Yin BAO, Ph.D.

Assistant Professor
Department of Plant and Soil Sciences
Department of Mechanical Engineering
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Education

Ph.D., Agricultural and Biosystems Engineering, Iowa State University (ISU)	2018

- Dissertation: "Automated Plant Phenotyping using 3D Machine Vision and Robotics"

M.S. study in Mechanical Engineering, University of Illinois Urbana-Champaign	2012.08-2012.12
B.E., Mechanical (Vehicle) Engineering, China Agricultural University	2012

Professional Experience

Assistant Professor, Plant & Soil Sciences Dept. (80%), University of Delaware (UD)	2023.09 to date
Assistant Professor, Mechanical Engineering Dept. (20%), University of Delaware (UD)	2023.09 to date
Assistant Professor, Biosystems Engineering Dept., Auburn University (AU)	2019.08-2023.08
Postdoctoral Research Associate, Ag & Biosystems Engineering Dept., Iowa State University	2018.05-2019.08
Graduate Research Assistant, Ag & Biosystems Engineering Dept., Iowa State University	2013.01-2018.05

Research Interests

Digital agriculture. Specific elements include remote and proximal sensing, computer vision, robotics, and machine/deep learning.

Teaching

Instructor for PLSC 467/667 MEEG 667 Digital Technology for Ag. & Natural Resources (UD)	2024 to date
Faculty Advisor for MEEG 401 Engineering Senior Design (UD)	2023 to date
Instructor for BSEN 3610/7110 Instrumentation & Controls for Biological Systems (AU)	2020-2023
Instructor for BATM 5120/6120 Agri-Industrial Electronics & Controls (AU)	2021-2022
Guest lecturer and lab instructor for *TSM 465 Automation Systems* (ISU)	Spring 2016 & 2017

Professional Affiliations

American Society of Agronomy (ASA)	2024 to date
Crop Science Society of America (CSSA)	2024 to date
American Society of Agricultural and Biological Engineers (ASABE)	2013 to date
Association of Overseas Chinese Agricultural Biological Food Engineers (AOCABFE)	2014 to date

International Society of Precision Agriculture (ISPA)	2019-2023
American Association for the Advancement of Science (AAAS)	2018 to date

Honors & Awards

2022 ASABE AIM ITSC paper award

2020 New Faces of ASABE

2018 Reverend P. T. Taiganides Award

2018 Iowa State Research Excellence Award

2017 AOCABFE Graduate Leadership and Service Award

2017 First Place AOCABFE Student Paper Competition Award

2017 First Place AOCABFE Student Research Presentation Award

2016 Third Place AOCABFE Student Paper Competition Award

2016 First Place AOCABFE Student Research Presentation Award

Service

Associate Editor for ASABE Journals (Machine Systems)	2022 to date
President of AOCABFE	2025 to date
President Elect of AOCABFE	2024 to 2025
Vice President of AOCABFE	2023 to 2024
Board member at-large of AOCABFE	2020 to 2022
ASABE Robotics Student Design Competition Committee	2019 to 2021
Secretary of ASABE Robotics Student Design Competition Committee	2019 to 2020
Student Activity Committee Chair of AOCABFE	2016 to 2017
Associate Editor for AOCABFE IMPACT Newsletter	2015 to 2017

Graduate Students Advised

1. Puranjit Singh. 2023 to date. PhD in Plant Science. Dissertation: TBD

2. Ashish Reddy Mulaka. 2025 to date. PhD in Plant Science. Dissertation: TBD

3. Ashish Reddy Mulaka. 2023 to 2025. M.S. in Data Science. Thesis: *Effects of Imaging Angle and Field of View on Detection and Tracking of Bareroot Loblolly Pine Seedlings using Computer Vision* (Co-major advisor).

4. Rafael Bidese-Puhl. 2019-2023. PhD in Biosystems Engineering. Dissertation: *Precision agriculture systems for the Southeast US using computer vision and deep learning*.

5. Sharif Shabani. 2022-2023. Non-thesis M.S. in Biosystems Engineering.

6. Mary Beth Cassity, 2021-2023. M.S. in Biosystems Engineering. Thesis: *Segmentation and 3D reconstruction of root systems and Humulus lupulus for high-throughput phenotyping using deep neural networks and 3D imaging*.

