

Dr. Alexander Bucksch



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Plants are a lot like icebergs: A bulk of their mass is invisible to the naked eye, buried in their roots. Roots allow plants to compensate for their stationary role in life, hunting for nutrients and diving to mine for water in times of drought. These are abilities food security researchers would like to be able to enhance to develop more durable crops...

[Scientific American – “First Direct Observations of How Roots Grow”](#)

EDUCATION

- 12/2005-04/2011 Ph.D. at the Chair of Optical and Laser Remote Sensing,
Delft University of Technology, The Netherlands
Dissertation: “Revealing the skeleton from imperfect point clouds“
Advisors: Roderik Lindenbergh & Massimo Menenti
- 10/2001-05/2005 M.Sc. and B.Sc., Information and Media Technology at the Chair of Graphics Systems,
Technical University of Brandenburg, Germany
Advisor for M.Sc. and B.Sc thesis: Winfried Kurth

PROFESSIONAL EXPERIENCE

- 08/2016 - present Assistant Professor, Department of Plant Biology, Warnell School of Forestry and Natural Resources and Institute of Bioinformatics, University of Georgia, USA
- 03/2015-06/2016 Research Scientist II, School of Biology and School of Interactive Computing
Georgia Institute of Technology, USA
- 06/2011-03/2015 Postdoctoral Scientist, School of Biology and School of Interactive Computing
Georgia Institute of Technology, USA
Advisors: Joshua Weitz (Biology) & Gregory Turk (Interactive Computing)
- 01/2015-02/2015 Guest Scientist at the Helmholtz Institute of Bio- and Geosciences
Forschungszentrum Jülich, Germany
- 11/2004-09/2005 Developer for image compression algorithms at Leibnitz Institute for innovative microelectronics (IHP), Frankfurt (Oder), Germany

AWARDS AND HONORS

- 01/2020 Fred C. Davison Early Career Scholar Award
- 04/2019 NSF CAREER Award
- 02/2019 Finalist of the Early Career Award of the North American Plant Phenotyping Network
- 08/2018 Fellow of the UGA Teaching Academy
- 08/2017 Fellow of the UGA Leadership Institute
- 10/2016 IPPN Root Phenotyping Working Group Early Career Travel Award (1 out of 4, EUR 500)
- 10/2016 Publons Sentinels of Science Award: Agricultural and Biological Sciences (top 10% reviewer world-wide)
- 10/2015 GeorgiaTech College of Computing Outstanding Presentation Award, 2nd Annual Postdoctoral Research Symposium
- 05/2015 NIMBioS Morphological Plant Models Workshop - competitive travel grant for 40 attendees
- 02/2015 ISPRS Journal of Photogrammetry and Remote Sensing Certificate for Outstanding Contribution in Reviewing
- 05/2014 Gordon Conference on Image Sciences Scholarship

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12/2005 - 12/2007 Albrecht von Haller Institute for Plant Sciences Full-time Ph.D. Fellowship (sponsored by Zoller+Fröhlich, research carried out at TU Delft)

RESEARCH GRANTS AND CONTRACTS

- 04/2019-03/2024 NSF CAREER Award, The phenotypic spectrum: Quantifying new patterns of architecture variation in crop roots, \$1,137,000, PI: **A. Bucksch**.
- 08/2017-07/2021 U.S. Department of Energy, ARPA-e, DEEPER: An Integrated Phenotyping Platform for Deeper Rooting, \$7,000,000 (\$810,000 to Bucksch), PIs: Jonathan Lynch (PI) **A. Bucksch (Co-PI)**, K. Brown (Co-PI), M. Bennett (Co-PI), T. Pridmore (Co-PI), S. Mooney (Co-PI), S. Keppler (Co-PI), N. DeLeon (Co-PI), P. Heinemann (Co-PI).
- 05/2017-04/2018 UGA Presidential Seed Grant, Using Robotic Systems to Accelerate the Application of Genome Information in the Improvement of Food Crops. \$114,066 (\$14,000 to Bucksch), PIs: C. Li (PI), H. Scherm (Co-PI), S. Jackson (Co-PI), **A. Bucksch (Co-PI)**, Ping Ma (Co-PI).
- 04/2016-03/2020 XSEDE Research Award, DIRT – High-throughput Phenotyping of Crop Roots. 100.000SU and 500GB, PI: **A. Bucksch (yearly renewable)**.
- 05/2015-04/2016 iPlant Collaborative, High-throughput Computing Platform for Quantifying Root Traits from Images, \$40,000, PIs: Joshua Weitz (PI) and **A. Bucksch (Co-PI)** (6/1/15-12/1/15)
- 06/2013-05/2014 Georgia Institute of Technology, Center for Data Analytics: Spatial Networks in Biology: Organizing and Analyzing the Structure of Distributed Biological Systems, \$15,000, PIs: Joshua Weitz (PI), Daniel Goldman (Co-PI), and **A. Bucksch (Co-PI)**
- 01/2010-12/2010 German Aerospace Agency (DLR) Institute of Robotics and Mechatronics: Registration of Botanical Trees, 90.000 Euro, PI: **A. Bucksch**.

