**Agricultural Robotics and Automation: Driving Innovation in Agri-Food Systems**

**1. Organizers**

**Dr. Yongliang Qiao** **(Correspondence)**, Australian Institute for Machine Learning (AIML), The University of Adelaide, SA, 5000, Australia.URL: <https://researchers.adelaide.edu.au/profile/yongliang.qiao> Email: [yongliang.qiao@ieee.org](mailto:yongliang.qiao@ieee.org)

Previously organized workshop/special issues: IROS 2024- AI and Robotic for future farming;IROS 2023- Robotics and Cybernetics for future farming, IROS 2022-Robotics in Agriculture and Livestock Farming Systems; IEEE INDIN 2025-Smart Agriculture, IEEE IECON 2023- Industry 4.0 in Agriculture; IEEE ONCON2022 Industry 4.0 in Agriculture; The XX CIGR World Congress 2022-AI, IoT and Robotics in Agriculture and Livestock Farming.

**Dr. Zichen Huang (Correspondence)**, Assistant professor, Zhejiang University. URL: <https://person.zju.edu.cn/huangzichenss>. Email: [huangzichenss@zju.edu.cn](mailto:huangzichenss@zju.edu.cn).

Previously organized workshop/special issues: IROS 2022-Robotics in Agriculture and Livestock Farming Systems; The XX CIGR World Congress 2022- Working Group on Image Analysis for Agricultural Products and Processes.

**Dr. João Valente,** Tenured Senior Scientist | Agro-Food Robotics, UAVs & Artificial Intelligence, Spanish National Research Council (CSIC),Centre for Automation and Robotics (CAR), 28500, Madrid, Spain.URL: <http://www.joao-valente.com> Email: joao.valente@csic.es

**Associate Professor.** **Liangliang Yang**: Department of Mechanical Engineering, Kitami Institute of Technology, Hokkaido, Japan. URL: <https://hanadasearch.office.kitami-it.ac.jp/searchen/show/id/1304>. Email: Yang [yang@mail.kitami-it.ac.jp](mailto:yang@mail.kitami-it.ac.jp).

Previously organized workshop/special issues: The XX CIGR World Congress 2022- Organized Session: Agricultural Robotics for Field Operations and Sensing; Mobile Robotics in Smart Vineyards; Special issues: Computers and Electronics in Agriculture, Intelligent and Autonomous Systems for Field Operations in Fruit and Vegetable Production

**Prof. Meili Wang**, College of Information Engineering, Northwest A&F University, Yangling, Shaanxi 712100, China. Email: [wml@nwsuaf.edu.cn](mailto:wml@nwsuaf.edu.cn).

Previously organized workshop/special issues: conference programmer for IFIP-ICEC 2020,IVCR 2023

**Assoc. Prof., Yufei Liu**, Zhejiang University, URL: [https://person.zju.edu.cn/en/liuyufei](Previously%20organized%20workshop/special%20issues:)Email: yufeiliu@zju.edu.cn

Previously organized workshop/special issues: The XX CIGR World Congress 2022-Organized Session: Agricultural Robotics for Field Operations and Sensing

**2. Abstract (max 250 words) and Website**

Robotics and AI have become fundamental drivers transforming global industries, including agriculture. The agricultural sector, however, faces unique challenges due to its inherently unstructured environments, hindering the widespread adoption of these technologies.

Simultaneously, the global demand for food, fiber, and fuel continues to rise, driven by population growth and evolving consumer needs. The agricultural sector faces numerous challenges in meeting this demand, including limited arable land, labor shortages, health and safety risks associated with farm work (e.g., chemical exposure, repetitive motion injuries, and ladder falls), and the adverse effects of climate change. Recent advancements in AI, big data, and the Internet of Things (IoT) have led to intelligent farming systems capable of precise monitoring, crop management optimization, and automated harvesting. Technologies such as autonomous navigation, robotic harvesting and weeding, precision chemical applications, and livestock automation (e.g., robotic milking and shearing) are demonstrating significant potential to transform agriculture.

This workshop aims to facilitate interdisciplinary collaboration among experts from agricultural engineering, robotics, and AI research communities. By promoting knowledge exchange and showcasing cutting-edge research and applications, the event seeks to accelerate the development and adoption of AI-driven robotic technologies, ultimately ensuring a more efficient, sustainable, and resilient agri-food system.

Website: xxxx

**3. Content of the workshop and expected impact**

The "Agricultural Robotics and Automation: Driving Innovation in Agri-Food Systems" workshop aims to address one of the most pressing global challenges—enhancing agricultural productivity to meet the rising demand for food, fiber, and fuel. As conventional farming faces increasing constraints, such as labor shortages, diminishing arable land, resource depletion, and climate change, AI and robotics offer transformative solutions. This workshop will focus on cutting-edge advancements in Robotics and Autonomous Systems (RAS) and Artificial Intelligence (AI) for agriculture, demonstrating how these technologies can revolutionize modern farming by enhancing efficiency, sustainability, and yield.