7. Kamand Bagherian. 2021-2022. M.S. in Biosystems Engineering. Thesis: *Rapid peanut phenotyping and*

water quality monitoring using remote sensing and machine learning techniques.

8. Nariman Niknejad. 2021-2022. M.S. in Biosystems Engineering. Thesis: *Kinematic Equine Gait Analysis and Phenotyping of Loblolly Pine using 3D Stereo Machine Vision and Deep Learning*. Completed.

9. Vinika Gupta. 2020-2021. M.S. in Computer Science and Software Engineering. Thesis: *Equine Gait Analysis, Body Part Tracking using DeepLabCut and Detectron2 and Biomechanical Parameter Extraction* (Co-major advisor).

Patents

1. **Yin Bao**, James Johnson, Bobby Bradford, Rafael Bidese-Puhl (2023). Tree seedling inventory system. US Patent Application No.: 18/174,350 (pending).

2. **Yin Bao**, Rafael Bidese Puhl (2023). mmWave radar-based peanut mass flow sensor. Provisional Application No.: 63/417,343 (expired).

3. Lie Tang, Ji Li, **Yin Bao**, Jian Jin, Akash Nakarmi (2017). Crop stand analyzer using reflective laser proximity sensors. Patent No.: US9804097B1

*Manuscripts in Preparation, Submission or Review (*correspondence)*

1. Cassity, M. E., **Bao, Y.***, Sanz-Saez, A., de Silva, A. High-throughput phenotyping of Humulus lupulus in greenhouse using stereo vision, semantic segmentation, and 3D point cloud analysis. *Smart Agricultural Technology*. In submission.

2. Tang, G., Mulaka, A. R., Rong, W., Yuan, X., **Bao, Y.**, Tan, J. Biochar-driven soil improvement and plant performance under water stress: A combined agronomic and computational approach. *Biochar*. In review.

3. Tibbs-Cortes, L., Han, L., Benke, R., Singh, P., Huang, H., Jewell, J., Trieu, T., Tang, Z., Swaminathan, K., Andorf, C., Graham, M., Sanguinet, K., Zhang, Z., Bartley, L., **Bao, Y.**, Juenger, T., Yu, J., Li, X. Differentiated phenotypic plasticity mediated haplotype territory and adaptation. *Cell*. In review.

*Peer-Reviewed Journal Publications (*correspondence)*

1. Singh, P., Niknejad, N., Spiers, J. D., **Bao, Y.***, & Ru, S. 2025. Development of a smartphone application for rapid blueberry detection and yield estimation. *Smart Agricultural Technology, 12,* 101361. https://doi.org/10.1016/j.atech.2025.101361

2. Mulaka, A., Bidese, R., & **Bao, Y***. 2025. Effects of viewing angle and field of view on detection, tracking, and counting of pine seedlings towards automated forest nursery inventory. *Smart Agricultural Technology, 11*, 100951. https://doi.org/10.1016/j.atech.2025.100951

3. Singh, P., Perez, M., Donald, W., **Bao, Y.***. A comparative study of deep semantic segmentation and UAV-based multispectral imaging for enhanced roadside vegetation composition assessment. *Remote Sensing*, *17*(12), 1991. https://doi.org/10.3390/rs17121991

4. Shabani, S., Mulaka, A. R., Stokes, T. A., Rehman, T. U., & **Bao, Y***. 2025. Development of a stereo vision-based UGV guidance system for bareroot forest nurseries. *Smart Agricultural Technology, 11*, 100990. https://doi.org/10.1016/j.atech.2025.100990

5. Cassity, M. E., Bartley, P. C., & **Bao, Y.*** (2024). Root segmentation of horticultural plants in X-Ray CT images by integrating 2D instance segmentation with 3D point cloud clustering. *Smart Agricultural Technology*, *9*, 100666. https://doi.org/10.1016/j.atech.2024.100666