BOOKS

- 2018: E. Puttonen, **A. Bucksch**, A. Zlinszky, N. Pfeifer: Optical approaches to capture plant dynamics in time, space, and across scales, Ebook, *Frontiers in Plant Science*, ISBN 978-2-88945-543-0.
- 2017: **A. Bucksch**, D. Chitwood: Morphological Plant Modeling: Unleashing geometric and topologic potential within the plant sciences, Ebook, *Frontiers in Plant Science*, ISBN 978-2-88945-297-2.
- 2011: **A. Bucksch**: Revealing the skeleton from imperfect point clouds, PhD Thesis, TU Delft: Dr.Hut, Munich, ISBN 978-3-86853-877-9.

JOURNAL PUBLICATIONS (google scholar: h-index 19, over 1300 citations)

- 2019: A. Zhan, J. Liu, S. Yup, X. Chen, S. Li, **A. Bucksch**: Architectural and anatomical responses of maize roots to agronomic practices in a semi-arid environment. *Journal of Plant Nutrition and Soil Science* 182(5), pp. 751-762
- 2019: J. Kengkanna, P. Jakaew, S. Amawan, N. Busener, **A. Bucksch**, P. Saengwilai: Phenotypic variation of cassava root traits and their responses to drought. *Applications in Plant Sciences* 7(4), e01238.
- 2018: E. Puttonen, **A. Bucksch**, A. Zlinszky, N. Pfeifer: Optical approaches to capture plant dynamics in time, space, and across scales. *Frontiers in Plant Science* 9
- 2018: P. Saengwilai, S. Klinsawang, M. Sangachart, **A. Bucksch**: Phenotypic variation of root traits of Thai rice (*Oryza sativa* L.). *Applied Ecology and Environmental Research* 16(2), pp. 1069-1083
- 2017: J. Friesner, S. Assmann, R. Bastow, J. Bailey-Serres, J. Beynon, V. Brendel, C.R. Buell, **A. Bucksch**, W. Busch, T. Demura, J. Dinneny, C. Doherty, A. Eveland, P. Falter-Braun, M. Gehan, M. Gonzales, E. Grotewold, R. Gutiérrez, U. Kraemer, G. Krouk, S. Ma, R.J. Markelz, M. Megraw, B. Meyers, J. Murray, N. Provart, S. Rhee, R. Smith, E. Spalding, C. Taylor, T. Teal, K. Torii, C. Town, M. Vaughn, R. Vierstra, D. Ware, O. Wilkins, C. Williams, S. Brady: The Next Generation of Training for Arabidopsis Researchers: Bioinformatics and Quantitative Biology. *Plant Physiology* 175(4), pp. 1499-1509
- 2017: **A. Bucksch**, A. Atta-Boateng, A.F. Azihou, D. Battogtokh, A. Baumgartner, B.M. Binder, S.A. Braybrook, C. Chang, V. Coneva, T. J. DeWitt, A.G. Fletcher, M.A. Gehan, D.H. Diaz-Martinez, L. Hong, A.S. Iyer-Pascuzzi, L.L. Klein, S. Leiboff, M. Li, J.P. Lynch, A. Maizel, J.N. Maloof, R.J.C. Markelz, C.C. Martinez, L.A. Miller, W. Mio, W. Palubicki, H. Poorter, C. Pradal, C.A. Price, E. Puttonen, J. Reese, R. Rellán-Álvarez, E.P. Spalding, E.E. Sparks, C.N. Topp, J. Williams, D.H. Chitwood: Morphological Plant Modeling: Unleashing geometric and topologic potential within the plant sciences. *Frontiers in Plant Science* 8

