, Nov. 2009.

19. Leo Grady, "Random Walks for Image Segmentation", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 28, No. 11, pp. 1768–1783, Nov., 2006.

20. Leo Grady and Eric L. Schwartz, "Isoperimetric Partitioning: A new algorithm for graph partitioning", SIAM Journal on Scientific Computing, vol. 27, no. 6, pp. 1844–1866, June 2006.

21. Leo Grady and Eric L. Schwartz, "Isoperimetric Graph Partitioning for Image Segmentation", IEEE Trans. on Pattern Analysis and Machine Intelligence, vol. 28, no. 3, pp. 469–475, March 2006.

Invited Book Chapters:

1. Leo Grady, "Targeted Image Segmentation Using Graph Methods", in "Image Processing and Analysis with Graphs", ed. Olivier Lezoray and Leo Grady, CRC Press 2012.

2. Olivier Lezoray and Leo Grady, "Graph Theory Concepts and Definitions used in Image Processing", in "Image Processing and Analysis with Graphs", ed. Olivier Lezoray and Leo Grady, CRC Press 2012.

3. Dheeraj Singaraju, Leo Grady, Ali Kemal Sinop, René Vidal, "Continuous Valued MRFs for Image Segmentation", In "Markov Random Fields for Vision and Image Processing", pp. 127–142, ed. Andrew Blake, Pushmeet Kohli, Carsten Rother, MIT Press 2011.

4. Leo Grady, Yiyong Sun and James Williams, "Three Interactive Graph-Based Segmentation Methods Applied to Cardiovascular Imaging", In "Mathematical Models in Computer Vision: The Handbook", pp. 453–469, ed. Nikos Paragios, Yunmei Chen, Oliver Faugeras, Springer 2006.

Double Blind Refereed Conferences with Less than 30% Acceptance Rate (Full Papers):

1. Sethuraman Sankaran, Michiel Schaap, Stanley C. Hunley, James K. Min, Charles A. Taylor, Leo Grady, "HALE: Healthy Area of Lumen Estimation for Vessel Stenosis Quantification", Proc. of MICCAI 2016.

2. Sethuraman Sankaran, Leo Grady and Charles Taylor, "Real-Time Sensitivity Analysis of Blood Flow Simulations to Lumen Segmentation Uncertainty", Proc. of MICCAI 2014.

3. Petter Strandmark, Johannes Ulén, Fredrik Kahl, Leo Grady "Shortest Paths with Curvature and Torsion", Proc. of ICCV 2013.

4. Noha El-Zehiry, Michelle Yan, Sara Good, Tong Fang, S. Kevin Zhou, Leo Grady, "Learning the manifold of quality ultrasound acquisition", Proc. of MICCAI 2013.

5. Herve Lombaert, Leo Grady, Xavier Pennec, Nicholas Ayache and Farida Cheriet, "Spectral Demons - Image Registration via Global Spectral Correspondence", Proc. of ECCV, pp. 30-44, 2012.

6. Leo Grady, Vivek Singh, Timo Kohlberger, Christopher Alvino and Claus Bahlmann, "Automatic Segmentation of Unknown Objects, with Application to Baggage Security", Proc. of ECCV, pp. 430-444, 2012.

7. Timo Kohlberger, Vivek Singh, Chris Alvino, Claus Bahlmann and Leo Grady, "Evaluating Segmentation Error Without Ground Truth", Proc. of MICCAI, Vol. 7510, pp. 528-536, 2012.

8. Maxwell D. Collins, Jia Xu, Leo Grady and Vikas Singh, "Random Walks for Multi Image Cosegmentation: Quasiconvexity Results and GPU-based Solutions", Proc. of CVPR 2012.

9. Leo Grady, Marie-Pierre Jolly and Aaron Seitz, "Segmentation from a Box", Proc. of ICCV, pp. 367–374, 2011.

10. Leo Grady, Saurabh Datta, Oliver Kutter, Christophe Duong, Wolfgang Wein, Stephen H. Little, Stephen R. Igo, Shizhen Liu and Mani Vannan, "Regurgitation Quantification Using 3D PISA in Volume Echocardiography", Proc. of MICCAI, pp. 512–519, 2011.

11. Herve Lombaert, Leo Grady, Jonathan R. Polimeni and Farida Cheriet, "Fast Brain Matching with Spectral Correspondence", Proc. of IPMI, pp. 660–673, 2011.

12. Noha El-Zehiry and Leo Grady, "Fast Global Optimization of Curvature", Proc. of CVPR, pp. 3257–3264, 2010.

13. Camille Couprie, Leo Grady, Laurent Najman and Hugues Talbot, "Power Watersheds: A New Image Segmentation Framework Extending Graph Cuts, Random Walker and Optimal Spanning Forest", Proc. of ICCV, pp. 731–738, 2009.

