

# Pappu Kumar Yadav, Ph.D.

## Assistant Professor

Department of Agricultural & Biosystems Engineering  
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## EDUCATION

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|------|--|
| 2022 | <b>Ph.D. in Biological &amp; Agricultural Engineering</b><br>Thesis: Artificial Intelligence-Based Computer Vision for Rapid Detection and Classification of Objects in Agricultural Situations<br>Texas A&M University, College Station, Texas, USA |
| 2014 | <b>MS in Electrical Engineering</b><br>Project: Embedded Optical Link<br>California State University, Fresno, California, USA  |
| 2011 | <b>B. Tech in Electronics &amp; Communication Engineering</b><br>Project: Radio Frequency Grid for Electronic Voting Machine Theft Prevention Based on ARM Cortex M3, MEMS, WSN and GSM<br>SRM Institute of Science & Technology, Chennai, India     |

## APPOINTMENTS AND RESEARCH EXPERIENCES

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|---------------------------|---|
| Nov 2023 – Present        | <b>Assistant Professor-Precision Agriculture AI Engineering</b><br>Department of Agricultural & Biosystems Engineering, South Dakota State University, Brookings, SD, USA |
| June 2022 – Nov 2023      | <b>Postdoctoral Research Associate</b><br>Department of Agricultural & Biological Engineering, University of Florida, Gainesville, FL, USA<br>P.I.: Thomas Burks          |
| June 2018 – May 2022      | <b>Graduate Research Assistant</b><br>Texas A&M University, College Station, Texas, USA<br>Advisor: J. Alex Thomasson   |
| January 2015 – May 2018   | <b>Electrical Equipment Technician</b><br>Center for Irrigation Technology, California State University, Fresno, CA, USA<br>Supervisor: David F. Zoldoske                 |
| June 2013 – December 2014 | <b>Graduate Research Assistant</b><br>California Water Institute, California State University, Fresno, CA, USA<br>Supervisor: Diganta Adhikari                            |

## RESEARCH INTERESTS

- **Precision Agriculture:** UAVs & UGVs, remote sensing, thermal imaging, multispectral imaging, hyperspectral imaging, fluorescence imaging, precision spraying
- **High Throughput Phenotyping:** disease and pest management, water & nutrient stress management
- **Decision Support System:** yield prediction, crop water requirements, wireless sensor network, internet of things (IoT)

- **Database Development & Management:** yield and prescription mapping for grain crops like wheat, barley, sugar beets, etc.
- **Engineering & Technology:** aerial & ground-based robotics, fluorescence imaging system like CSI-D+ for bacteria and fungus detection, hyperspectral imaging system, artificial intelligence, machine learning including deep learning, soil moisture sensors
- **Spatial Science:** spatiotemporal variability, variable rate irrigation, yield, and prescription mapping

## PUBLICATIONS

### Peer reviewed Journal Publications

- [1] Frederick, Q., Burks, T., Watson, A., **Yadav, P. K.**, Qin, J., Kim, M., & Ritenour, M. A. (2023). Selecting hyperspectral bands and extracting features with a custom shallow convolutional neural network to classify citrus peel defects. *Smart Agricultural Technology*, 6, 100365.
- [2] **Yadav, P. K.**, Thomasson, J. A., Hardin, R., Searcy, S. W., Braga-Neto, U., Popescu, S. C., ... & White, E. L. (2023). Plastic Contaminant Detection in Aerial Imagery of Cotton Fields Using Deep Learning. *Agriculture*, 13(7), 1365.
- [3] **Yadav, P. K.**, Burks, T., Dudhe, K., Frederick, Q., Qin, J., Kim, M., Mark, A., 2023a. Classification of E. coli Colony with Generative Adversarial Networks, Discrete Wavelet Transforms and VGG19. *J. Radiol. Clin. Imaging* 6, 146–160. <https://doi.org/10.26502/jrci.2809082>
- [4] **Yadav, P. K.**, Thomasson, J. A., Hardin, R., Searcy, S. W., Braga-Neto, U., Popescu, S. C., ... & Wang, T. (2023). Detecting volunteer cotton plants in a corn field with deep learning on UAV remote-sensing imagery. *Computers and Electronics in Agriculture*, 204, 107551.
- [5] **Yadav, P. K.**, Burks, T., Frederick, Q., Qin, J., Kim, M., & Ritenour, M. A. (2022). Citrus disease detection using convolution neural network generated features and Softmax classifier on hyperspectral image data. *Frontiers in Plant Science*, 13, 1043712.
- [6] **Yadav, P. K.**, Thomasson, J. A., Searcy, S. W., Hardin, R. G., Braga-Neto, U., Popescu, S. C., ... & Wang, T. (2022). Assessing the performance of YOLOv5 algorithm for detecting volunteer cotton plants in corn fields at three different growth stages. *Artificial Intelligence in Agriculture*, 6, 292-303.
- [7] Wang, T., Mei, X., Thomasson, J. A., Yang, C., Han, X., **Yadav, P. K.**, & Shi, Y. (2022). GIS-based volunteer cotton habitat prediction and plant-level detection with UAV remote sensing. *Computers and Electronics in Agriculture*, 193, 106629.
- [8] Han, X., Thomasson, J. A., Xiang, Y., Gharakhani, H., **Yadav, P. K.**, & Rooney, W. L. (2019). Multifunctional ground control points with a wireless network for communication with a UAV. *Sensors*, 19(13), 2852.