6. Bagherian, K., Fernandez-Figueroa, E., Kaye, K., Wilson, A., Rogers, S., **Bao, Y.*** (2024). Detecting harmful algal blooms in Lake Okeechobee using MODIS satellite imagery and long-short term memory. *Journal of the ASABE, 67*(5), 1191-1202. https://doi.org/10.13031/ja.15995

7. Oliveira, M. F., Carneiro, F. M., Ortiz, B. V., Thurmond, M., Oliveira, L. P., **Bao, Y.**, Sanz-Saez, A., Tedesco, D. (2024). Predicting below and above-ground peanut biomass and maturity using multi-target regression. *Computers and Electronics in Agriculture, 218,* 108647. https://doi.org/10.1016/j.compag.2024.108647

8. Panelo, J., **Bao, Y.**, Tang, L., Schnable, P., Salas-Fernandez, M. (2024). Genetics of canopy architecture dynamics in photoperiod sensitive and photoperiod insensitive sorghum. *The Plant Phenome Journal*, 7, e20092. https://doi.org/10.1002/ppj2.20092

9. Bidese-Puhl, R., Butts, C., Rewis, M. D., Mclntyre, J., Morris, J., Branch, B., **Bao., Y.*** (2023). Mass flow rate sensing using mmWave radar and machine learning towards a peanut yield monitor. *Computers and Electronics in Agriculture*, *215*, 108340. https://doi.org/10.1016/j.compag.2023.108340

10. Bagherian, K., Bidese-Puhl, R., **Bao, Y.***, Zhang, Q., Sanz-Saez, A., Dang, P., Lamb, M., Chen, C.Y. (2023). Phenotyping agronomic and physiological traits in peanut using UAV-based hyperspectral imaging and machine learning. *The Plant Phenome Journal*, *6*, e20081. https://doi.org/10.1002/ppj2.20081

11. Niknejad, N., Bidese-Puhl, R., **Bao, Y.***, Payne, K., Zheng, J. (2023). Phenotyping of architecture traits of loblolly pine trees using stereo machine vision and deep learning: stem diameter, branch angle, and branch diameter. *Computers and Electronics in Agriculture, 221*. 107999. https://doi.org/10.1016/j.compag.2023.107999

12. Niknejad, N., Caro, J., Bidese-Puhl, R., **Bao, Y.***, Staiger, E.A. (2023). Equine kinematic gait analysis using stereo videography and deep learning: Stride length and stance duration estimation. *Journal of the ASABE, 66*(4)*.* https://doi.org/10.13031/ja.15386

13. Bidese-Puhl, R., **Bao, Y.***, Payne, N., Stokes, T., Nadel, R., Enebak, S.A. (2023). In-field pine seedling counting using end-to-end deep learning for inventory management. *Journal of the ASABE, 66*(2), 469-477. https://doi.org/10.13031/ja.15383

14. Xiang, L., Gai, J., **Bao, Y.**, Yu, J., Schnable, P., Tang, L. (2023). Field-based robotic leaf angle detection and characterization of maize plants using stereo vision and deep convolutional neural networks. *Journal of Field Robotics*, *40*, 1034-1053. https://doi.org/10.1002/rob.22166

15. Puppala, N., Nayak, S. N., Sanz-Saez, A., Chen, C.Y., Devi, M. J., Nivedita, N., **Bao, Y.**, He, G., Traore, S. M., Wright, D. A., Pandey, M. K., Sharmaei, V. (2023). Physiological and molecular basis of drought and heat stress tolerance to enhance productivity and nutritional quality of peanuts in harsh environments. *Frontiers in Genetics, 14*, 234. https://doi.org/10.3389/fgene.2023.1121462

16. Xiang, L., Nolan, T., **Bao, Y.**, Elmore, M., Tuel, T., Gai, J., Shah, D., Wang, P., Huser, N., Hurd, A., McLaughlin, S., Howell, S., Walley, J., Yin, Y., Tang, L. (2021), Robotic Assay for Drought (RoAD): an automated phenotyping system for brassinosteroid and drought responses. *The Plant Journal, 107*, 1837-1853. https://doi.org/10.1111/tpj.15401