14. Marie-Pierre Jolly, Hui Xue, Leo Grady and Jens Guehring "Combining Registration and Minimum Surfaces for the Segmentation of the Left Ventricle in Cardiac Cine MR Images", Proc. of MICCAI, pp. 910–918, 2009.

15. Dheeraj Singaraju, Leo Grady and René Vidal, "P-Brush: Continuous Valued MRFs with Normed Pairwise Distributions for Image Segmentation", Proc. of CVPR, 2009.

16. Leo Grady and Christopher Alvino, "Reformulating and Optimizing the Mumford-Shah Functional on a Graph — A Faster, Lower Energy Solution", Proc. of ECCV, pp. 248–261, 2008.

17. Leo Grady, "A Lattice-Preserving Multigrid Method for Solving the Inhomogeneous Poisson Equations used in Image Analysis", Proc. of ECCV, pp. 252–264, 2008.

18. Leo Grady and Marie-Pierre Jolly, "Weights and Topology: A Study of the Effects of Graph Construction on 3D Image Segmentation", Proc. of MICCAI, vol. 1, pp. 153–161, 2008.

19. Dheeraj Singaraju, Leo Grady and René Vidal, "Interactive Image Segmentation Via Minimization of Quadratic Energies on Directed Graphs", Proc. of CVPR 2008, 2008.

20. Leo Grady and Ali Kemal Sinop, "Fast Approximate Random Walker Segmentation Using Eigenvector Precomputation", Proc. of CVPR, 2008.

21. Ali Kemal Sinop and Leo Grady, "A Seeded Image Segmentation Framework Unifying Graph Cuts and Random Walker Which Yields A New Algorithm", Proc. of ICCV, 2007.

22. Ali Kemal Sinop and Leo Grady, "Uninitialized, Globally Optimal, Graph-Based Rectilinear Shape Segmentation — The Opposing Metrics Method", Proc. of ICCV 2007, 2007.

23. Leo Grady, Gareth Funka-Lea, "An Energy Minimization Approach to the Data Driven Editing of Presegmented Images/Volumes", Proc. of MICCAI, vol. 2, pp. 888–895, 2006.

24. Ali Kemal Sinop, Leo Grady, "Accurate Banded Graph Cut Segmentation of Thin Structures Using Laplacian Pyramids", Proc. of MICCAI, vol. 2, pp. 896–903, 2006.

25. Leo Grady, "Computing Exact Discrete Minimal Surfaces: Extending and Solving the Shortest Path Problem in 3D with Application to Segmentation", Proc. of CVPR, vol. 1, pp. 69–78, 2006.

26. Leo Grady, "Fast, Quality, Segmentation of Large Volumes — Isoperimetric Distance Trees", Proc. of ECCV, vol. 3, pp. 449–462, 2006.

27. Daniel Cremers, Leo Grady, "Statistical Priors for Efficient Combinatorial Optimization via Graph Cuts", Proc. of ECCV, vol. 3, pp. 263–274, 2006.

28. Leo Grady, Thomas Schiwietz, Shmuel Aharon, Rudiger Westermann, "Random Walks for Interactive Organ Segmentation in Two and Three Dimensions: Implementation and Validation", Proc. of MICCAI, vol. 2, pp. 773–780, 2005.

29. Herve Lombaert, Yiyong Sun, Leo Grady, Chenyang Xu "A Multilevel Banded Graph Cuts Method for Fast Image Segmentation", Proc. of ICCV, Vol. 1, pp. 259–265, 2005.

30. Leo Grady, "Multilabel Random Walker Image Segmentation Using Prior Models", Proc. of CVPR, Vol. 1, pp. 763–770, 2005.

31. Leo Grady and Eric L. Schwartz. "Faster graph-theoretic image processing via small-world and quadtree topologies." Proc. of CVPR, pp. 360–365, 2004.

Other conferences, abstracts and technical reports:

1. Grady L., Petersen K., Schaap M., Choi G., Sankaran S., Uzu K., Toba T., Otake H., Taylor CA., "Vessel lumen segmentation from coronary CTA using Deep Learning: Validation with OCT data", SCCT 2016.

