

BIOGRAPHICAL SKETCH

NAME Michael David Abràmoff eRA COMMONS USER NAME mabramoff	POSITION TITLE Associate Professor
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EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Amsterdam, Netherlands	M.S.	1982-1988	Medicine
University of Amsterdam	M.S.	1987-1989	Biomedical Informatics
University of Amsterdam	M.D.	1993-1994	Medicine (Internship)
University Hospital of Utrecht	Residency	1995-1999	Ophthalmology
Vrije Universiteit University Hospital, Amsterdam, Netherlands	Retinal Fellowship	1999-2000	
University of Utrecht	Ph.D.	1997 - 2001	Biomedical Imaging
Vrije Universiteit, Amsterdam, Netherlands	Postgraduate Degree	2002 - 2003	Clinical Epidemiology

A. Positions and Honors.**Positions and Employment**

- 2009 - Associate Director, Department of Veterans' Affairs Center of Excellence for Prevention and Treatment of Visual Loss
- 2008-present Associate Professor (tenure), Ophthalmology & Visual Sciences, Carver College of Medicine and Electrical and Computer Engineering, College of Engineering, University of Iowa
- 2005-present Retinal Specialist, Eye Service, Veterans' Affairs Medical Center Iowa City, Iowa
- 2004-2007 Assistant Professor, Ophthalmology & Visual Sciences, Carver College of Medicine and Electrical and Computer Engineering, College of Engineering University of Iowa
- 2003-2004 Research Fellow, Ophthalmology and Visual Sciences, University of Iowa, IA
- 2002-2002 Visiting Researcher, Smith Kettlewell Research Institute, San Francisco, CA
- 2001-present Director and Founder, EyeCheck project, Amsterdam, Netherlands
- 2001-2006 Associated Faculty, Image Sciences Institute, University of Utrecht, Netherlands
- 2001-2004 Universitair Medisch Specialist (staff), Department of Ophthalmology, Vrije Universiteit University Hospital, Amsterdam, Netherlands
- 1991-1993 Director of Research and Development, Prodix S.A., Paris, France
- 1990-1991 Postdoctoral Research Fellow, RIKEN neural networks research lab., Wako-shi, Saitama Pref., Japan

Other Experience and Professional Memberships

- Reviewer for all leading journals in Ophthalmology, Diabetes, and Medical Image Analysis
- 2008 - Editorial Board, IEEE Transactions on Medical Imaging
- 2008 Review Committee, UI Department of Molecular Physiology and Biophysics
- 2007 - Member, Macula Society
- 2007- Founding Member, Iowa Institute for Biomedical Imaging (IIBI)
- 2006 - Chair, ARVO special interest group on computer aided diagnosis of the retina
- 2006 Chair, IEEE EMBC conference on retinal imaging
- 2006-2008 Member, Biomedical Engineering Committee, IASTED (International Association of Science and Technology for Development)
- 2006-2008 Chair, ISIE computer aided diagnosis symposium
- 2006 - Reviewer, American Diabetes Association
- 2006 - Reviewer, NIH, NEI, ETTN, NIDDK study sections
- 2005 - University of Iowa Hospital Information Management Committee
- 2005 - University of Iowa Institutional Review Board
- 2004 - Member, Committee on Medical Information Technology of the American Academy of Ophthalmology
- 2001 - Digital Imaging and Communications in Medicine (DICOM), working group 9 (ophthalmology)
- 1999- Member, European Association for the Study of Diabetic Eye Complications (EASDEC)
- 1997 - Member, American Academy of Ophthalmology (AAO)
- 1997- Member, Institute for Electrical and Electronic Engineers (IEEE)
- 1996 - Association for Research in Vision and Ophthalmology (ARVO)

Honors

- 2009 Visiting Professor, Moran Eye Center, University of Utah, Salt Lake City, UT; Fraunhofer Institute, Erlangen, Germany, Ophthalmology, UPMC, Pittsburgh, PA