### Non-Peer-Reviewed Publications and Conference Proceedings

- [1] **Yadav, P. K.**, Thomasson, J. A., Searcy, S. W., Hardin, R. G., Braga-Neto, U., Popescu, S. C., ... & Wang, T. (2022). Computer Vision for Volunteer Cotton Detection in a Corn Field with UAS Remote Sensing Imagery and Spot Spray Applications. *arXiv preprint arXiv:2207.07334*.
- [2] **Yadav, P. K.**, Burks, T., Frederick, Q., Qin, J., Kim, M., Ritenour, M. A., & Dudhe, K. (2023, June). Classifying E. coli concentration levels on multispectral fluorescence images with discrete wavelet transform, deep learning, and support vector machine. In *Sensing for Agriculture and Food Quality and Safety XV* (Vol. 12545, pp. 54-73). SPIE.
- [3] **Yadav, P. K.**, Burks, T., Qin, J., Kim, M., Frederick, Q., Dewdney, M. M., & Ritenour, M. A. (2023, June). Citrus disease classification with convolution neural network generated features and machine learning classifiers on hyperspectral image data. In *Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping VIII* (Vol. 12539, p. 1253902). SPIE.
- [4] Gharakhani, H., Thomasson, J. A., Nematzadeh, P., **Yadav, P. K.**, & Hague, S. (2022, June). Using under-canopy cotton imagery for cotton variety classification. In *Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping VII* (Vol. 12114, pp. 74-79). SPIE.

- [5] **Yadav, P. K.**, Thomasson, J. A., Hardin, R. G., Searcy, S. W., Braga-Neto, U., Popescu, S. C., ... & Wang, T. (2022, June). Volunteer cotton plant detection in corn field with deep learning. In *Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping VII* (Vol. 12114, pp. 15-22). SPIE.
- [6] Wang, T., Mei, X., Thomasson, J. A., Han, X., & **Yadav, P. K.** (2020). Volunteer cotton habitat prediction model and detection with UAV remote sensing. In *2020 ASABE Annual International Virtual Meeting* (p. 1). American Society of Agricultural and Biological Engineers.
- [7] **Yadav, P. K.**, White, E. L., Thomasson, J. A., Cholula, U., Marconi, T., & Enciso, J. (2020). Application of UAV Remote Sensing for Detecting Plastic Contaminants in Cotton Fields. In *Beltwide Cotton Conferences*.
- [8] **Yadav, P. K.**, Sharma, F. C., Thao, T., & Goorahoo, D. (2020). Soil moisture sensor-based irrigation scheduling to optimize water use efficiency in vegetables. *Irrigation Association*, 1-7.
- [9] **Yadav, P. K.**; Swanson, Charles; Penning, Tom; Wallace, Joe (2016). Study of Moisture Sensors' Response to Drying Cycles of Soil. *Irrigation Association*, 1-19.

## Publications Currently in Review

- [1] **Yadav, P. K.**, Burks, T., Qin, J., Kim, M., Frederick, Q., Dewdney, M. M., & Ritenour, M. A. (2023). Citrus disease classification with convolution neural network generated features and machine learning classifiers on hyperspectral image data. *Journal of Applied Remote Sensing*.
- [2] **Yadav, P. K.**, Burks, T., Qin, J., Kim, M., Dewdney, M. M., & Ritenour, M. A. (2023). Detection of citrus black spot fungus *Phyllosticta citricarpa* on multispectral fluorescence images using YOLOv8. *Computers and Electronics in Agriculture*.