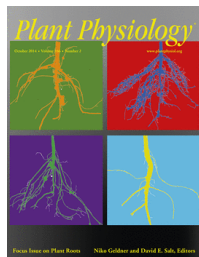
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2017: **A. Bucksch**, A. Das, H. Schneider, N. Merchant, J.S. Weitz: Overcoming the Law of the Hidden in Cyberinfrastructure Projects. Trends in Plant Science 22(2), pp. 117-123

2017: M.A. Balduzzi, B.M. Binder, **A. Bucksch**, C. Chang, L. Hong, A. Iyer-Pascuzzi, C. Pradal, E.E. Sparks: Reshaping Plant Biology: Qualitative and Quantitative Descriptors for Plant Morphology. Frontiers in Plant Science 8

2016: J. Burrige, H.M. Schneider, B.L. Huynh, P.A. Roberts, **A. Bucksch**, J.P. Lynch: Genome-Wide Association Mapping and Agronomic Impact of Cowpea Root Architecture. Theoretical and Applied Genetics 130(2), pp. 419-431

2016: J. Burrige, C. Jochua, **A. Bucksch**, J.P. Lynch: Legume shovelomics: high - throughput phenotyping of common bean (*Phaseolus vulgaris* L.) and cowpea (*Vigna unguiculata* subsp. *unguiculata*) root architecture in the field. Field Crops Research, 192, pp. 21-32



2015: A. Das, H. Schneider, J. Burrige, A. K. Martinez Ascanio, T. Wojciechowski, C. N. Topp, J. P. Lynch, J. S. Weitz, **A. Bucksch**: Digital Imaging of Root Traits (DIRT): a high-throughput computing and collaboration platform for field-based plant phenomics. Plant Methods 11(51)

2014: **A. Bucksch**, J. Burrige, L.M. York, A. Das, E. Nord, J.S. Weitz, J.P. Lynch: Image-based high-throughput field phenotyping of crop roots. Plant Physiology, 166, pp. 470-486

2014: **A. Bucksch**: A practical introduction to skeletons for the plant sciences. Applications in Plant Sciences, 2(8)

2014: A. Das, **A. Bucksch**, C.A. Price, S. Wing, J. S. Weitz: ClearedLeavesDB, an online database of cleared plant leaf images. Plant Methods, 10(8). (*Editors Pick*)

2014: **A. Bucksch**, G. Turk, J.S. Weitz: The Fiber Walk: The Fiber Walk: A Model of Tip-Driven Growth with Lateral Expansion. PLoS ONE, 9(1), e85585

2014: **A. Bucksch**, R. Lindenbergh, M.Z.A. Rahman, M. Menenti: Breast height diameter estimation in high density airborne LiDAR data. IEEE Geoscience and Remote Sensing Letters, 11(6), pp. 156-1060

2013: C.N. Topp, A.S. Iyer-Pascuzzi, J.T. Anderson, C.R. Lee; P.R. Zurek, O. Symonova, Y. Zheng, **A. Bucksch**, Y. Mileyko, T. Galkovskyi, B.T. Moore, J. Harer, H. Edelsbrunner, T. Mitchell-Olds, J.S. Weitz, P.N. Benfey: 3-dimensional phenotyping of growing root systems and QTL mapping identifies core regions of the rice genome controlling root architecture. Proceedings of the National Academy of Sciences 110(18), E1695-E1704

2012: **A. Bucksch** and K. Koshelham: Localized registration of point clouds of botanic trees. IEEE Geoscience and Remote Sensing Letters, 10(3), pp.631-635

2012: T. Galkovskyi, Y. Mileyko, **A. Bucksch**, B. Moore, O. Symonova, C.A. Price, C.N. Topp, A.S. Iyer-Pascuzzi, P.R. Zurek, S. Fang, J. Harer, P.N. Benfey, J.S. Weitz: GiA Roots: Software for the High Throughput Analysis of Plant Root System Architecture. BMC Plant Biology 2012, 12(116)

2011: **A. Bucksch** and S. Fleck: Automated detection of branch dimensions in woody skeletons of fruit tree canopies. Photogrammetric Engineering & Remote Sensing 77(3), pp. 229-240