- 2008 Annual Medical Education Award, University of Iowa
2004 P.J. Leinfelder Award, "Functional imaging of the retina," Best seminar delivery by fellow. Sponsored by Department of Ophthalmology and Visual Sciences, University of Iowa
2003 Binkhorst Award, "Objective Measurement of Motion in the Orbit," Highest research merit from the Netherlands Ophthalmologic Society. Sponsored by Netherlands Ophthalmologic Society.
2002 3M-Jonkers Award and Medal of Honor, "Rectus extraocular muscle paths and decompression surgery for Graves orbitopathy: mechanism of motility disturbances," Best scientific publication over preceding 3 years. Sponsored by 3M-Jonkers Foundation.
1997 Recipient of F.P. Fischer Foundation Award
1990 Peter Reichertz Memorial Prize, "Simulation of Stuttering with Neural Networks," best young researcher. Sponsored by European Federation for Medical Informatics (EFMI).
1989 Science and Technology Agency (STA) Postdoctoral Fellowship Award, Sponsored by Ministry of Education, Tokyo, Japan

Patents

- 2009 Automatic detection of red lesions from digital color fundus photographs. US Patent No 7474775.

B. Selected peer-reviewed publications (out of 84)

1. Abràmoff, MD, Lee, K., Niemeijer, M, Alward, LM, Greenlee, EC, Garvin, MK, Sonka, M, Kwon, YH. Automated Segmentation of the Cup and Rim from Spectral Domain OCT of the Optic Nerve Head. *Invest Ophthalmol Vis Sci* 50(12):5778-84, 2009.
2. Niemeijer, M., (21 authors)..., Abràmoff, MD. Retinopathy Online Challenge: Automatic Detection of Microaneurysms in Digital Color Fundus Photographs. *IEEE Trans Med. Imaging*, [in press], 2009.
3. Lee, K., Niemeijer, M, Garvin, MK, Kwon, YH, Sonka, M, Abràmoff, MD. Segmentation of the Optic Disc in 3D-OCT Scans of the Optic Nerve Head. *IEEE Trans Med. Imaging*, [in press], 2009.
4. Garvin, MK, Abràmoff, MD, Wu, X, Burns, TK, Russell, SR, Sonka, M. Automated 3-D Intraretinal Layer Segmentation of Macular Spectral-Domain Optical Coherence Tomography Images. *IEEE Trans Med. Imaging*, [in press], 2009.
5. Ts'o D, Schallek J, Kwon Y, Kardon R, Abramoff M, Soliz P. Noninvasive functional imaging of the retina reveals outer retinal and hemodynamic intrinsic optical signal origins. *Jpn J Ophthalmol.* 53(4):334-44, 2009
6. Schallek J, Li H, Kardon R, Kwon Y, Abramoff M, Soliz P, et al. Stimulus-Evoked Intrinsic Optical Signals in the Retina: Spatial and Temporal Characteristics. *Invest Ophthalmol Vis Sci.*, 50(10):4865-72, 2009
7. Schallek J, Kardon R, Kwon Y, Abramoff M, Soliz P, Ts'o D. Stimulus-Evoked Intrinsic Optical Signals in the Retina: Pharmacological Dissection Reveals Outer Retinal Origins. *Invest Ophthalmol Vis Sci.*, 50(10):4873-80, 2009.
8. Niemeijer, van Ginneken, Abramoff, MD. Fast Detection of the Optic Disc and Fovea in Color Fundus Photographs. *Med Imag Anal*, 13(6):859-70, 2009
9. VanDijk, HW, Kok, PHB, Garvin, M, Sonka, M, Baillosterski, C, vanVelthoven, MEJ, Michels, RPJ, Schlingemann, RO, Verbraak, FD, Abràmoff, MD. Selective Loss of Inner Retinal Layer Thickness in Type 1 Diabetic Patients with Minimal Nonproliferative Diabetic Retinopathy. *Invest Ophthalmol Vis Sci*. Jul;50(7):3404-9. 2009.
10. Kwon YH, Adix M, Zimmerman MB, Piette S, Greenlee EC, Alward WLM, Abràmoff MD. Variance owing to observer, repeat imaging, and fundus camera type on cup-to-disc ratio estimates by stereo planimetry. *J Glaucoma*, 18:305-310, 2009
11. Abràmoff, MD, Niemeijer, M., Suttorp-Schulten, M. S., Viergever, MA, Russell, SR, and van Ginneken, B. Safe automated detection of diabetic retinopathy. *Diabetes Care* 31(8):e64, 2008.
12. Niemeijer, M., van Ginneken, B, Abràmoff, MD. Information Fusion for Diabetic Retinopathy CAD in Digital Color Fundus Photographs. *IEEE Trans Med Imaging*. May;28(5):775-85. 2009.
13. Garvin, MK, Abràmoff, MD, Kardon, R, Russell, SR, Wu, X., Sonka, M. Intraretinal layer segmentation of Macular Optical Coherence Tomography Images using Optimal 3-D graph search. *IEEE Trans Med. Imaging*, 27(10), 1495-1505, 2008.
14. Chiang MF, Boland MV, Margolis JW, Lum F, Abràmoff, MD, Hildebrand PL. Adoption and Perceptions of Electronic Health Record Systems by Ophthalmologists: An American Academy of Ophthalmology Survey. *Ophthalmology*, 115(9):1591-7, 2008
15. Sanchez, C, Niemeijer, M, Kockelkorn, T, Abramoff, MD, van Ginneken, B. Active Learning Approach for Detection of Hard Exudates, Cotton Wool Spots and Drusen in Retinal Images. *Proc SPIE Med Imaging*, 2009 [in press].
16. Niemeijer, M, Garvin, MK, van Ginneken, B, Sonka, M, Abramoff, MD. A linking framework for pixel classification based retinal vessel segmentation. *Proc SPIE Med Imag*, 2009 [in press]
17. Niemeijer, M, Garvin,MK, Lee, K, Abramoff, MD, Sonka, M. Registration of 3D spectral OCT volumes using 3D SIFT featurepoint matching. *Proc SPIE Med Imag*, 2009 [in press]
18. Niemeijer, M, van Ginneken, B., Abramoff, MD. Automatic classification of retinal vessels into arteries and veins. *Proc SPIE Med Imag*, 2009 [in press]