## Presentations

### Invited Talks and Seminars

- [1] “Citrus Disease Classification with Convolution Neural Network Generated Features and Machine Learning Classifiers on Hyperspectral Image Data”, SPIE-DCS. Orlando, FL. Jun. 13, 2023.
- [2] “Applications of AI-based Computer Vision in Agricultural Situations”, Seminar Talk Series organized by Nepalese Student Association, University of Florida, Gainesville, FL. May 31, 2023.
- [3] “Artificial Intelligence-Based Computer Vision for Rapid Detection and Classification of Objects in Agricultural Situations”, *Drone Manthan* organized by *Just Agriculture*, India (Virtual). Nov. 25, 2022.
- [4] “Computer Vision for Spot-Spraying Volunteer Cotton Plants in Corn Fields with Remotely Piloted Aerial Applications Systems (RPAAS)”, Remotely Piloted Aerial Application Systems 2022 Workshop, Penticton, BC, Canada (Virtual). Oct. 5, 2022.

### Conference Presentations from Accepted Abstracts

- [1] **Yadav, P. K.**, Burks, T., Thomasson, J. A., Hardin, Robert., “YOLOv5 Algorithm for Detecting Volunteer Cotton Plants in Corn Field and Mitigating Boll Weevil Pests with Spot Spray Capable UAS”, Florida Section ASABE Annual Conference. Duck Key, FL. Jun. 6, 2023.
- [2] **Yadav, P. K.**, Burks, T., Frederick, Q., Qin, J., Kim, M., Ritenour, M. A., & Dudhe, K., “Classifying E.coli concentration levels on multispectral fluorescence images with discrete wavelet transform, deep learning and support vector machine”, SPIE-DCS. Orlando, FL. Jun. 13, 2023.
- [3] **Yadav, P. K.**, Burks, T., Frederick, Q., Qin, J., Kim, M., Ritenour, M. A., & Dudhe, K., “Studying the effects of discrete wavelet transform (DWT) on deep learning-based image classification of *E. Coli* concentration levels”, AI in Agriculture conference. Orlando, FL.

- [4] **Yadav, P. K.**, Burks, T., Qin, J., Kim, M., Frederick, Q., Dewdney, M. M., & Ritenour, M. A., “Classification of citrus leaf disease using hyperspectral imagery and YOLOv8”, ASABE AIM, Omaha, Nebraska. Jul. 11, 2023.
- [5] **Yadav, P. K.**, Thomasson, J. A., Hardin, R. G., Searcy, S. W., Braga-Neto, U., Popescu, S. C., ... & Wang, T., “Volunteer cotton plant detection in corn field with deep learning”. SPIE, DCS, Orlando, FL. Jun. 4, 2022.
- [6] **Yadav, P. K.**, White, E. L., Thomasson, J. A., Cholula, U., Marconi, T., & Enciso, J., “Application of UAV Remote Sensing for Detecting Plastic Contaminants in Cotton Fields”, Beltwide Cotton Conferences, Jan. 10, 2020.
- [7] **Yadav, P. K.**, Sharma, F. C., Thao, T., & Goorahoo, D., “Soil moisture sensor-based irrigation scheduling to optimize water use efficiency in vegetables”, Irrigation Show & Education Conference, Irrigation Association, Long Beach, CA., Dec. 4, 2018.
- [8] **Yadav, P. K.**; Swanson, Charles; Penning, Tom; Wallace, Joe., “Study of Moisture Sensors' Response to Drying Cycles of Soil”, Irrigation Show & Education Conference, Irrigation Association, Las Vegas, NV., Dec. 5, 2016.

## Conference Posters from Accepted Abstracts

- [1] **Yadav, P. K.**, Thomasson, J. A., Hardin, R. G., Searcy, S. W., Braga-Neto, U., Popescu, S. C., ... & Wang, T., “Computer Vision for Volunteer Cotton Detection in a Corn Field with Remote Sensing Imagery and Spot-Spray Applications” in *Envisioning 2050 in the Southeast: AI-Driven Innovations in Agriculture*, Auburn, AL., Mar. 10, 2022.
- [2] Sharma, FC., Mele, A., Goorahoo, D., **Yadav, PK.**, T Thao, C Cochran, “Irrigation Scheduling Strategies to Improve Nitrogen Use Efficiency of Vegetables Grown in a Sandy Loam Soil” in *Soil Science Society of America International Soils Meeting*, San Diego, CA. Jan. 2019.
- [3] Mele, A., Sharma, FC., T Thao., Goorahoo, D., **Yadav, PK.**, “Evaluation of Sorghum and Corn Performance to Varying Irrigation and Nitrogen Fertilization Regimes”, *ASA and CSSA Meeting*, Baltimore, MA., Nov. 5, 2018.
- [4] Sharma, FC., **Yadav, PK.**, Goorahoo, D., Thao, T., Mele, A., “ Sensor-Based Technology to Optimize Irrigation Scheduling in Drip-Irrigated Vegetable Systems”, *Annual conference of American Society for Horticulture Science*, Washington DC., Aug. 3, 2018.
- [5] Vang, K., **Yadav, PK.**, Feaver, G., “ Measuring and Monitoring Nitrogen Dynamics in Central Valley Crops in Real Time to Control Nitrogen Leaching”, *California Department of Food and Agriculture-Fertilizer Research and Education Program* conference, Modesto, CA., Oct. 26, 2016.