2. Takayoshi Toba, Gilwoo Choi, Hyun Jin Kim, Arjun Roy, Tran Nguyen, Michiel Schaap, Leo Grady, Kenzo Uzu, Shumpei Mori, Toshiro Shinke, Bon-Kwon Koo, Charles Taylor, Hiromasa Otake, Ken-ichi Hirata, "Why does thin-cap fibroatheroma cluster in the proximal segment in left anterior coronary artery, but are evenly distributed throughout the entire right coronary artery? — Results from computational fluid dynamics simulation by CT-FFR", TCT 2016

3. Kenzo Uzu, Gilwoo Choi, Hyun Jin Kim, Arjun Roy, Tran Nguyen, Michiel Schaap, Leo Grady, Takayoshi Toba, Shumpei Mori, Tomofumi Takaya, Toshiro Shinke, Bon-Kwon Koo, Charles Taylor, Hiromasa Otake, "Evaluation of local hemodynamic forces acting on plaque may help predict plaque vulnerability - Lessons from combined analysis of optical coherence tomography and computational fluid dynamics simulation", ACC 2016

4. Takayoshi Toba, Gilwoo Choi, Hyun Jin Kim, Arjun Roy, Tran Nguyen, Michiel Schaap, Leo Grady, Kenzo Uzu, Shumpei Mori, Tomofumi Takaya, Toshiro Shinke, Bon-Kwon Koo, Charles Taylor, Hiromasa Otake, "Impact of Wall Shear Stress and Axial Plaque Stress on Coronary Plaque Initiation and Progression", ACC 2016

5. Takayoshi Toba, Gilwoo Choi, Kenzo Uzu, Hyun Jin Kim, Arjun Roy, Tran Nguyen, Michiel Schaap, Leo Grady, Charles Taylor, Hiromasa Otake, "Impact of precision of lumen boundary extracted from coronary CT on FFRCT: validation with OCT", ACC 2016.

6. Gilwoo Choi, Kenzo Uzu, Takayoshi Toba, Hyun Jin Kim, Arjun Roy, Tran Nguyen, Bon-Kwon Koo, Leo Grady, Charles Taylor, Hiromasa Otake, "Correlation of Wall Shear Stress and Axial Plaque Stress between models derived from CT and OCT data", ACC 2016.

7. S Sankaran, L Grady, C Taylor, "Fast geometric sensitivity analysis in hemodynamic simulations using a machine learning approach", APS Division of Fluid Dynamics Meeting, 2013.

8. Wei Li, Gianluca Paladini, Leo Grady, Timo Kohlberger, Vivek Singh and Claus Bahlmann, "Luggage Visualization and Virtual Unpacking", Workshop at SIGGRAPH Asia, 2012.

9. Noha El-Zehiry and Leo Grady, "Vessel Segmentation using 3D Elastica Regularization", Proc. ISBI 2012.

10. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Accelerated parallel magnetic resonance imaging reconstruction using joint estimation with a sparse signal model", IEEE Statistical Signal Processing Workshop, 2012.

11. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Greater Acceleration through Sparsity-Promoting GRAPPA Kernel Calibration", ISMRM 2012.

12. Andrei Chekkoury, Parmeshwar Khurd, Jie Ni, Claus Bahlmann, Ali Kamen, Amar Patel, Leo Grady, Maneesh Singh, Martin Groher, Nassir Navab, Elizabeth Krupinski, Jeffrey Johnson, Anna Graham and Ronald Weinstein, "Automated Malignancy Detection in Breast Histopathological Images", Proc of SPIE 2012 (won Best Student Paper Award).

13. Noha El-Zehiry and Leo Grady, "Discrete Optimization of the Multiphase Piecewise Constant Mumford-Shah Functional", Proc. of EMMCVPR, pp. 233–246, 2011

14. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Regularizing GRAPPA using Simultaneous Sparsity to Recover Denoised Images", Proc. SPIE Wavelets and Sparsity XIV, Vol. 8138, pp. 8138M-1-9, Aug. 2011.

15. Parmeshwar Khurd, Leo Grady, Kalpit Gajera, Mamadou Diallo, Peter Gall, Martin Requardt, Berthold Kiefer, Clifford Weiss and Ali Kamen, "Facilitating 3D Spectroscopic Imaging Through Automatic Prostate Localization in MR Images Using Random Walker Segmentation Initialized Via Boosted Classifiers", Proc. of Prostate Cancer Imaging, pp. 47–56, 2011.

16. Parmeshwar Khurd, Leo Grady, Ali Kamen, Summer Gibbs-Strauss, Elizabeth M. Genega and John V. Frangioni, "Network Cycle Features: Application to Computer-Aided Gleason Grading of Prostate Cancer Histopathological Images", Proc. of ISBI, pp. 1632–1636, 2011.

17. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Evaluating Sparsity Penalty Functions for Combined Compressed Sensing and Parallel MRI", Proc. of ISBI 2011 (Finalist for best student paper).

18. Camille Couprie, Hugues Talbot, Jean-Christophe Pesquet, Laurent Najman and Leo Grady, "Dual Constrained TV-Based Regularization", Proc. of ICASSP 2011.

19. Daniel S. Weller, Jonathan R. Polimeni, Leo Grady, Lawrence L. Wald, Elfar Adalsteinsson and Vivek K. Goyal, "Combined Compressed Sensing and Parallel MRI Compared for Uniform and Random Cartesian Undersampling of K-Space", Proc. of ICASSP, pp. 553–556, 2011.