17. Zhang, J., Bao, Y., Du, D., Wang, J., Wei, Z. (2021). OM2S2: on-line moisture-sensing system using multi-frequency microwave signals optimized by a two-stage frequency selection framework. IEEE Transactions on Industrial Electronics, 68(11), 11501-11510. https://doi.org/10.1109/TIE.2020.3032927

18. Qian, K., **Bao, Y.**, Zhu, J., Wang, J., Wei, Z. (2021). Development of a portable electronic nose based on a hybrid filter-wrapper method for identifying the Chinese dry-cured ham of different grades. *Journal of Food Engineering*, 290, 110250. https://doi.org/10.1016/j.jfoodeng.2020.110250

19. Mantilla-Perez, M., **Bao, Y.**, Tang, L., Schnable, P., Salas-Fernandez, M. (2020). Towards "smart canopy" sorghum: discovery of the genetic control of leaf angle across layers. *Plant Physiology*, 184(4): 1927-1940. https://doi.org/10.1104/pp.20.00632

20. Zhang, J., Du, D., **Bao, Y.**, Wang, J., Wei, Z. (2020). Development of multi-frequency swept microwave sensing system for moisture measurement of sweet corn with deep-neural-network. *IEEE Transactions on Instrumentation and Measurement,* 69(9), 6446-6454. https://doi.org/10.1109/TIM.2020.2972655 (IF 5.332)

21. **Bao, Y.**, Zarecor, S., Shah, D., Tuel, T., Campbell, D., Chapman, A., Imberti, D., Kiekhaefer, D., Imberti, H., Lübberstedt, T., Yin, Y., Nettleton, D., Lawrence-Dill, C., Whitham, S., Tang, L., Howell, S. (2019). Assessing plant performance in the Enviratron. *Plant Methods*, 15(1), 117. https://doi.org/10.1186/s13007-019-0504-y

22. Breitzman, M., **Bao, Y.**, Tang, L., Schnable, P., Salas-Fernandez, M. (2019). Linkage disequilibrium mapping of high-throughput image-derived descriptors of plant architecture traits under field conditions. *Field Crop Research*, 244, 107619. https://doi.org/10.1016/j.fcr.2019.107619

23. Xiang, L., **Bao, Y.**, Tang, L., Ortiz, D., Salas-Fernandez, M. (2019). Automated morphological traits extraction for sorghum plants via 3D point cloud data analysis. *Computers and Electronics in Agriculture*, 62, 951-961. https://doi.org/10.1016/j.compag.2019.05.043

24. **Bao, Y.**, Tang, L., Srinivasan, S., Schnable, P. (2019). Plant architectural traits characterization for maize using time-of-flight 3D imaging. *Biosystems Engineering*, 178, 86-101. https://doi.org/10.1016/j.biosystemseng.2018.11.005

25. **Bao, Y.**, Tang, L., Breitzman, M., Salas-Fernandez, M., Schnable, P. (2018). Field-based robotic phenotyping of sorghum plant architecture using stereo vision. *Journal of Field Robotics*, 36(2), 397-415. https://doi.org/10.1002/rob.21830

26. **Bao, Y.**, Shah, D., Tang, L. (2018). 3D perception-based collision-free robotic leaf probing for automated indoor plant phenotyping. *Transactions of the ASABE*, 61(3), 859-872. https://doi.org/10.13031/trans.12653

27. Salas-Fernandez, M., **Bao, Y.**, Tang, L., Schnable, P. (2017). A high-throughput, field-based phenotyping technology for tall biomass crops. *Plant Physiology*, 174(4), 2008-2022. https://doi.org/10.1104/pp.17.00707 (IF 8.7)

28. **Bao, Y.**, Tang, L. (2016). Field-based robotic phenotyping for sorghum biomass yield component traits characterization using stereo vision. *IFAC-PapersOnLine*, 49(16), 265-270. https://doi.org/10.1016/j.ifacol.2016.10.049

Book Chapters

1. **Bao, Y.**, Gai, J., Xiang, L., Tang, L. (2021). Field robotic systems for high-throughput plant phenotyping: A review and a case study. In: Zhou J., Nguyen H.T. (eds) *High-Throughput Crop Phenotyping. Concepts and Strategies in Plant Sciences*. Springer, Cham. https://doi.org/10.1007/978-3-030-73734-4_2

Conference Papers and Presentations

1. **Bao, Y.**, Magee, E., Mulaka, A. S., Ernest, E. (2024). Accelerate lima bean breeding through computer vision in field-based robotic high-throughput phenotyping. 2024 ASA, CSSA, SSSA International Annual Meeting,

Nov. 10-13, San Antonio, TX, USA.