2010: **A. Bucksch**, R. Lindenbergh, M. Menenti: SkelTre - Robust skeleton extraction from imperfect point clouds. The Visual Computer, Vol.26, No. 10, pp. 1283-1300

2008: D.L. Esme, **A. Bucksch**, W. H. Beekman: 3D Laser imaging as a valuable tool to specify changes in breast shape after augmentation mammoplasty. Aesthetic Plastic Surgery. 33(2), pp. 191-195

2008: **A. Bucksch** and R. Lindenbergh: CAMPINO - A skeletonization method for point cloud processing. ISPRS Journal of Photogrammetry and Remote Sensing, 63(1), pp. 115-127

CONFERENCE PUBLICATIONS

Peer Reviewed Conference Proceedings:

2011: K.A. Razak, **A. Bucksch**, M. Damen, C. van Westen, M. Straatsma, S. de Jong: Characterizing tree growth anomaly induced by landslides using LiDAR. 2nd World Landslide Forum, 3-9. October 2011, Rome, Italy.

2009: **A. Bucksch**, R. Lindenbergh, M. Menenti: Skeltre - Fast skeletonization of imperfect point clouds of botanic trees. 3D Object Retrieval Workshop/Eurographics 2009, München 28.March-3.April 2009

2009: **A. Bucksch**, S. Fleck: Automated detection of branch dimensions in woody skeletons of leafless fruit tree canopies. SilviLaser 2009, 14.-16. October 2009 Austin, Texas

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2009: M.Z.A. Rahman, B.G.H. Gorte, **A. Bucksch**: A new method for individual tree measurement from airborne LiDAR. SilviLaser 2009, 14.-16. October 2009 Austin, Texas

2009: M.Z.A. Rahman, B.G.H. Gorte and **A. Bucksch**: A new method for individual tree delineation and undergrowth removal from high resolution airborne LiDAR. ISPRS Workshop on Laser Scanning 2009, 1. -2. September 2009 Paris, France

Invited Conference Papers:

2007: **A. Bucksch**, R. Lindenbergh, J. van Ree: Error budget of terrestrial laser scanning: Influence of the intensity remission of the scan quality. Proceedings of the III International Scientific Congress Geo-Siberia 2007, 23-27. April, Novosibirsk, Vol. I, 2nd part, Geodesy, Geoinformatics, Cartography, Markscheider, pp.113-122, ISBN 978-5-87693-229-7 and ISBN 978-5-87693-231-0

Conference Proceedings:

2013: K. A. Razak, **A. Bucksch**: High-density airborne LiDAR estimation of disrupted trees induced by landslides. IEEE International Geoscience and Remote Sensing Symposium, Melbourne, Australia

2010: **A. Bucksch**, S. Fleck, S. Rumpf, P. Rademacher: Woody biovolume extraction from laser scanned trees, Silvilaser 2010, 14-17. September 2010, Freiburg, Germany

2009: **A. Bucksch**, R. Lindenbergh, M. Menenti, M.Z.A. Raman: Skeleton-based botanic tree diameter estimation from dense LiDAR data. Lidar Remote Sensing for Environmental Monitoring X, edited by Upendra N. Singh, Proceedings of SPIE Vol. 7460 (SPIE, Bellingham, WA 2009) 746007. Optics and Photonics 2009, San Diego (CA).

2009: R. Lindenbergh, L. Uchanski, **A. Bucksch**, R. van Gosliga: Structural monitoring of Tunnels using terrestrial laser scanning. Reports of Geodesy, Special Issue of the IX Konferencji naukowo- technicznej "Aktualne Problemy w Geodezji Inżynieryjnej", 27./28. March 2009, Warszawa

2009: **A. Bucksch**, R. Lindenbergh: Applications for point cloud skeletonization in forestry and agriculture. Reports of Geodesy, Special Issue of the IX Konferencji naukowo-technicznej "Aktualne Problemy w Geodezji Inżynieryjnej", 27./28. March 2009, Warszawa

2007: S. Soudarissanane, J. van Ree, **A. Bucksch** and R. Lindenbergh: Error budget of terrestrial laser scanning: Influence of the incidence angle on the scan quality, Proceedings 3D-NordOst, 10. Workshop for Aquisition, Modelling, Processing and Analysis of 3D Data, Berlin, 6-7. December 2007

2007: G. Pop, **A. Bucksch**, B. Gorte: 3D Buildings modeling based on a combination of techniques and methodologies. In Proceedings XXI CIPA International Symposium, 1-6. October 2007, Athens, Greece p.1-5

2007: G. Pop, **A. Bucksch**: Combining modern techniques for urban 3D modeling. In Proceedings IEEE International Geoscience and Remote Sensing Symposium, pp.1-4, 23.-27. July 2007, Barcelona, Spain.

