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"

EDUCATIONAL

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 BACKGROUND

08/2021 - present	Associate Professor, Department of Plant Biology, Warnell School of Forestry and Natural Resources and Institute of Bioinformatics, University of Georgia, USA
08/2016 - 07/2021	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

04/2020	Fred C. Davison Early Career Scholar Award
02/2020	Early Career Award of the North American Plant Phenotyping Network
04/2019	NSF CAREER Award
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 |
| 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

12/2021-03/2022	UGA Conference Grant, NAPPN Meeting support 2022, $2,500, PIs: **A. Bucksch (PI)**
12/2021-12/2022	UGA Teaming Grant, Organs from the shelf: Merging cross-disciplinary perceptions to grow organs across organismal kingdoms,$3,000, PIs: N. Zeltner (PI), **A. Bucksch (Co-PI),** M. Fok (Co-PI), M. DeMarche (Co-PI), E. Wallace (Co-PI), M. van Wagtendonk (Co-PI).
01/2022-03/2022	AG2PI 2022 NAPPN Meeting, $13,500. PIs: D. LeBauer (PI), **A. Bucksch (Co-PI),** J. Clarke.
09/2021-03/2022	USDA 2022 NAPPN Meeting, $49,891. PIs: **A. Bucksch (PI),** R. Masalia (Co-PI), J. Clarke (Co-PI), M. Gehan (Co-PI).
09/2021-03/2022	U.S. Department of Energy, ARPA-E, 2022 NAPPN Meeting, $10,000. PI: **A. Bucksch.**
05/2021-04/2024	NSF Phylogenetic investigation of Asparagus L. trait evolution, phylogeography and diversification, $451,611. PIs: J. Leebens-Mack (PI) **A. Bucksch (Co-PI).**
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**.
08/2017-06/2022	U.S. Department of Energy, ARPA-E, DEEPER: An Integrated Phenotyping Platform for Deeper Rooting, $7,000,000, PIs: J.P. 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, PIs: C. Li (PI), H. Scherm (Co-PI), S. Jackson (Co-PI), **A. Bucksch (Co-PI),** P. Ma (Co-PI).
04/2016-present	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: J. Weitz (PI) and **A. Bucksch (Co-PI).**
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: J. Weitz (PI), D. 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.

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JOURNAL PUBLICATIONS (google scholar: h-index 22, over 2000 citations)

2021: A. Roy, **A. Bucksch**: Root Hairs vs. Trichomes: Not everyone is straight! <u>Current Opinion in Plant Biology</u> 64, 102151.

2021: S. Liu, C.S. Barrow, M. Hanlon, J.P. Lynch, **A. Bucksch**: DIRT/3D: 3D root phenotyping for field grown maize (*Zea mays*). <u>Plant Physiology</u> 187(2), pp. 739–757.

2021: H.M. Schneider, V.S.N. Lor, M.T. Hanlon, A. Perkins, S.M. Kaeppler, A.N. Borkar, R. Bhosale, X. Zhang, J. Rodriguez, **A. Bucksch,** M.J. Bennett, K.M. Brown, J.P. Lynch: Root angle in maize influences nitrogen capture and is regulated by CBL-interacting serine/threonine-protein kinase 15 (ZmCIPK15). <u>Plant, Cell & Enviroment,</u> (early access)

2021: D. Kawa, T. Taylor, B. Thiombiano, Z. Musa, H.E. Vahldick, A. Walmsley, **A. Bucksch**, H. Bouwmeester, S.M. Brady: Characterization of growth and development of sorghum genotypes with differential susceptibility to *Striga hermonthica*, <u>Journal of Experimental Botany</u> 72(22), pp. 7970–7983

2021: R. Dale, S. Oswald, A. Jalihal, M.-F.Laporte, D.M. Fletcher, A. Hubbard, S.-H. Shiu, A.D.L. Nelson, **A. Bucksch**: Overcoming the challenges to enhancing experimental plant biology with computational modeling. <u>Frontiers in Plant Science</u> 12, 1266.

2020: J. Salungyu, S. Thaitad, **A. Bucksch**, J. Kengkanna, P.J. Saengwilai: From lab to field: Open tools facilitating the translation of maize root traits. <u>Field Crops Research</u> 255, 107872

2020: N. Busener, J. Kengkanna, P.J. Saengwilai, **A. Bucksch**: Image-based root phenotyping links root architecture to micronutrient concentration in cassava. <u>Plants, People, Planet</u> 2 (6), pp. 678-687

2020: M. Herrero-Huerta, **A. Bucksch**, E Puttonen, K.M. Rainey: Canopy Roughness: A New Phenotypic Trait to Estimate Aboveground Biomass from Unmanned Aerial System, <u>Plant Phenomics</u>, 6735967.