2. Singh, P., Nariman, N., Ru, S., **Bao, Y.** (2024). Deep learning approaches for yield prediction and maturity assessment in southern highbush blueberry cultivation. 2024 ASA, CSSA, SSSA International Annual Meeting, Nov. 10-13, San Antonio, TX, USA.

3. Singh, P., **Bao, Y.**, Perez, M. A., Donald, W. N. (2024). UAS-based assessment of vegetation cover and composition on construction sites using semantic segmentation. 2024 ASABE Annual International Meeting, July 28-31, Anaheim, CA, USA.

4. Singh, P., Nariman, N., Ru, S., **Bao, Y**. (2023). A deep learning-based smartphone app for field-based blueberry yield prediction. 2023 ASA, CSSA, SSSA International Annual Meeting, Oct. 29-Nov. 1, St. Louis, MO, USA.

5. Wolfe, M., Sanz-Saez, A., **Bao, Y.**, Rios, E. F. (2023). Breeding to deliver cover crop and forage cultivars with improved performance in species mixtures. 2023 ASA, CSSA, SSSA International Annual Meeting, Oct. 29-Nov. 1, St. Louis, MO, USA.

6. **Bao, Y.**, Bidese-Puhl, R., Shabani, S., Abrahams, A., McDonald, T., Tang, L. (2023). An AI-based ground robotic vision system for automated forest nursery inventory. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA. (Poster)

7. Singh, P., **Bao, Y.**, Perez, M., Donald, W. (2023). Image-based assessment of vegetation cover and composition using U-Net-based semantic segmentation. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA. doi: 10.13031/aim.202300237

8. Bidese-Puhl, R., **Bao, Y.**, Payne, N., Stokes, T., Enebak, S. (2023). Real-time infield counting of early-stage pine seedlings using efficient object detection and multiple object tracking. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA.

9. Bidese-Puhl, R., Bao, Y., Davis, J., Purswell, J. (2023). Quantification of broiler activity using deep learning-based multi-animal pose tracking. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA.

10. Cassity, M. E., Bartley, P. C., **Bao, Y.** (2023). Root segmentation of X-ray computed tomography images of container horticultural plants using Mask R-CNN and DBSCAN-based 3D point cloud clustering. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA. doi: 10.13031/aim.202301147

11. Cassity, M. E., **Bao, Y.,** Sanz-Saez, A., de Silva, A. (2023). High-throughput phenotyping of Humulus lupulus in greenhouse using stereo vision, semantic segmentation, and 3D point clouds. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA.

12. Shabani, S., Bidese-Puhl, R., **Bao, Y.**, McDonald, T., Tang, L. (2023). Development of a ground-based robotic platform towards automated inventory for precision forest nursery management. 2023 ASABE Annual International Meeting, July 9-12, Omaha, Nebraska, USA. Won ASABE Student Presentation Competition Award.

13. Bidese-Puhl, R., **Bao, Y.**, Butts, C., McIntyre, J., McDonald, T. (2023). A novel mass flow sensor using mmwave radar and machine learning towards a peanut yield monitor. AI in agriculture: Innovation and discovery to equitably meet producer needs and perceptions. April 17-19, Orlando, Florida, USA.

14. Bagherian, K., **Bao, Y.**, Kaye, K., Fernandez-Figueroa, E., Rogers, S. (2022). Forecasting harmful algal blooms in inland water bodies using Sentinel-2 data and long-short term memory. 2022 Alabama Water Resources Conference. September 6-8, Orange Beach, Alabama, USA.