2006: **A. Bucksch**, H. Appel van Wageningen: Skeletonization and segmentation of point clouds using octrees and graph theory. ISPRS Symposium: Image Engineering and Vision Metrology, Int. Archives of Photogrammetry Vol. XXXVI, pp. 1-6 Dresden, Germany

INVITED TALKS

2020: Seminar Talk, "Frontiers in root phenotyping: Mathematical and physical challenges in the field", April 2020, Columbia, MO.

2019: Student talk at Mahidol University, "Frontiers in root phenotyping: Everything you never dared to ask", November 2019, Bangkok, Thailand.

2019: Seminar Talk at Northwest A&F University, "Frontiers in root phenotyping: Mathematical and physical challenges in the field", October 2019, Yangling, China

2019: International Plant Phenotyping Symposium, "An algorithm to measure root hair response to abiotic stresses in microscopy images", October 2019, Nanjing, China.

2019: Invited talk at ASPB Plant Biology 2019, "The shape of plants revealed - a shape theoretic perspective on statistics of trait measurements", August 2019, San Jose, CA, USA.

2019: Seminar talk at Clemson University, "Frontiers in root phenotyping: Physical and mathematical challenges in the field", April 2019, Clemson, SC, USA.

2019: Seminar talk at University of Nebraska, "Frontiers in root phenotyping: Physical and mathematical challenges in the field", February 2019, Lincoln, NE, USA.

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2019: Seminar talk at Doane University, “Training Computational Plant Scientists: Experiences of student training at the interface”, February 2019, Crete, NE, USA.

2018: Invited talk at Noble Foundation, “Frontiers in root phenotyping in the field: Physical and mathematical limits in the light of ongoing developments”, November 2018, Aardmore, OK, USA.

2018: Seminar talk at the Department of Plant Pathology at the University of Georgia, “Frontiers in root phenotyping in the field: Physical and mathematical limits in the light of ongoing developments”, October 2018, Athens, GA, USA.

2018: Invited talk at Washigthon State University, “Frontiers in root phenotyping in the field: Physical and mathematical limits in the light of ongoing developments”, September 2018, Pullman, WA, USA.

2018: ASPB Plantae webinar (online), “Computational Plant Science”, June 2018, world-wide.

2018: Seminar talk at College of Biological Sciences at UC Davis, “The shape of plants to come: *in situ* computation and field math”, April 2018, Davis, CA, USA.

2018: Invited talk at Phenome 2018 “The shape of plants to come: *in situ* computation and field math”, February 2018, Tucson, AZ, USA.

2018: Seminar Talk at Northwest A&F University, “Unleashing geometry and topology for forestry and agriculture”, January 2018, Yangling, China

2017: Reseach Forum talk at Mahidol University, “The shape of plants to come: Unleashing geometry and topology within the plant sciences”, December 2017, Bangkok, Thailand.

2017: Invited talk at the JST Field Phenotyping and Modeling for Cultivation workshop, “The shape of plants to come: *in situ* computation and field math”, December 2017, Tokyo, JP.

2017: Seminar speaker at the Southern Research Station of the U.S. Forest Service, “The shape of plants to come: *in situ* computation and field math”, August 2017, Athens, GA, USA.

2017: Speaker at CROPS 2017 conference, “Computational advances towards a new characterization of root phenotypes under field conditions”, June 2017, Huntsville, AL, USA.

2017 Seminar speaker at the Department of Computer Science, University of Georgia, “The shape of plants to come: *in situ* computation and field math”, April 2017, Athens, GA, USA.

2017: Seminar speaker at the Institute for Bioinformatics, University of Georgia, “Computational advances towards identifying and quantifying in situ plant traits”, January 2017, Athens, GA, USA.