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. <u>Journal of Plant Nutrition and Soil Science</u> 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. <u>Applications in Plant Sciences</u> 7(4), e01238.

2018: E. Puttonen, **A. Bucksch**, A. Zlinszky, N. Pfeifer: Optical approaches to capture plant dynamics in time, space, and across scales. <u>Frontiers in Plant Science</u> 9

2018: P. Saengwilai, S. Klinsawang, M. Sangachart, **A. Bucksch**: Phenotypic variation of root traits of Thai rice (*Oryza sativa L.*). <u>Applied Ecology and Eviromental Research</u> 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. <u>Plant Physiology</u> 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. <u>Frontiers in Plant Science</u> 8

2017: **A. Bucksch,** A. Das, H. Schneider, N. Merchant, J.S. Weitz: Overcoming the Law of the Hidden in Cyberinfrastructure Projects. <u>Trends in Plant Science</u> 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. <u>Frontiers in Plant Science</u> 8

2016: J. Burridge, 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. <u>Theoretical and Applied Genetics</u> 130(2), pp. 419-431

2016: J. Burridge, 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. <u>Field Crops Research,</u> 192, pp. 21-32

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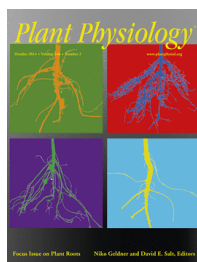
2015: A. Das, H. Schneider, J. Burridge, A. K. Martinez Ascanio, T. Wojciechowski, C. N. Topp, J. P. Lynch, J. S. Weitz, **A. Bucksch:** Digital Imaging of Root Traits (DIRT): a high-throughput computing and collaboration platform for field-based plant phenomics. <u>Plant Methods</u> 11(51)

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

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

2014: A. Das, **A. Bucksch**, C.A. Price, S. Wing, J. S. Weitz: ClearedLeavesDB, an online database of cleared plant leaf images. <u>Plant Methods,</u> 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. <u>PLoS ONE</u>, 9(1), e85585

2014: **A. Bucksch**, R. Lindenbergh, M.Z.A. Rahman, M. Menenti: Breast height diameter estimation in high density airborne LiDAR data. <u>IEEE Geoscience and Remote Sensing Letters</u>, 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. <u>Proceedings of the National Academy of Sciences</u> 110(18), E1695-E1704

2012: **A. Bucksch** and K. Koshelham: Localized registration of point clouds of botanic trees. <u>IEEE Geoscience and Remote Sensing Letters</u>, 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. <u>BMC Plant Biology</u> 2012, 12(116)

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

2010: **A. Bucksch**, R. Lindenbergh, M. Menenti: SkelTre - Robust skeleton extraction from imperfect point clouds. <u>The Visual Computer</u>, 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. <u>Aesthetic Plastic Surgery</u>. 33(2), pp. 191-195

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

CONFERENCE PUBLICATIONS

Peer Reviewed Conference Proceedings:

2022: P. Pietrzyk, N. Phan-Udom, C. Chutoe, P. Saengwilai, **A. Bucksch**: DIRT/mu: Automatic root hair measurement in maize (Zea mays ssp.) from microscopy images. <u>2022 NAPPN Conference</u>, 22.-25. February 2022, Athens, GA.

2022: J. Knapp-Wilson, R. Bohn-Reckziegel, **A. Bucksch**, D.J. Chavez: 3D phenotyping of peach tree canopy architecture using terrestrial laser scanning. <u>2022 NAPPN Conference</u>, 22.-25. February 2022, Athens, GA.

2022: S. Liu, W.P. Bonelli, P. Pietrzyk, **A. Bucksch**: Comparison of open-source image-based reconstruction pipelines for 3D root phenotyping of field-grown maize. <u>2022 NAPPN Conference</u>, 22.-25. February 2022, Athens, GA.

2022: S. Binder, M. Yang, V. Qiu, **A. Bucksch**, M. Fok: Non-destructive measurements of root traits and their soil-water environment using Fiber Bragg Grating-based fiber optic sensors. <u>2022 NAPPN Conference</u>, 22.-25. February 2022, Athens, GA.