20. Weller, D. S., Polimeni, J. R., Grady, L., Wald, L. L., Adalsteinsson, E., and Goyal, V. K. "SpRING: Sparse Reconstruction of Images using the Nullspace method and GRAPPA", Proc. of ISMRM 2011.

21. Camille Couprie, Xavier Bresson, Laurent Najman, Hugues Talbot and Leo Grady, "Surface Reconstruction using Power Watershed", Proc. of ISMM 2011.

22. Sowmya Ramakrishnan, Christopher Alvino, Leo Grady and Atilla Kiraly, "Automatic Three-Dimensional Rib Centerline Extraction from CT Scans for Enhanced Visualization and Anatomical Context", Proc. of SPIE 2011.

23. Zihua Su, Xiang Deng, Christophe Chefd'hotel, Leo Grady, Jun Fei, Dong Zheng, Ning Chen and Xiaodong Xu, "Quantitative Evaluation of Six Graph Based Semi-Automatic Liver Tumor Segmentation Techniques Using Multiple Sets of Reference Segmentation", Proc. of SPIE 2011.

24. Camille Couprie, Leo Grady, Laurent Najman and Hugues Talbot, "Anisotropic Diffusion using Power Watersheds", Proc. of ICIP 2010.

25. Noha El-Zehiry and Leo Grady, "Optimization of Weighted Curvature for Image Segmentation", Preprint posted to arXiv. 2010

26. D. S. Weller, J. R. Polimeni, L. J. Grady, L. L. Wald, E. Adalsteinsson and V. K. Goyal, "Combining nonconvex compressed sensing and GRAPPA using the nullspace method", Proc. of ISMRM 2010.

27. Camille Couprie, Leo Grady, Laurent Najman and Hugues Talbot, "A New Image Segmentation Framework: Power Watersheds", Proc. of the International Symposium on Mathematical Morphology 2009, pp. 53-55.

28. Leo Grady, Jonathan R. Polimeni, "Nullspace Compressed Sensing for Accelerated Imaging", Proc. of ISMRM 2009.

29. Marie-Pierre Jolly and Leo Grady, "3D General Lesion Segmentation in CT", Proc. of ISBI, pp. 796–799, 2008.

30. AM Sommer, A Milkowski, G Funka-Lea, GA Sisney, GK Hesley, ES Burnside, L Grady, MP Jolly, TJ Hall, "A comparison of automated and manually drawn lesion boundaries for *in vivo* breast ultrasound and strain images", 7th International Conf. on the Ultrasonic Measurement and Imaging of Tissue Elasticity, Austin, Texas, Oct. 2008.

31. Frank Coumans, Leo Grady, Chandra Rao, Jimmy Page, Mark Connelly, Leon Terstappen, "Imaging cytometer for counting of virally infected cells in nasopharingeal swabs", Proc. of ISAC 2008.

32. Engin Dikici, Thomas O'Donnell, Leo Grady, Randolph Setser, and Richard D. White, "Coronary Artery Centerline Tracking using Axial Symmetries", The Insight Journal, 2008.

33. Hüseyin Tek, M. Akif Gülsün, Soizic Laguitton, Leo Grady, David Lesage and Gareth Funka-Lea, "Automatic Coronary Tree Modeling", The MIDAS Journal - Grand Challenge Coronary Artery Tracking.

34. Camille Couprie, Leo Grady, Hugues Talbot and Laurent Najman, "DCMF: Discretized Continuous Max Flows", Institut Gaspard Monge, 2008.

35. Osman Bodur, Leo Grady, Arthur Stillman, Randolph Setser, Gareth Funka-Lea, Thomas O'Donnell, "Semi-Automatic Aortic Aneurysm Analysis", in A. Manduca and X.P. Hu (Eds), Proc. SPIE Medical Imaging 2007: Physiology, function, and structure from medical images, 6511

36. R.T. Seethamraju, M.G. Harisinghani, A.S. Katkar, G. Unal, L. Grady, M. Braschi, "Semi-Automated Segmentation of Lymph Nodes Following the Administration of Lymphotropic Nanoparticles — Comparison of Different Methodologies", Abstract at the Radiological Society of North America, 2006

37. R. Seethamraju, A. Katkar, G. Unal, L. Grady, T. Moeller, M. Braschi, C. Schultz, M. Requardt, R. Weissleder, M. Harisinghani, "Precise Volumetric Estimation of Lymphotropic Nano-Particle Enhanced Lymph Nodes using Semi-Automated Segmentation", Abstract at the Society for Molecular Imaging, 2006.

38. R.T. Seethamraju, L. Grady, T. Moeller, M. Requardt, R. Weissleder and M. Harisinghani, "Effect of Nano-Particle Concentration on Accuracy of Semi-Automated MR Volume Estimation of Lymph Nodes", Proc. of ISMRM, 2006.