19. Lee, K., Niemeijer, M, Garvin, M.K., Sonka, M, Kwon, Y.H, Abramoff, MD. 3-D segmentation of the rim and cup in spectral-domain optical coherence tomography volumes of the optic nerve head. Proc SPIE Med Imag, 2009 [in press]
20. Abràmoff, M. D., Folk, JC, Lee AG, Boldt, HC. Teaching and assessing competency in Retinal Lasers in Ophthalmology Residency. Ophthalmic Surgery, Lasers and Imaging. 39(4):270-80, 2008.
21. Abràmoff, MD, Niemeijer, M., Suttorp-Schulten, M. S., Viergever, MA, Russell, S.R., and van Ginneken, B. Evaluation of a system for automated detection of diabetic retinopathy from color fundus photographs in a large population of patients with diabetes. Diabetes Care 31(2), 193-198, 2008.
22. Lee AG, Golnik KC, Oetting TA, Beaver HA, Boldt HC, Olson R, Greenlee E, Abràmoff, MD, Johnson AT, Carter K. Re-engineering the resident applicant selection process in ophthalmology: a literature review and recommendations for improvement. Surv Ophthalmol. 53(2):164-76, 2008.
23. Niemeijer, M., Garvin, M., van Ginneken, B, Sonka, M, Abramoff, MD. Vessel Segmentation in 3D Spectral OCT Scans of the Retina. Proc SPIE Med Imag, 2008
24. Lee, S., Reinhardt, JM, Abramoff, MD. Objective and Expert-Independent Validation of Retinal Image Registration Algorithms by a Projective Imaging Distortion Model. Med Imag Anal J, 2008 [in press]
25. Lee, S., Abràmoff, MD, Reinhardt, J. Retinal Image Mosaicing using the Radial Distortion Correction (RADIC) Model. Proc SPIE Med Imaging, 2008.
26. Giancardo, L, Abràmoff, MD, Chaum E, Karnowski TP, Meriaudeau F, Tobin KW. Elliptical local vessel density: a fast and robust quality metric for retinal images. Conf Proc IEEE Eng Med Biol Soc.3534-7. 2008.
27. Karnowski TP, Govindasamy V, Tobin KW, Chaum E, Abramoff MD. Retina lesion and microaneurysm segmentation using morphological reconstruction methods with ground-truth data. Conf Proc IEEE Eng Med Biol Soc. 5433-6. 2008.
28. Tobin KW, Abramoff MD, Chaum E, Giancardo L, Govindasamy V, Karnowski TP, Tennant MT, Swainson S. Using a patient image archive to diagnose retinopathy. Conf Proc IEEE Eng Med Biol Soc. 2008:5441-4. 2008.
29. Lee AG, Beaver, HA, Greenlee, E, Oetting, TA, Olson, R, Boldt, HC, Abràmoff, MD, Carter, K. Teaching and assessing systems-based competency in ophthalmology residency training programs. Surv Ophthalmol 52(6):680-689, 2007.
30. Haeker, M, Wu, X, Abràmoff, MD, Kardon, R, Sonka, M. Use of varying constraints in optimal 3-D graph search for segmentation of macular optical coherence tomography images. Proceedings of MICCAI, 10(Pt 1):244-51, 2007.
31. Haeker, M, Wu, X, Abràmoff, MD, Kardon, R, Sonka, M. Incorporation of Regional Information in Optimal 3-D Graph Search with Application for Intraretinal Layer Segmentation of Optical Coherence Tomography Images. IPMI 2007, Eds Karssemeijer and Lelieveldt, Springer, 2007.