2016: Speaker at the IPPN Root Phenotyping Workshop, “The shape of plants to come: *in situ* computation and field math”, December 2016, Texcoco, MX.

2016: Speaker at the Plant Center Retreat, “The shape of plants to come: *in situ* computation and field math”, The Plant Center, October 2016, Helen, GA, USA.

2016: Speaker at the Precision Agriculture Workshop, “Computational Plant Science”, University of Arizona, October 2016, Tucson, AZ, USA.

2016: Speaker at the Georgia Informatics Institutes Symposium, “Computational Plant Science”, University of Georgia, October 2016, Athens, GA, USA.

2016: Speaker at the EMSL Workshop in Multiscale Plant Modeling, “DIRT: Computational root phenotyping in the field”, Pacific Northwest National Laboratory, August 2016, Richland, WA, USA.

2016: Seminar speaker at the Department of Mathematics, University of Georgia, “Computational advances towards identifying and quantifying in situ plant traits”, April 2016, Athens, GA, USA.

+ 20 invited talks before faculty appointment not included in the CV

+ over 30 conference poster presentations not included in the CV

SYNERGISTIC ACTIVITIES

Service to the science communtiy:

2020	Scientific committee of the <i>Functional-Structural Plant Modelling Workshop 2020</i>
2019	Member of the Crop Germplasm Committee for sweet potato (National Plant Germplasm System)
2019-present	Member of the Executive Committee of the Institute of Bioinformatics at UGA
2018-present	Member of the Advisory Board of the Georgia Advanced Computing Resource Center

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2017-2018	Department of Plant Biology Faculty Search Committee Member
2017-present	Associate Editor of <i>Plant Methods</i>
2016-2018	Associate Guest Editor for <i>Frontiers in Plant Sciences</i> special issue on “Technical Advances in Plant Science”
2016	Organizer of “Revealing the hidden half: Advances in imaging and quantification of plant roots and root-soil interactions” at the Fall Meeting of the American Geophysical Union
2015-2017	Associate Guest Editor for <i>Frontiers in Plant Sciences</i> special issue on “Plant Biophysics and Modeling”
2014 - 2017	Scientific Committee Member <i>IEEE International Geoscience and Remote Sensing Symposium</i>
2014	Postdoctoral member in the Academic Review of the School of Biology at Georgia Tech
2014	IQumulus Processing Large Geospatial Data Program Workshop Committee Member
2013 - 2016	<i>ISPRS Journal of Photogrammetry and Remote Sensing</i> Editorial Advisory Board Member

Reviewer/panel member of grant/fellowship/award programs:

2019	NSF PGRP ad-hoc reviewer
2019	US-Israel Agricultural Research & Development Fund (reviewer)
2019	Hatch Program, University of Kentucky (reviewer)
2018	USDA/NIFA AFRI, Plant Breeding And Phenomics Fellowship (panel member)
2018	ASPB Convirion Scholar Fellowship (panel member)
2017	Nebraska’s Experimental Program to Stimulate Competitive Research (EPSCoR) (reviewer)
2017- 2019	UGA Institute of Bioinformatics Fellowship (panel member)
2016	Plant Center Retreat Jury Member for Poster Competition

Ad hoc journal reviewer for over 30 journals/conferences including Proceedings of the National Academy of Science (PNAS), Nature Biotechnology, Nature Food, ACM Siggraph, IEEE Transactions on Geosciences and Remote Sensing, Plant Physiology, Plant Cell.

Journal Reviewer Awards: Publons Sentinels of Science Award: Agricultural and Biological Sciences (top 10% reviewer world-wide, 2016), ISPRS Journal of Photogrammetry and Remote Sensing Certificate for Outstanding Contribution in Reviewing (2015)

Memberships:

Professional Societies: American Association for the Advancement of Science (2016-), American Society of Plant Biologists (2014-), Botanical Society of America (2013-), Society for Mathematical Biology (2012-2013), SIAM-Society for Industrial and Applied Mathematics (2008-2011), Eurographics (2009)

Institutional Memberships: Georgia Informatics Institutes (Founding member, 2016-), Center for Plant Phenomics and Robotics (Founding member, 2016-), UGA Plant Center (2016-), Center for Data Analytics at Georgia Tech (2013-)

TEACHING

Introduction to Computational Plant Science BIOL4910/PBIO7500, annually since Spring 2017

The course teaches algorithm development to undergraduate and graduate students. Students learn the basics on examples of simulation and imaging applications within the plant sciences. The course is taught in an experiential learning setting. Students transition from the stage of understanding and modifying well documented code over extending code to algorithm development from scratch.