39. Fred S. Azar, Nassim Hajjioui, Ali Khamene, Leo Grady, Kijoon Lee, Regine Choe, Alper Corlu, Soren D. Konecky, Arjun G. Yodh, Frank Sauer, "A software platform for visualization and multimodal registration of diffuse optical tomography and MRI of breast cancer", Proc. SPIE Volume 6081, 2006

40. Leo Grady, Tolga Tasdizen "A Geometric Multigrid Approach to Solving the 2D Inhomogeneous Laplace Equation with Internal Dirichlet Boundary Conditions", Proc. of ICIP 2005, vol. 2, 2005, pp. 642–645.

41. Leo Grady, Thomas Schiwietz, Shmuel Aharon , Rudiger Westermann, "Random Walks for Interactive Alpha-Matting", Proc. of VIIP 2005, pp. 423–429.

42. Leo Grady and Gareth Funka-Lea, "Multi-Label Image Segmentation for Medical Applications Based on Graph-Theoretic Electrical Potentials", in Proc. of the 8th ECCV Workshop on Computer Vision Approaches to Medical Image Analysis and Mathematical Methods in Biomedical Image Analysis, p. 230–245, 2004.

43. Leo Grady, "The Graph Analysis Toolbox: A User's Manual", Technical Report, Boston University, CNS-TR-03-021, 2003.

44. Leo Grady and Eric Schwartz, "Isoperimetric graph partitioning for data clustering and image segmentation", Technical Report, Boston University, CNS-TR-03-015, 2003.

45. Leo Grady and Eric Schwartz, "Anisotropic interpolation on graphs: The combinatorial Dirichlet problem", Technical Report, Boston University, CNS-TR-03-014, 2003.

Intellectual property

I have been an inventor on numerous patents and worked closely with attorneys to develop claims and prosecute the patents. Additionally, I drove a systematic development of the IP portfolio at HeartFlow. These numbers describe the US patents for which I am an inventor or co-inventor.
Granted US patents: **112**
Additional pending US patents: **173**

1. Fonte, T. ; Choi, G. ; Grady, L. ; Singer, M., "Systems and methods for estimating ischemia and blood flow characteristics from vessel geometry and physiology", #10,010,255

2. Grady, L. ; Taylor, C., "Systems and methods for assessment of tissue function based on vascular disease", #10,007,762

3. Sankaran, S. ; Zarins, C. ; Grady, L. ; "Systems and methods for risk assessment and treatment planning of arterio-venous malformation", #9,993,303

4. Grady, L. ; Schaap, M. ; Khem, S. ; Wilkes, S. ; Bai, Y., "Systems and methods for correction of artificial deformation in anatomic modeling", #9,974,616

5. Fonte, T. ; Choi, G. ; Grady, L. ; Singer, M., "Systems and methods for estimating ischemia and blood flow characteristics from vessel geometry and physiology", #9,974,453

6. Grady, L. ; Schaap, M., "Systems and methods for image-based object modeling using multiple image acquisitions or reconstructions", #9,965,891

7. Grady, L. ; Schaap, M., "Systems and methods for data and model-driven image reconstruction and enhancement", #9,965,873

8. El-Zehiry, N. ; Yan, M. ; Good, S. ; Grady, L., "Tuning ultrasound acquisition parameters", #9,918,700

9. Grady, L. ; Schaap, M., "Systems and methods for controlling user repeatability and reproducibility of automated image annotation correction", #9,870,634

10. Grady, L. ; Choi, G., ; Taylor, C. ; Zarins, C., "Systems and methods for embolism prediction using embolus source and destination probabilities", #9,864,840

11. Sankaran, S. ; Zarins, C. ; Grady, L., "Systems and methods for risk assessment and treatment planning of arterio-venous malformation", #9,839,483

12. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S., "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #9,836,840

13. Bhatia, V. ; Grady, L. ; Sengupta, S. ; Fonte, T., "Systems and methods for identifying medical image acquisition parameters", #9,805,470

14. Choi, G. ; Grady, L. ; Taylor, C., "Systems and methods for predicting location, onset, and/or change of coronary lesions", #9,805,463

15. Sankaran, S. ; Grady, L. ; Taylor, C., "Method and system for sensitivity analysis in modeling blood flow characteristics", #9,805,168

16. Fonte, T. ; Grady, L., "Systems and methods for determining blood flow characteristics using flow ratio", #9,785,746

17. Sankaran, S. ; Grady, L. ; Taylor, C., "Systems and methods for using geometry sensitivity information for guiding workflow", #9,773,219

18. Choi, G. ; Grady, L. ; Schaap, M. ; Taylor, C., "Systems and methods for predicting coronary plaque vulnerability from patient-specific anatomic image data", #9,770,303