15. Bidese-Puhl, R., **Bao, Y.**, Payne, N., Stokes, T., Nadel, R., Enebak, S. (2022). In-field pine seedling counting using end-to-end deep learning for inventory management. 2022 ASABE Annual International Meeting, July 17-20, Houston, Texas, USA. doi: 10.13031/aim.202200463 (ITSC Paper Award)

16. Bagherian, K., Bidese-Puhl, R., **Bao, Y.**, Zhang, Q., Sanz-Saez, A., Chen, C., Dang, P. (2022). Phenotyping agronomic traits of peanuts using UAV-based hyperspectral imaging and deep learning. 2022 ASABE Annual International Meeting, July 17- 20, Houston, Texas, USA. doi:10.13031/aim.202200814

17. Niknejad, N., Caro, J., Bidese-Puhl, R., **Bao, Y.**, Staiger, E. A. (2022). Estimation of equine stride length and stance duration using stereo 3D videography and deep learning. 2022 ASABE Annual International Meeting, July 17- 20, Houston, Texas, USA. doi:10.13031/aim.202201204

18. Smythe, M. P., Gupta, V., Staiger, E. A., **Bao, Y.**, Brooks, S. A. (2021). Using artificial intelligence to analyze horse gait parameters for genomics research in musculoskeletal traits. Journal of Equine Veterinary Science, 100, 103502. doi: 10.1016/j.jevs.2021.103502.

19. West, A., Gupta, V., Smythe, M. P., Staiger, E. A., **Bao, Y.**, Brooks, S. A. (2021). Locomotion pattern analysis using digital video labeling by machine learning. Journal of Equine Veterinary Science, 100, 103604. doi: 10.1016/j.jevs.2021.103604.

20. Bidese-Puhl, R., **Bao, Y.**, Sanz-Saez, A., Chen, C (2021). Infield peanut pod counting using deep neural networks for yield estimation. 2021 ASABE Annual International Virtual Meeting, July 12-16. doi:10.13031/aim.202101080

21. Gupta, V., West, A., **Bao, Y.**, Brooks, S. A., Staiger, E. A. (2021). A video processing pipeline for equine biomechanical parameters extraction and gait analysis. 2021 ASABE Annual International Virtual Meeting, July 12-16. doi:10.13031/aim.202100942

22. Akter, M., Niknejad, N., **Bao, Y.**, Bidese-Puhl, R., Payn, K., Zheng, J. (2021). Phenotyping of pine tree architecture with stereo vision and deep learning. 2021 ASABE Annual International Virtual Meeting, July 12-16. doi:10.13031/aim.202100847

23. **Bao, Y.**, Tang, L. (2019). Temporal leaf tracking of maize plant using a convolutional neural network. 2019 ASABE Annual International Meeting, July 7-10, Boston, MA, USA.

24. **Bao, Y.**, Tang, L. (2018). A robotized multi-sensor perception-driven indoor plant phenotyping system. 2018 ASABE Annual International Meeting, July 29-August 1, Detroit, MI, USA.

25. **Bao, Y.**, Tang, L. (2018). Plant architectural traits characterization for maize using Time-of-Flight 3D imaging. 2018 ASABE Annual International Meeting, July 29-August 1, Detroit, MI, USA.

26. **Bao, Y.**, Tang, L., Shah, D. (2017). Robotic 3D plant perception and leaf probing with collision-free motion planning for automated indoor plant phenotyping. 2017 ASABE Annual International Meeting, July 16-19, Spokane, WA, USA. doi:10.13031/aim.201700369

27. **Bao, Y.**, Tang, L., Schnable, P., Salas-Fernandez, M. (2016). Infield biomass sorghum yield component traits extraction pipeline using stereo vision". 2016 ASABE Annual International Meeting, July 17-20, Orlando, FL, USA. doi:10.13031/aim.20162462338

28. **Bao, Y.**, Tang, L., Schnable, P., Salas-Fernandez, M. (2015). GPU-based parallelization of a sub-pixel high-resolution stereo matching algorithm for high-throughput biomass sorghum phenotyping. 2015 ASABE

Annual International Meeting, July 26-29, New Orleans, LA, USA. doi:10.13031/aim.20152188089