2022: L.G. Swartz, S. Liu, D. Dahlquist, E.S. Walter, S. Mcinturf, **A. Bucksch**, D.G. Mendoza-Cozatl: Tracking dynamic changes of leaves in response to nutrient availability using an open-source cloud-based phenotyping system (OPEN Leaf). <u>2022 NAPPN Conference</u>, 22.-25. February 2022, Athens, GA.

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. <u>2nd World Landslide Forum</u>, 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

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, Warsawa

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, Warsawa

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

2021: Invited talk at the 3rd Plant Phenomics and Robotics Symposium:" DIRT and Co.: Computational discovery in plant biology data", September 2021, online world-wide

2021: CyVerse Webinar talk:" DIRT and Co.: Enabeling discovery in plant biology data", August 2021, online world-wide

2021: Invited talk Plant Biology World Summit 2021:" Making sense of the phenotypic chaos: Techniques for discovery in plant biology data", July 2021, online world-wide

2021: Invited talk at Retreat of the Institute of Plant Breeding:" Sorting out the chaos in phenotyping data: From trait measurement to biological discovery", May 2021, online world-wide

2021: Invited talk Bayer Crop Science: "Phenotyping the chaos of root shapes at scale", April 2021, online

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2021: Keynote at 1st NAPPN Meeting: "Making sense of the phenotypic chaos: Techniques for discovery in plant biology data", February 2021, online world-wide

2021: Agriculture Data Science Seminar Talk, "Discovering uncharacterized phenotypes in big data", January 2021, Athens, GA.

2020: Invited talk at ASA, CSSA and SSSA International Annual Meetings:"Computers, Roots & Big Data from the Field", November 2020, Phoenix, AZ (online world-wide)

2020: Invited talk at Mathematical modelling workshop during Plant Biology World Summit 2020:"Deterministic spatial modelling in plant biology", July 2020, online world-wide

2020: Webinar series of the International Plant Phenotyping Network. "Computers, Roots & Big Data from the Field: Can new methods identify uncharacterized phenomena in existing data?", April 2020, world-wide

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

2020: Invited talk at the Genomes2Field workshop at Phenome2020, "Frontiers in root phenotyping: Mathematical and physical limits in the field", February 2020, Tucson, AZ.

2020: Agriculture Data Science Seminar Talk, "Discovering uncharacterized phenotypes in big data", January 2020, Athens, GA.

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.

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.

+ 25 invited talks before faculty appointment and over 80 conference poster presentations not included in the CV

SYNERGISTIC ACTIVITIES

Service to the science communtiy:

2021-present	Conference chair of the *2022 Meeting of the North American Plant Phenotying Network*
2020-present	Associate Editor at *Frontiers in Plant Science*
2020	Scientific committee of the *Functional-Structural Plant Modelling Workshop 2020*
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
2017-2018	Department of Plant Biology Faculty Search Committee Member
2017-present	Associate Editor of *Plant Methods*
2016-2018	Associate Guest Editor for *Frontiers in Plant Sciences* 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 *Frontiers in Plant Sciences* special issue on "Plant Biophysics and Modeling"
2014 - 2017	Scientific Committee Member *IEEE International Geoscience and Remote Sensing Symposium*
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	*ISPRS Journal of Photogrammetry and Remote Sensing* Editorial Advisory Board Member

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

2021	USDA/NIFA AFRI, Plant Breeding And Phenomics (ad-hoc reviewer)
2020, 2021	James L. Carmon Award (panel member)
2020	French Science Foundation ad-hoc reviewer
2020	Swiss National Science Foundation ad-hoc reviewer
2020	NSF GRFP Review Panel – IOS (panel member)
2019	NSF PGRP ad-hoc reviewer
2019 - 2021	US-Israel Agricultural Research & Development Fund (reviewer)
2019	Hatch Program, University of Kenntucky (reviewer)
2018	USDA/NIFA AFRI, Plant Breeding And Phenomics (panel member)
2018	ASPB Conviron 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 40 jounals/conferences including Proceedings of the National Academy of Science (PNAS), Nature Biotechnology, Nature Food, New Phytologist, 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:

<u>Professional Societies:</u> International Society of Root Research (2017-), North American Plant Phenotyping Network (2017-) 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)

<u>Institutional Memberships:</u> 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 in Spring

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 expieriential 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 in Fall

The collaboratorium gives senior graduate students with various backgrounds the opportunity to gain expierience in a multi-diciplinary setting. The course teaches skill awareness and critical thinking by challanging 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. Topics explored so far: Quantifying the amount of communication in one qubic meter of soil, Quantum Phenomics: Applying the quantum framework on the organismal level of plant populations