19. Baloch, S. ; Siampli, E. ; Grady, L., "Parameter estimation for mesh segmentation using random walks", #9,704,262

20. Choi, G. ; Grady, L. ; Taylor, C. ; "Systems and methods for predicting location, onset, and/or change of coronary lesions", #9,679,374

21. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S., "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #9,672,615

22. Sankaran, S. ; Taylor, C. ; Choi, G. ; Schaap, M. ; Zarins, C. ; Grady, L., "Systems and methods for treatment planning based on plaque progression and regression curves", #9,649,171

23. Grady, L. ; Schaap, M. ; Khem, S. ; Wilkes, S. ; Bai, Y., "Systems and methods for correction of artificial deformation in anatomic modeling", #9,607,386

24. Grady, L. ; Taylor, C. ; Zarins, C.K., "Systems and methods for vessel reactivity to guide diagnosis or treatment of cardiovascular disease", #9,607,130

25. Sankaran, S. ; Grady, L. ; Taylor, C. ; Zarins, C.K., "Systems and methods for simulation of occluded arteries and optimization of occlusion-based treatments", #9,594,876

26. Weller, D. ; Grady, L. ; Wald L. ; Goyal, V., "System for accelerated magnetic resonance imaging using parallel coils", #9,594,141

27. Grady, L. ; Schaap, M., 'Systems and methods for controlling user repeatability and reproducibility of automated image annotation correction", #9,589,349

28. Weller, D. ; Grady, L. ; Wald L. ; Goyal, V., "System for reconstructing MRI images acquired in parallel", #9,588,207

29. Grady, L. ; Schaap, M., "Systems and methods for image-based object modeling using multiple image acquisitions or reconstructions", #9,514,530

30. Grady, L. ; Saperstein, S. ; Bohland, J., "Method and system for diagnosis of attention deficit hyperactivity disorder from magnetic resonance images", #9,510,756

31. Sankaran, S. ; Grady, L. ; Taylor, C., "Methods and systems for predicting sensitivity of blood flow calculations to changes in anatomical geometry", #9,501,622

32. Kamen, A. ; Grady, L. ; Paladini, G. ; Khurd, P. ; Kutter, O. ; Comaniciu, C. "Method and system for integrated radiological and pathological information for diagnosis, therapy selection and monitoring.", #9,478,022

33. Spilker, R. ; Eberle, D. ; Grady, L., "Method and system for determining treatments by modifying patient-specific geometrical models", #9,449,146

34. Sankaran, S. ; Grady, L. ; Taylor, C., "Systems and methods for virtual contrast agent simulation and computational fluid dynamics (CFD) to compute functional significance of stenoses", #9,449,145

35. Sankaran, S. ; Grady, L. ; Taylor, C., "Method and system for sensitivity analysis in modeling blood flow characteristics", #9,424,395

36. Grady, L. ; Ramaraj, R. ; Schlachter, S. ; Nguyen, X., "Cell feature-based automatic circulating tumor cell detection", #9,396,532

37. Taylor, C. ; Kim, HJ ; Sankaran, S. ; Schaap, M. ; Eberle, D. ; Choi, G. ; Grady, L., "Systems and methods for modeling changes in patient-specific blood vessel geometry and boundary conditions", #9,390,232

38. Grady, L. ; Taylor, C. "Systems and methods for determination of blood flow characteristics and pathologies through modeling of myocardial blood supply", #9,386,933

39. Grady, L. ; Schaap, M., "Systems and methods for image-based object modeling using multiple image acquisitions or reconstructions", #9,378,580

40. Sankaran, S. ; Grady, L. ; Taylor, C. ; Zarins, C., "Systems and methods for simulation of hemodialysis access and optimization", #9,336,354

41. Bhatia, V. ; Grady, L. ; Sengupta, S. ; Fonte, T., "Systems and methods for identifying medical image acquisition parameters", #9,330,233

42. Grady, L. ; Moreau-Gobard, R. ; Schaap, M., "Systems and methods for validating and correcting automated medical image annotations", #9,304,982

43. Grady, L. ; Taylor; C. ; Zarins, C., "Systems and methods for vessel reactivity to guide diagnosis or treatment of cardiovascular disease", #9,292,659

44. Sankaran, S. ; Taylor, C. ; Choi, G. ; Schaap, M. ; Zarins, C. ; Grady, L., "Systems and methods for treatment planning based on plaque progression and regression curves", #9,280,639

45. Sankaran, S. ; Taylor, C. ; Choi, G. ; Schaap, M. ; Zarins, C. ; Grady, L., "Systems and methods for treatment planning based on plaque progression and regression curves", #9,239,905

46. Choi, G. ; Grady, L. ; Schaap, M. ; Taylor, C., "Systems and methods for predicting coronary plaque vulnerability from patient-specific anatomic image data", #9,220,419