32. Niemeijer, M, Russell, SR, Suttorp, MA, VanGinneken, B, Abràmoff, MD. Automated Detection and Differentiation of Drusen, Exudates, and Cotton-wool Spots in Digital Color Fundus Photographs for Early Diagnosis of Diabetic Retinopathy. Invest Ophthalmol Vis Sci 48(5):2260-2267, 2007.
33. Abràmoff, MD, Alward, LM, Greenlee, EC, Shuba, L, Kim, CY, Fingert, JH, Kwon, YH. Automated segmentation of the optic nerve head from stereo color photographs using physiologically plausible feature detectors. Invest Ophthalmol Vis Sci 48(4): 1665-1673, 2007.
34. Barriga, ES, Pattichis, M, Ts'o, D, Abràmoff, MD, Kardon, RH, Kwon, YH, Soliz, P. Spatiotemporal independent component analysis for the detection of functional responses in cat retinal images. IEEE Trans Med. Imaging 26(8): 1035-1045, 2007
35. Merickel, MB, Abràmoff, MD, Sonka, M, Wu, X. Segmentation of the Optic Nerve Head Combining Pixel Classification and Graph Search. Medical Imaging: Image Analysis. Proceedings of SPIE Medical Imaging, Volume 6512, 2007
36. Lee, S., Abràmoff, MD, Reinhardt, J. Feature-based pairwise retinal image registration by radial distortion correction. Medical Imaging: Image Analysis. Proceedings of SPIE Medical Imaging, Volume 6512, 2007.
37. Lee S, Abràmoff, MD, Reinhardt JM. Validation of retinal image registration algorithms by a projective imaging distortion model. Conf Proc IEEE Eng Med Biol Soc, 6472-5, 2007.
38. Haeker, M, Sonka, M, Kardon, R, Shah, VA, Wu, X, Abràmoff, MD. Automated segmentation of intraretinal layers from macular optical coherence tomography images. Proceedings of SPIE Medical Imaging, Volume 6512, 2007
39. Lee AG, Greenlee, E, Oetting, TA, Beaver, HA, Johnson, AT, Boldt, HC, Abramoff, MD, Olson, R, Carter, K. Assessing cataract surgical competency. Ophthalmology 114(7):1415-6, 2007
40. Lee AG, Greenlee, E, Oetting, TA, Beaver, HA, Johnson, AT, Boldt, HC, Abramoff, MD, Olson, R, Carter, K. The Iowa ophthalmology wet laboratory curriculum for teaching and assessing cataract surgical competency. Ophthalmology;114(7), 2007
41. Lee AG, Beaver, HA, Boldt, HC, Olson, R, Oetting, TA, Abramoff, MD, Carter, K. Teaching and assessing professionalism in ophthalmology residency training programs. Surv Ophthalmol; 52(3):300-1, 2007.
42. Niemeijer, M, Abràmoff, MD, van Ginneken, B. Segmentation of the optic disc, macula and vascular arch in fundus photographs. IEEE Trans Med. Imaging 26(1): 116-127, 2007
43. Abràmoff, MD, Niemeijer, M. Automatic detection of the optic disc location in retinal images using optic disc location regression. Conf Proc IEEE Eng Med Biol Soc. 2006;1:4432-5, 2006.