## RESEARCH GRANTS

- USDA-APHIS Improved Aerial Application Technologies for Precise and Effective Delivery of Crop Production Products (FY) 2020-2022  
*Detecting volunteer cotton plants in a corn field with deep learning on UAV remote-sensing imagery*  
 Primary Investigators- J. Alex Thomasson  
 Co-primary Investigator-**Pappu Kumar Yadav**, Daniel E. Martin, Chenghai Yang, Bradley Fritz  
 Grant amount- **\$205,000**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2016  
*Managing Deep Percolations in Drip Irrigation Systems*  
 Primary Investigator- Shawn Ashkan  
 Co-primary Investigator- David Zoldoske, **Pappu Kumar Yadav**  
 Grant amount- **\$37,720**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2015  
*Orchard Management*  
 Primary Investigators- Balaji Sethuramasamyraja  
 Co-primary Investigator-**Pappu Kumar Yadav**  
 Grant amount- **\$50,000**

- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2017  
*Managing Deep Percolations in Drip Irrigation Systems*  
Primary Investigator- Shawn Ashkan  
Co-primary Investigator- David Zoldoske, **Pappu Kumar Yadav**  
Grant amount- **\$35,991**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2018  
*Managing Deep Percolations in Drip Irrigation Systems*  
Primary Investigator- Shawn Ashkan  
Co-primary Investigator- David Zoldoske, **Pappu Kumar Yadav**  
Grant amount- **\$32,491**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2017  
*Mitigation of Nitrate in Vegetable Crops through an Autonomous Feedback Control System (AFCS)*  
Primary Investigator- Balaji Sethuramasamyraja  
Co-primary Investigator- Dilruba Yeasmin, Dave Goorahoo, **Pappu Kumar Yadav**  
Grant amount- **\$80,377**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2018  
*Mitigation of Nitrate in Vegetable Crops through an Autonomous Feedback Control System (AFCS)*  
Primary Investigator- Balaji Sethuramasamyraja  
Co-primary Investigator- Dilruba Yeasmin, Dave Goorahoo, **Pappu Kumar Yadav**  
Grant amount- **\$67,278**
- California State University-Agricultural Research Institute (CSU-ARI) (FY) 2019  
*Mitigation of Nitrate in Vegetable Crops through an Autonomous Feedback Control System (AFCS)*  
Primary Investigator- Balaji Sethuramasamyraja  
Co-primary Investigator- Dilruba Yeasmin, Dave Goorahoo, **Pappu Kumar Yadav**  
Grant amount- **\$57,200**

## RESEARCH OUTREACH, SERVICES AND COMMUNITY ENGAGEMENT

- Demonstrated real-time video stream from customized UAS over ATT 5G testbed at Texas A&M University-RELLIS campus., May 2022.
- Represented the department of Biological & Agricultural Engineering at TAMU Drone Day., 2019.
- Drone demonstration for visiting students from Mexico - University of Guanajuato., 2019, 2020.
- Departmental representative for UF Postdoc Association at University of Florida, Gainesville, FL., 2022.
- Served as Industry/Student Liaison for ASABE California/Nevada section., 2017.

## ACADEMIC ACHIEVEMENTS/ RECOGNITION

- Secured best student paper award-runner up at SPIE-DCS Autonomous Air and Ground Sensing conference in Orlando, FL., 2023.
- Secured first place during student paper competition at Beltwide Cotton Conferences-Cotton Engineering Systems Conference in Austin, TX., 2020.
- Awarded outstanding work as a graduate student at Graduate Research and Creative Activities Symposium at California State University, Fresno., 2014.