47. Choi, G. ; Grady, L. ; Schaap, M. ; Taylor, C., "Systems and methods for predicting coronary plaque vulnerability from patient-specific anatomic image data", #9,220,418

48. Taylor, C. ; Kim, HJ ; Sankaran, S. ; Schaap, M. ; Eberle, D. ; Choi, G. ; Grady, L., "Systems and methods for modeling changes in patient-specific blood vessel geometry and boundary conditions", #9,202,010

49. Sankaran, S. ; Taylor, C. ; Choi, G. ; Schaap, M. ; Zarins, C. ; Grady, L. "Systems and methods for treatment planning based on plaque progression and regression curves", #9,195,801

50. Grady, L. ; Taylor, C. ; Choi, G. ; Rogers, C. "Systems and methods for identifying personalized vascular implants from patient-specific anatomic data", #9,195,800

51. Spilker, R. ; Eberle, D. ; Grady, L., "Method and system for determining treatments by modifying patient-specific geometrical models", #9,189,600

52. Choi, G. ; Grady, L. ; Schaap, M. ; Taylor, C., "Systems and methods for predicting coronary plaque vulnerability from patient-specific anatomic image data", #9,155,512

53. Grady, L. ; Schaap, M. "Systems and methods for data and model-driven image reconstruction and enhancement", #9,153,047

54. Bhatia, V. ; Grady, L. ; Sengupta, S. ; Fonte, T., "Systems and methods for identifying medical image acquisition parameters", #9,152,761

55. El-Zehiry, N. ; Grady, L. ; Sofka, M. ; Tietjen, C. ; Zhou, S. "Semi-automated preoperative resection planning", #9,129,391

56. Grady, L. ; Schaap, M. ; Khem, S. ; Wilkes, S. ; Bai, Y. "Systems and methods for correction of artificial deformation in anatomic modeling", #9,081,721

57. Grady, L. ; Schaap, M. "Systems and methods for data and model-driven image reconstruction and enhancement", #9,070,214

58. Grady, L. ; Schaap, M. "Systems and methods for image-based object modeling using multiple image acquisitions or reconstructions", #9,058,692

59. Grady, L. ; Taylor, C. ; Choi, G. ; Rogers, C. "Systems and methods for identifying personalized vascular implants from patient-specific anatomic data", #9,043,191

60. Grady, L. ; Taylor, C. ; Choi, G. ; Rogers, C. "Systems and methods for identifying personalized vascular implants from patient-specific anatomic data", #9,043,190

61. Spilker, R. ; Eberle, D. ; Grady, L. "Method and system for determining treatments by modifying patient-specific geometrical models", #9,042,613

62. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S. "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #9,008,405

63. Khurd, P. ; Oketokoun, R. ; Kamen, A. ; Grady, L. ; Sundar, H. ; Frangioni, J. ; Gajera, T. "Global error minimization in image mosaicking using graph laplacians and its applications in microscopy", #8,983,230

64. Grady, L. ; Lombaert, H. ; Polimeni, J. ; Cheriet, F. "Methods and systems for fast automatic brain matching via spectral correspondence", #8,965,077

65. Grady, L. ; Schaap, M. ; Khem, S. ; Wilkes, S. ; Bai, Y. "Systems and methods for correction of artificial deformation in anatomic modeling", #8,958,623

66. Grady, L. ; Schaap, M. "Systems and methods for data and model-driven image reconstruction and enhancement", #8,917,925

67. Sun, Y. ; Lombaert, H. ; Grady, L. ; Xu, C. "Multilevel image segmentation", #8,913,830

68. El-Zehiry, N. ; Grady, L., "System and method for image denoising optimizing object curvature", #8,885,961

69. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S. "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #8,861,820

70. Grady, L. ; Schaap, M. "Systems and methods for data and model-driven image reconstruction and enhancement", #8,837,860

71. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S. "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #8,831,315

72. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S. "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #8,831,314

73. Fonte, T. ; Grady, L. ; Wu, Z. ; Schaap, M. ; Hunley, S. ; Sengupta, S. "Methods and systems for assessing image quality in modeling of patient anatomic or blood flow characteristics", #8,824,752

74. Weller, D. ; Goyal, V. ; Polimeni, J. ; Grady, L. "System for accelerated MR image reconstruction", #8,823,374

75. Khurd, P. ; Grady, L. ; Kamen, A. ; Diallo, M. ; Gajera, K. ; Gall, P. ; Requardt, M. ; Kiefer, B. ; Weiss, C., "Systems and method for automatic prostate localization in MR images using random walker segmentation initialized via boosted classifiers", #8,811,701

76. Grady, L. ; Polimeni J. "Method for reconstructing images of an imaged subject from a parallel MRI acquisition", #8,692,549