44. Niemeijer, M, VanGinneken, B, Abràmoff, MD. Image Structure Clustering for Image Quality Verification of Color Retina Images in Diabetic Retinopathy Screening. *Medical Image Analysis* 10(6): 888-898, 2006
45. Haeker, M, Abràmoff, MD, Kardon, R, Sonka, M. Segmentation of the Surfaces of the Retina Layer from OCT images. *Proceedings MICCAI 2006;9(Pt 1):800-7*, 2006
46. Abràmoff, MD, Kwon, YH, Tso, DY, Soliz, P, Zimmerman, B, Pokorny, J, Kardon, R. Visual stimulus induced changes in human near-infrared fundus reflectance, *Invest Ophthalmol Vis Sci.* 47(2), 715-721. 2006.
47. Niemeijer, M, vanGinneken, B, Staal, J, Suttorp-Schulzen, M.S.A., Abràmoff, MD. Automatic Detection of Red Lesions in Digital Color Fundus Photographs. *IEEE Transactions on Medical Imaging.* 24(5):584-592. 2005.
48. Abràmoff, MD, Suttorp-Schulzen, MSA. Web based Screening for Diabetic Retinopathy in a Primary Care Population: the EyeCheck Project. *Journal of Telemedicine and E health.* 11(6):668-674, 2005.
49. Staal J, Abràmoff MD, Niemeijer M, Viergever, .Ridge based Vessel Segmentation in Color Images of the Retina. *IEEE Transactions on Medical Imaging.* 23(4):501-9. 2004.
50. Abràmoff, MD, Kwon, YH, Tso, DY, Li, H, Barriga, ES, and Kardon, R. A spatial truncation approach to the analysis of optical imaging of the retina in humans and cats. *Proc IEEE Intern Sympos Biomed Imag.* 2:1115-1118. 2004.
51. Niemeijer, M, Staal, JS, van Ginneken, B, Loog, M, and Abràmoff, MD. Comparative study of retinal vessel segmentation on a new publicly available database. *SPIE San Diego CA. Proceedings of SPIE,* 5370: 658-656. 2004.
52. van Leiden HA, Moll AC, Dekker JM, Abràmoff MD, Polak BC. Photography or ophthalmoscopy for detection of diabetic retinopathy. *Diabetes Care;* 26(4):1318-9, 2003.
53. Abràmoff MD, Viergever MA. Computation and Visualization of Three dimensional Soft Tissue Motion in the Orbit. *IEEE Transactions on Medical Imaging;* 21(4):296-304, 2002.
54. Abràmoff MD, Kalman R, de Graaf ME, Stilma JS, Mourits MP. Rectus extraocular muscle paths and decompression surgery for Graves orbitopathy mechanism of motility disturbances. *Invest Ophthalmol Vis Sc.* 43(2):300-7, 2002.
55. Abràmoff MD, Ramos LP, Jansen GH, Mourits MP. Patients with persistent pain after enucleation studied by MRI dynamic color mapping and histopathology. *Investigative Ophthalmology Visual Science.* 42(10):2188-92, 2001.
56. Abràmoff MD, Niessen WJ, Viergever MA. Objective Quantification of the Motion of Soft Tissues in the Orbit. *IEEE Trans on Medical Imaging;* 19(10):986-95, 2000.
57. Abràmoff MD, Van Gils AP, Jansen GH, Mourits MP. MRI dynamic color mapping a new quantitative technique for imaging soft tissue motion in the orbit. *Invest Ophthalmol Vis Science.* 41(11):3256-60, 2000.