29. **Bao, Y.**, Nakarmi, A., Tang, L. (2014). Development of a field robotic phenotyping system for sorghum biomass yield component traits characterization. 2014 ASABE Annual International Meeting, July 13-16, Montreal, Quebec, Canada. doi: 10.13031/aim.20141901199

Invited Presentations

1. "AI-based robotic forest nursery inventory". 2023 Southern Forest Nursery Management Cooperative Contact Meeting, July 18. Auburn, AL, USA.
2. "Turbocharging Agri-forestry sciences and production through imaging, robotics, and artificial intelligence". Auburn University AI@AU Forum, March 31, 2023. Auburn, AL, USA.
3. "Automated pine seedling inventory using machine vision and machine learning". 2022 Joint Annual Meeting: Southern and Northeastern Forest Nursery Associations, July 19, 2022. Charleston, SC, USA.
4. "Automated seedling inventory". 2021 Southern Forest Nursery Management Cooperative Contact Meeting, July 19, 2021. Online Zoom meeting.
5. "Robotic plant phenotyping". Biological Systems Engineering Department Seminar, University of Wisconsin-Madison. February 24. 2021. Online Zoom meeting.
6. "High-throughput plant phenotyping and its potential for automated seedling inventory". 2020 Auburn University Southern Forest Nursery Management Cooperative Contact Meeting, July 20, 2020. Online Zoom meeting.
7. "Robotic Plant Phenotyping". 2019 Plant Science Research Symposium, December 17, Auburn, AL, USA
8. "High-Throughput Phenotyping: Plant Architecture". 2019 North Carolina State University Tree Improvement Program Contact Meeting, November 14, Tuscaloosa, AL, USA.
9. "Robotic plant phenotyping". 2019 ASABE Alabama Station Section Meeting, April 12, Auburn, AL, USA.

Grants and Contracts

1. Improve the blueberry yield prediction app and extend its availability for iOS users ($33,728). **Yin Bao**, Sushan Ru. California Blueberry Commission. 2024-2025.
2. Improving machine vision systems for monitoring ecosystem phenology ($20,999). **Yin Bao**, Rodrigo Vargas. Delaware NASA EPSCoR RID. 2024-2025.
3. Accelerate UD lima bean breeding through field-based robotic high-throughput phenotyping ($100,147). Yin Bao, Emmalea Ernest. UD CANR Research Seed Grant. 2024-2025.
4. A smart ground-based vision system for automated inventory management and quality evaluation of ornamental nursery crops ($299,484). Tanzeel Rehman, **Yin Bao**, Jeremy Pickens, Jian Jin. USDA-NIFA AFRI. 2023-2025.
5. Expanding southern highbush blueberries to underserved regions of southeastern U.S. ($497,828). Sushan Ru, Elina Coneva, **Yin Bao**. USDA-NIFA AFRI. 2023-2026.
6. Leveraging genomic and phenomic selection to breed better cover crop and forage mixtures, faster ($300,000). Marnin Wolfe, Alvaro Sanz-Saez, **Yin Bao**, Esteban Rios. USDA-NIFA AFRI. 2023-2025.
7. An AI-based ground robotic vision system for automated inventory and quality assessment of bareroot

seedlings in forest tree nursery production ($548,897). **Yin Bao**, Lie Tang, Scott Enebak, Timothy McDonald. USDA-NIFA AFRI. 2022-2025.

8. Unmanned aerial systems for determining vegetative establishment on ALDOT construction sites ($199,976). Michael Perez, **Yin Bao**, Wesley Donald. Alabama Department of Transportation. 2022-2024.

9. Development of a mmWave radar-based peanut yield monitor ($28,708). **Yin Bao**, Christopher Butts. Alabama Peanut Producers Association. National Peanut Board. 2022-2023.

10. Evaluating a remote soil moisture sensor for precision cotton irrigation management ($8,000). **Yin Bao**, Brenda Ortiz. Alabama Cotton Commission. 2021-2022.

11. Enabling high-throughput yield prediction for efficient blueberry production ($30,280). Sushan Ru, **Yin Bao**, Elina Coneva, James Spiers, Paul Bartley. California Blueberry Commission. 2021-2022.