77. Grady, L. ; El-Zehiry, N. "System and method for image segmentation by optimizing weighted curvature", #8,478,044

78. Kiraly, A. ; Grady, L. ; Alvino, C. "Fluid dynamics approach to image segmentation", #8,411,919

79. Grady, L. ; Ladic, L. "Identification, classification and counting of targets of interest in multispectral image data", #8,379,944

80. Sinop, A.K. ; Grady, L. "System and method for signal reconstruction from incomplete data", #8,335,955

81. Artan, Y. ; Grady, L. ; Alvino, C. "Method and system for interactive segmentation using texture and intensity cues", #8,331,669

82. Alvino, C. ; Grady, L. "Piecewise smooth Mumford-Shah on an arbitrary graph", #8,300,975

83. Grady, L. “Accelerated image volume segmentation using minimal surfaces given a boundary”, #8,270,690

84. Grady, L. ; Singaraju, D. ; Vidal, R. “System and method for image segmentation using continuous valued MRFs with normed pairwise distributions”, #8,224,093

85. Jolly, M.-P. ; Grady, L. “Editing of pre-segmented images using seeds derived from contours”, #8,131,076

86. Grady, L. ; Azar, F., “Cell analysis using isoperimetric graph partitioning”, #8,131,035

87. Khamene, A. ; Grady, L. ; Rietzel, E. ; Boettger, T., “Methods and systems for fully automatic segmentation of medical images”, #8,073,220

88. Grady, L. ; Sinop, A. K., “Robust reconstruction method for parallel magnetic resonance images”, #8,055,037

89. Jolly, M.-P. ; Grady, L., “3D General Lesion Segmentation in CT”, #8,023,734

90. Singaraju, D. ; Grady, L. “Interactive Image Segmentation On Directed Graphs”, #8,009,911

91. Sinop, A.K. ; Grady, L. “Interactive Image Segmentation by Precomputation”, #8,000,527

92. Grady, L. ; Schiwietz, T. ; Aharon, S. “Manifold Learning for Discriminating Pixels in Multi-Channel Images, with Application to Image/Video Segmentation and Clustering”, #7,907,777

93. Sinop, A.K. ; Grady, L. “Globally Optimal, Uninitialized, Graph Based, Rectilinear Shape Segmentation”, #7,889,924

94. Grady, L. “System and method for multi-label image segmentation of digital photographs”, #7,835,577

95. Sinop, A.K. ; Grady, L. “Banded graph cut segmentation algorithms with Laplacian pyramids”, #7,822,274

96. Sinop, A.K. ; Grady, L., “A New Seeded Segmentation Algorithm Using L_{inf} Minimization”, #7,773,807

97. Grady, L. ; Funka-Lea, G. “Editing of presegemented images/volumes with the multilabel random walker or graph cut segmentations”, #7,729,537

98. Grady, L. ; Xu, C. “Fast Graph Cuts: A Weak Shape Assumption Provides a Fast, Exact Method for Graph Cuts Segmentation”, #7,724,256

99. Sun, Y. ; Grady, L. ; Funka-Lea, G. ; O’Donnell, T. “Automatic Determination of the Standard Cardiac Views from Volumetric Data Acquisitions”, #7,715,627

100. Grady, L. “Method for tracking blood vessels”, #7,711,168

101. Aharon, S. ; Grady L., “GPU accelerated multi-label image segmentation (MLS)”, #7,697,756

102. Cremers, D. ; Grady, L., “Statistical priors for combinatorial optimization: Efficient solutions via graph cuts”, #7,672,516

103. Grady, L., “System and Method for Lattice-Preserving Multigrid Method for Image Segmentation and Filtering”, #7,672,511

104. Grady, L., "System and method for 3D volume segmentation using exact minimal surfaces given a boundary", #7,653,243

105. Aharon, S. ; Grady, L. ; Schiwietz, T., "GPU accelerated multilabel digital photo and video editing", #7,630,549

106. Grady, L., "Image segmentation using isoperimetric trees", #7,630,548

107. Grady, L., "System and method for image segmentation by a weighted multigrid solver", #7,565,010

108. Grady, L. ; Tasdizen, T. ; Whittaker, R., "System and method for image segmentation by solving an inhomogeneous Dirichlet problem", #7,542,604

109. Aharon, S. ; Grady, L. ; Schiwietz, T., "GPU Accelerated Isoperimetric Algorithm for Image Segmentation, Digital Photo and Video Editing", #7,519,220

110. Grady, L., "System and method for filtering noise from a medical image", #7,502,499

111. Grady, L., "System and method for multilabel random walker segmentation using prior models", #7,486,820

112. Grady, L. "System and method for multi-label image segmentation", #7,460,709. This patent won the **Edison Patent Award** (2012) for best patent in medical imaging due to its commercial impact and application to medical imaging.