C. Research Support

ACTIVE SUPPORT

- 2010 - 2013 PI, VA Merit. Computer Aided Detection of Diabetic Retinopathy in Veterans with Diabetes. \$0.5M
2005 –2010 PI. R01 EY017066. National Eye Institute (NIH). “Low cost, patient friendly, portable imaging and computer detection of diabetic retinopathy”. \$1.875M
2009-2014 PI R01 EY018853. National Eye Institute (NIH). “Focal Structure-Function Relationships in Macular Layers from 3D Spectral OCT”. \$1.5M
2009-2015 Co-PI VA (with R. Kardon). ‘Center of Excellence for Prevention of Visual Loss and Blindness’. \$5M.
2008-2011 Co-investigator. (PI: R. Kardon) Veterans Administration Merit “Rehabilitation of Glaucoma Using Computer-Analyzed Eye Images” \$1.1M
2004-2010 PI. 907-00-095 Netherlands Organization for Research (NWO) “Effect of retinal tomography of diabetic macular edema treatment on outcome” \$200k (approximate from euros)

COMPLETED SUPPORT

- 2007-2009 PI. Carl Zeiss Meditec Inc. “Optic nerve head cup and disc classification from 3D OCT” \$100k
2007- Investigator (PI: Soliz, Pete). National Eye Institute (NIH). 1R44EY018280, phase I “Computer-based Screening for Diabetic Retinopathy. \$100k. In this grant, a set of algorithms has been developed to automatically detect abnormalities associated with diabetic retinopathy in digital retinal images. \$100k
2005-2007 PI. Wellmark Foundation
“Tele-diagnosis of Diabetic Retinopathy in Rural Iowa” Phase 1 and 2. \$75k
2006-2008 PI. University of Iowa Centers of Excellence
“Towards a prototype of a patient-friendly low-cost retinal camera”, \$50k
2006-2007 PI. STTR Department of Defense
“Inline treatment of subretinal lesions”, \$100k
2005-2006 PI. GCRC University of Iowa
“Automated classification of optic nerve head from stereo photographs”
Develop and test algorithms that can perform automated classification of the optic nerve head of patients with glaucoma, \$20k
2006-2007 PI. US Department of Agriculture, Distance Learning Telemedicine Program
“Telediagnosis of diabetic retinopathy in the rural Midwest”
Determine patient expectations and experience of retinal telediagnosis using digital cameras., \$300k
2004-2006 K-12 recipient. PI: Mark. RR01770001 K12 Career Development Award, 50% University of Iowa /NIH

Principal Investigator/Program Director (Last, First, Middle):

"Determine the potential of functional imaging of the retina using near-infrared tissue reflectance in response to visual stimuli".

2002-2006 PI. IOP STW (Netherlands Government)

"Computer aided diagnosis for diabetic retinopathy in fundus images", \$100k

Federal Government reporting Total Clinical hours: 20/80=0.25, Total Administrative hours = 0.0, Total Research hours = 0.60, Total Educational hours = 0.15; total = 1.00 (80 hours over 2 weeks).