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**

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**

Dr. Alexander Bucksch

Ph.D and M.Sc. Students:

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

William LaVoy: Experimental systems to quantify Root-Root Interaction (Spring 2022- present, PhD Plant Biology at University of Georgia)

Jordan Knapp-Wilson (co-advised with DarioChavez): Quantifying the impact of breeding for branching architecture of peach trees, (Spring 2020- present, PhD Horticulture at University of Georgia) – **4th place UGA Plant Phenotyping and Robotics Symposium Poster Competion 2021, 2021 John Ingle Innovation in Plant Breeding Award, 3rd-place poster competition at the National Association of Plant Breeders 2021**

Wesley Bonelli: Scale-free models of root development (Spring 2020- present, PhD Plant Biology at University of Georgia)

Limeng Xie: The phenotypic spectrum of common bean, (Spring 2019- present, PhD Plant Biology at University of Georgia) – **1st place UGA Plant Phenotyping and Robotics Symposium Poster Competion 2021, Graduate Education Advancement Board Fellowship 2021**

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), 2021-2022 ASPB Plantae Fellow**

Peter Pietrzyk, M.Sc. : Quatifying 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, 3rd place UGA Plant Phenotyping and Robotics Symposium Poster Competion 2021**

Hoe-Ming Wong (Senior Data Analyst at Fugro Inpark): 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): 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): 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): Automatic registration of laser scanning data and color images, 2006 (M.Sc. thesis at TU Delft)

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

Charles Wigington (Data Scientist at Insulet Corporation): Algorithms for pan and core genome clustering (Bioinformatics PhD at Georgia Tech)

Abhiram Das (Senior Data Engineer at The Public Health Company): Cloud computing for imaging applications in bioinformatics (Bioinformatics PhD at Georgia Tech)

Shimantika Sharma (Senior Software Engineer at Netflix): Computation of Genomic Fluidity (Bioinformatics M.Sc. at Georgia Tech).

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

+ 10 rotation students

Undergraduate Students:

Obinna Nnaduruaku (Computer Science): Frontend development for PLANT IT (Agust 2021 - present)

Sydney A. Page (Ecology): Alometric relationships between root and shoot traits (January 2021 - present) – **Won CURO Research Assistentship**

Joslyn McKlveen (Economy/Bussiness Analytics): t.b.a bean (January 2020 – present) – **Won three times the competitive CURO Research Assistentship, William Moore Crane Leadership Scholarship 2021**

Nathan Thrower (Biochemistry): 3D trait variation in maize root systems (January 2020 – July 2021, now research assistant)

Sarah Sadoris (Plant Biology) Networks of epigenetic stress response regulation, (Spring 2019-2020, now PhD student at Cornell) – **Barry M. Goldwater Scholar**

Addison Bralick (Chemistry/Math): Calcium stress effects on root hairs of common bean (August 2018 – August 2020, now at a chemistry lab) –**Undergraduate Reseach Award from the UGA Plant Center.**

Kate Batchler (Biology): Elevating potassium content in cassava through coconut intercropping (August 2018 – July 2021, medical student at Augusta University) – **Won the competitive CURO Research Assistentship**

Michelle Ibezim (Computer Science): In-field 3D reconstructuction of tuber roots (August 2018 – February 2020, now at AT&T) – **Won the competitive CURO Research Assistentship**

Maria Luck, formally Pedrosa (Information Management Systems, University of Georgia): Design of an online phenotyping workflow for users without technical background (August 2018– August 2019, now Sr. UX Designer at Walmart)

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**

Natalie Busener (Genetics and Biochemistry, University of Georgia): Cassava Root Phenotyping with Multiview Imaging Methods (June 2017 – August 2018, PhD Biotechnology Law at UFL) – **Won two times the competitive CURO Research Assistentship, Undergraduate Reseach 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:

Jitrana Kenganna (Biology Mahidol University, THA. International PhD Student) – 1 year 2021

Lilly Stafford-Adams (Biology Doane University, NE. NSF REU Student) – 10 weeks 2020 (virtual attendence)

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

PRESS AND OUTREACH (selection)

Farm Monitor – "Ranger Nick: The Important Role of Ag Technology"
https://www.youtube.com/watch?v=olJFwIi7CK0

Open Access Government – "Scientists say adapt plant roots to protect food security from climate"
https://www.openaccessgovernment.org/protect-food-security/116539/

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