Bioinformatics Collaboratorium BINF8980, bi-annually since Fall 2017

The collaboratorium gives senior graduate students with various backgrounds the opportunity to gain experience in a multidisciplinary setting. The course teaches skill awareness and critical thinking by challenging a team of 10 students with a currently unsolvable question. The goal for the student team is to develop a first proof that it is feasible to solve the question within the next 20 years using a budget of \$3000.

TRAINING AND MENTORSHIP

Postdoctoral Researchers:

Dr. Suxing Liu: 3D reconstruction and quantification of crop roots (UGA 2017-present) – **Two ASPB Travel Awards to Phenome 2018 and 2019, Invited Speaker at ASPB Plant Biology 2019**

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Dr. Christopher Cotter: Neuronal networks to simulate morphological diversity in crop roots (UGA 2018/2019, Data Scientist at Benson and Hill Biosystems) – **ASPB Travel Awards to Phenome 2019**

Dr. Margaret Frank: Grafting induced vigor (NSF Visiting Postdoc, UGA 2016/2017, Assistant Professor at Plant Biology Cornell) – **3rd place in poster competition at UGA Plant Center Retreat 2016**

Ph.D and M.Sc. Students:

Primary Supervisor (note: PhD Students can be adviser of Master Students at TU Delft)

Sarah Sadoris: Networks of epigenetic stress response regulation, (Spring 2019- present, DoubleDawg Student, combined B.sc Plant Biology / M.sc. Bioinformatics at University of Georgia) – **Barry M. Goldwater Scholar**

Limeng Xie: The microbiome of the phenotypic spectrum in common bean, (Spring 2019- present, PhD Plant Biology at University of Georgia)

Ankita Roy, M.Sc.: Root hair response to nutrient stress in common bean, (Spring 2018- present, PhD Plant Biology at University of Georgia) – **Alan Jaworski Student Travel Award 2019, finalist “Faculty for the Future” program 2018 (Schlumberger Foundation)**

Peter Pietrzyk, M.Sc. : Quantifying branching patterns in imaging data across biological scales, (Spring 2017- present, PhD Plant Biology at University of Georgia) – **ASPB Travel Awards to Phenome 2018, Palfrey Award 2019, 2nd place in poster competition at UGA Plant Center Retreat 2019, James C. Carmon Award for creative use of computing in science 2020.**

Hoe-Ming Wong (Senior Data Analyst at Fugro Inpark, The Netherlands): Registration of range images using geometric features, 2012 (M.Sc. thesis at TU Delft) – **won TU Delft Foundation grant to finish thesis at Georgia Tech w/ Bucksch**

Jane van Ree (Assetmanager Water at Municipality Rotterdam, The Netherlands): Determination of the precision and reliability parameters of terrestrial laser scanners, 2006 (M.Sc. thesis at TU Delft)

Adamantios Kagkaras (UAV Data Technician at Plowman Craven, The Netherlands): Laser scanning modeling of a Cessna Citation for Computational Fluid Dynamics (CFD) Studies, 2006 (M.Sc. thesis at TU Delft)

Steven Alexander Sablerolle (Metrology Engineer at the European Space Agency, The Netherlands): Automatic registration of laser scanning data and color images, 2006 (M.Sc. thesis at TU Delft)

Co-mentor (w/Joshua Weitz, Georgia Institute of Technology)

Charles Wigington (Data Scientist at Staples): Algorithms for pan and core genome clustering, 2016 - (Bioinformatics PhD at Georgia Tech)

Abhiram Das: Cloud computing for imaging applications in bioinformatics - (Senior Developer at DNA Nexus, Sunnyville, CA, USA, Bioinformatics PhD at Georgia Tech)

Shimantika Sharma (Senior Software Engineer at Netflix, Los Gatos, CA, USA): Computation of Genomic Fluidity, 2012 (Bioinformatics M.Sc. at Georgia Tech).