## TECHNICAL SKILLS

- **Software:** Python, TensorFlow, PyTorch, MATLAB, ROS, Gazebo, Robotics Toolbox for Python, Swift, ArcGIS, ENVI,

Mission Planner, Google Colab, JMP Pro, CRBasic, Pix4DMapper, Pix4DCapture, AgroSol, Windows, Linux

- **Hardware:** NVIDIA Jetson TX2, NVIDIA Jetson Nano, Raspberry Pi, Arduino, Pixhawk 4, MicaSense RedEdge-MX, DJI Matrice100, Hyllo AG-110, FPGA, JetBot, Boe-Bot Robot, Campbell Scientific Dataloggers, Specim ImSpector V10E, Headwall Nano-Hyperspec VNIR, SafetySpect CSI-D(+)
- **Machine Learning/Deep Learning Models:** YOLOv3, YOLOv4, YOLOv5, YOLOv7, YOLOv8, Mask-RCNN, VGG16, VGG19, Inception-v3, SVM, Random Forest, MobileNet-v2, LSTM.

## TEACHING AND MENTORING EXPERIENCE

Spring 2023	Served as Teaching Assistant for class <b>ABE6005: Applied Control for Automation and Robotics</b> at <b>University of Florida, Gainesville, FL.</b>
Spring 2019	Served as Teaching Assistant for class <b>BAEN 370: Measurement and Control of Biological Systems and Agricultural Processes</b> at <b>Texas A&amp;M University, College Station, TX.</b>
	<b>Visiting Scholar Mentorship</b>
Summer 2022	<b>Dr. Gopal U. Shinde</b> , Assistant Professor of Mechanical Engineering, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, India
	<b>Graduate Student Mentorship</b>
Summer 2022-Present	Quentin Frederick (Ph.D. student, University of Florida)
Spring 2023	Hanyu Qian (Ph.D. student, University of Florida) Kai Shen (Ph.D. student, University of Florida)
	<b>Undergraduate Student Mentorship</b>
Spring 2022	Quandong Qian (Electrical & Computer Engineering, Texas A&M University)
	Kevin Yu (Electrical & Computer Engineering, Texas A&M University)
Spring 2020	Griselda Quintero (Biological & Agricultural Engineering, Texas A&M University) Landon Kasberg (Biological & Agricultural Engineering, Texas A&M University)

## MEDIA PRESENCE

**AT&T, Texas A&M Demonstrate new 5G Research Testbed, Texas A&M University-Rellis Campus**

- AT&T, Texas A&M Demonstrate new 5G Research Testbed (kbt.com)
- 5G Research Testbed at RELLIS Opens for Business of Innovation - The Texas A&M University System (tamus.edu)
- AT&T and Texas A&M to Launch Private 5G Test Beds (att.com)

## CERTIFICATIONS

- Federal Aviation Administration (FAA)-Remote Pilot (Unmanned Aircraft System). Credential ID- 4146945.
- Fundamentals of Deep Learning for Computer Vision by NVIDIA Deep Learning Institute., Feb. 7, 2020.

## PROFESSIONAL DEVELOPMENT

- Attended workshop on Deep Learning for Computer Vision organized by NVIDIA Deep Learning Institute at Texas A&M University, College Station, TX., Feb. 2020
- Attended workshop at the 26<sup>th</sup> Annual Designer/Manager School of Irrigation held at the Irrigation Training and Research Center, California Polytechnic State University, San Luis Obispo, California., Aug. 3-4, 2015.

## AFFILIATIONS & MEMBERSHIPS

- American Society of Agricultural and Biological Engineers (NRES-24, MS-23-7-3) 2016-Present

- SPIE-International Society of Optics and Photonics 2019-Present
- Phi Tau Sigma – The Honor Society of Food Science and Technology 2024-Present

## PROFESSIONAL SERVICE

### Peer Reviewed articles for following journals

- Computers & Electronics in Agriculture (6)
- European Journal of Agronomy (1)
- Frontiers in Plant Science (6)
- Remote Sensing (1)
- Sustainability (1)
- Agronomy (1)

### Judging, Review Editor

- Served as a judge for poster presentation organized by the Department of Agricultural & Biological Engineering at the University of Florida, Gainesville, FL., 2023
- Serving as review editor for the journal Frontiers in Plant Science-Technical Advances in Plant Science., 2023- Present -

## LEADERSHIP EXPERIENCES

- 2021-2022- Departmental Mentor for Indian Graduate Student Association at Texas A&M University, College Station, TX.
- 2019-2020 Social Chair for Graduate Student Association at Texas A&M University, College Station, TX.