12. Utilizing drone to detect herbicide injury and common cotton pests ($8,000). Steve Li, **Yin Bao**. Alabama Cotton Commission. 2021-2022.

13. Future of peanut maturity assessment: Remote sensing, physiology and artificial intelligence ($25,000). Brenda Ortiz, Alvaro Sanz-Saez, Charles Chen, Kris Balkcom, Luan De Oliveira, **Yin Bao**. Alabama Peanut Producers Association. 2021-2022.

14. Creating a tool for forecasting Harmful Algal Blooms using Earth Observations and Machine Learning to Predict (HELP) high risk surface water sources ($149,546). Stephanie Rogers, **Yin Bao**, Alan Wilson. Alabama Agricultural Experiment Station Interdisciplinary Research Grant Program. 2021-2023.

15. Developing the AU-Hop Team: Breeding Southeastern-Adapted Hop Varieties with Integrative Horticultural, Phenotypic, and Genomic Strategies ($149,280). Andre da Silva, **Yin Bao**, Alex Harkess, Alvaro Sanz-Saez, Courtney Leisner. Alabama Agricultural Experiment Station Interdisciplinary Research Grant Program. 2021-2023.

16. Development of a vision-based robotic seedling counting and geo-mapping system for bareroot pine seedling production ($50,000). **Yin Bao**, Ryan Nadel, Timothy McDonald. Alabama Agricultural Experiment Station Production Agriculture Research Funding Program. 2020-2022.

17. Effects of environmental conditions in live production on production efficiency and product quality in commercial poultry ($1,307,680). Jeremiah Davis, Jessica Starkey, Charles Starkey, **Yin Bao**, Jesse Campbell. USDA ARS Poultry Research Unit. 2020-2022

18. Application of funding toward purchasing new drone-based remote sensing equipment (drone + hyperspectral and multispectral cameras) for AU row crop research ($100,000). Alabama Agricultural Experiment Station Equipment Grant Program. Steve Li, Kathy Lawrence, Katelyn Kesheimer, Scott Graham, Alvaro Sanz-Saez, **Yin Bao**, Tyler Sandlin, David Russell. 2020-2024.

19. Three-dimensional equine gait analysis using computer vision and deep learning for genomic mapping ($49,800). Elizabeth Staiger, **Yin Bao**, Sonia Moisá, Reid Hanson. Auburn University Intramural Grants Program. 2020-2022

20. Development of a low-cost, cable-based mobile crop sensing platform on a center pivot ($5,000). **Yin Bao**. Alabama Agricultural Experiment Station Planning Grant Program. 2019-2020.

21. Development of hands-on trainers in electrical systems and electronic control systems to strengthen

electrical problem-solving skills in poultry processing plants, feed mills, hatcheries, and on the farm ($31,946). Jeremiah Davis, Jess Campbell, William Batchelor, **Yin Bao**, Dennis Brothers and Kelly Goneke. Alabama Poultry and Egg Association. 2019.

Grant Panelist and Ad Hoc Grant Reviewer

1. Panelist, USDA-NIFA AFRI Regional Innovations for Climate-Smart Agriculture and Forestry (RICSAF) (2022)
2. Panelist, USDA-NIFA AFRI Research and Extension Experiences for Undergraduates (REEU) (2022)
3. Panelist, Alabama Agricultural Experiment Station Production Agriculture Research Funding program (2021)
4. Ad hoc reviewer, the Hong Kong Jockey Club Equine Welfare Research Foundation Pump-Prime Funding program (2022)

Technical Reviewer

1. Agricultural Water Management
2. Applied Engineering in Agriculture
3. Biosystems Engineering
4. Computers and Electronics in Agriculture
5. Frontiers in Plant Science
6. IEEE Transactions on Instrumentation and Measurement
7. International Journal of Agricultural and Biological Engineering
8. Plant Methods
9. Plant Phenomics
10. Precision Agriculture
11. Sensors
12. Smart Agricultural Technology
13. Journal of the ASABE (Transactions of the ASABE)