Kristen Knipe: (Center for Disease Control (CDC), Atlanta, USA): DynBio: An Educational Application to Facilitate the Instruction of Mathematical Modeling in Biology, 2011 (Bioinformatics M.Sc. at Georgia Tech)

+ **6 rotation students**

Undergraduate Students:

Addison Bralick (Chemistry/Math): Calcium stress effects on root hairs of common bean (August 2018 - present) – **Undergraduate Research Award from the UGA Plant Center.**

Kate Batchler (Biology): Elevating potassium content in cassava through coconut intercropping (August 2018 - present) – **Won the competitive CURO Research Assistentship**

Michelle Ibezim (Computer Science): In-field 3D reconstruction of tuber roots (August 2018 - present) – **Won the competitive CURO Research Assistentship**

Maria Pedrosa (Information Management Systems, University of Georgia): Design of an online phenotyping workflow for users without technical background (August 2018– August 2019, now at Microsoft)

Megan Flory (Graphics design, University of Georgia): Design of an online phenotyping workflow for users without technical background (August 2018– August 2019, now at Georgia-Pacific LLC)

Sasha Swenson (Plant Biology, University of Georgia): Variation in bean root morphology (January 2018– April 2019) – **PBIO Undergraduate Research Award, Plant Center Undergraduate Research Award**

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Natalie Busener (Genetics and Biochemistry, University of Georgia): Cassava Root Phenotyping with Multiview Imaging Methods (June 2017 – August 2018, applied for Biotechnology Law programs to start in 2020) – **Won two times the competitive CURO Research Assistantship, Undergraduate Research Award from the UGA Plant Center, Deans List.**

Alissa Schlosberg (Biology, Georgia Tech): Orcid Root Phenotyping at the Atlanta Botanical Garden (Fall 2015, 3 credits course work)

Visiting scholars:

Addison Bralick (Chemistry/Mathematics, University of Georgia, GA. USDA REEU Student) – 10 weeks 2019

Koji Noshita (Mathematical Biology, Kuyushu University, JP. Assistant Professor) – 3 month 2018

Benjamin Zwiener (Computer Science, Doane University, NE. NSF REU Student) – 10 weeks 2018

Chartinun Chutoe (Biology, Mahidol University, THA. International Undergraduate Student) – 3 month 2018

EXTERNAL THESIS EXAMINER / THESIS COMMITTEE

Ph.D Thesis:

Soyeon Choi: t.b.a. (Genetics, University of Georgia, Athens, USA, ongoing)

Ashley Scruse: t.b.a. (Bioinformatics, University of Georgia, Athens, USA, ongoing)

Scott Oswald: Modelling carbon distribution in trees (Forestry, University of Georgia, Athens, USA, ongoing)

Matthew Johnson: Genetic diversity of salt tolerance in Maize (Crop & Soil Science, University of Georgia, Athens, USA, ongoing)

Emily Krach: Formation of fungi networks (Genetics, University of Georgia, Athens, USA, ongoing)

Monica Herrero-Huerta: Close-range photogrammetry applied to agroforestry engineering (University of Salamanca, Salamanca, Spain, 2016)

M.Sc. Thesis:

Ahmad Mohammed Fallatah: Detection of linear segments in multispectral satellite images of urban area based on Helmholtz principle (ITC, Enschede, The Netherlands)

Nazanin Sepehri: Super Resolution Mapping with Support Vector Machine (ITC, Enschede, The Netherlands)

Martijn Meijers: Implementation and testing of variable scale topological data structures (TU Delft, Enschede, The Netherlands)

Fallah Vazirabad, Yazir: Automatic snow depth calculation in LIDAR data (ITC, Enschede, The Netherlands)

PRESS AND OUTREACH (selection)

Scientific American – “First Direct Observations of How Roots Grow”

<https://www.scientificamerican.com/article/first-direct-observations-of-how-roots-grow/>

Georgia Informatics Institutes of Research and Education – Broadcast Interview

<https://youtu.be/oh-QwGDavTw?t=40> (starting at 0:40)

Atlanta Science Tavern – “Using digital images and supercomputers to help create drought-resistant crops”

<http://www.meetup.com/AtlantaScienceTavern/events/223583556/>

KRCU Radio – “Researchers Develop Imaging Technique To Help Improve Crops”

<http://krcu.org/post/researchers-develop-imaging-technique-help-improve-crops>

Research Horizons – “Root of the issue”

<http://www.rh.gatech.edu/front-office/root-issue>