Key objectives include:

* **Highlighting AI and Robotics in Agriculture:** Showcasing state-of-the-art innovations in AI and robotic technologies that are shaping the future of agriculture.
* **Addressing Critical Agricultural Challenges:** Exploring how robotics and AI can help mitigate labor shortages, environmental degradation, and climate risks.
* **Showcasing Cutting-Edge Farming Technologies:** Presenting real-world applications and recent research breakthroughs in robotic farming machinery and AI-driven agricultural decision-making.
* **Catalyzing Cross-Disciplinary Collaboration:** Encouraging the exchange of ideas between experts in **computer science, robotics, AI, agricultural engineering, and crop sciences** to drive forward-thinking solutions.
* **Defining Future Research Directions:** Mapping out the next frontiers in agricultural robotics and AI to inspire novel research and industry applications.
* **Enhancing Industry-Academia Partnerships:** Creating opportunities for researchers, industry leaders, and technology developers to collaborate on practical innovations that accelerate the commercialization and adoption of robotics and AI in agriculture.

**3.1. Reflecting the State-of-the-Art in Robotics and Automation**

The workshop will feature cutting-edge research and technological advancements in agricultural robotics and AI-driven automation, showcasing the latest breakthroughs in areas such as autonomous navigation, robotic harvesting, precision farming, livestock automation, AI-powered crop monitoring, and intelligent decision-support systems. Leading researchers, industry experts, and innovators from top universities, research institutions, and agri-tech companies will present their latest findings and case studies. The workshop will also highlight the integration of machine learning, sensor fusion, bio-inspired robotics, and cloud-based AI solutions, ensuring that the discussions remain at the forefront of scientific and technological progress in the field.

**3.2. Engaging Attendees and Facilitating Idea Exchange**

To foster active participation and collaboration, the workshop will incorporate interactive discussions, live demonstrations, panel debates, and breakout sessions that encourage dialogue between researchers, engineers, and industry practitioners. Attendees will have the opportunity to engage in roundtable discussions, share their insights, and explore potential research collaborations. Additionally, live polling, Q&A sessions, and networking forums will allow participants to shape the discussions in real-time. A poster session and short technical pitch presentations will provide a platform for early-career researchers and startups to showcase their work, ensuring a dynamic and inclusive exchange of ideas.

**3.3 Expanding Originality and Diversity of Workshop Content at IROS 2025**

This workshop will introduce a unique interdisciplinary perspective to IROS 2025 by bridging robotics, AI, and agricultural sciences, which are often underrepresented in mainstream robotics conferences. By including speakers and attendees from diverse geographical regions, such as North America, Europe, Asia, the event will address region-specific agricultural challenges and solutions. The discussions will also emphasize emerging technologies and future research directions, ensuring that the workshop contributes fresh insights to the robotics and automation community. Additionally, by fostering collaborations between academia, industry, and policymakers, the workshop will help accelerate the real-world impact of AI and robotics in agriculture, further enhancing the originality and applied significance of IROS 2025 content.

**4. Intended audience and expected attendance**

The "Agricultural Robotics and Automation: Driving Innovation in Agri-Food Systems" workshop is poised to attract a diverse and engaged audience, targeting professionals, academics, and enthusiasts at the intersection of technology and agriculture. Specifically designed for those passionate about leveraging artificial intelligence (AI) and robotics to revolutionize farming practices, this workshop will draw interest from various sectors including researchers in robotics and AI, agricultural engineers, tech developers, farmers looking for innovative solutions, and policymakers focused on sustainable agriculture initiatives.

This workshop is especially relevant to members of several RAS Technical Committees (TCs) such as the Agricultural Robotics and Automation (ARA), Autonomous Ground Vehicles and Intelligent Transportation Systems (AGV-ITS), and the Environmental Monitoring TCs. Additionally, communities focused on bio-inspired robotics, cyber-physical systems, and big data analytics in agriculture will find the content particularly pertinent. The cross-disciplinary nature of the workshop aims to foster collaboration and spark innovation across these varied yet interconnected fields.

Based on the attendance of similar workshops at previous conferences and the growing global emphasis on sustainable and technologically driven farming solutions, we anticipate the workshop to attract a significant audience. We estimate an on-site attendance of approximately 100-120 participants, with additional online attendees potentially bringing total participation to 150-200. This projection is bolstered by the increasing interest in agricultural technology solutions demonstrated at recent IROS conferences and other related symposiums. The workshop's focus on cutting-edge technological applications in agriculture, combined with the urgency of addressing global food security challenges, positions it as a must-attend event for professionals and enthusiasts alike, promising a comprehensive and engaging experience for all participants.

**5. Invited speakers**

**List of confirmed speakers:**

1. Daobilige Su, Professor, College of Engineering, China Agricultural University, China. Email: [sudao@cau.edu.cn](mailto:sudao@cau.edu.cn). Proposed Title: The progress of Agricultural Robotics in China.

2. Mahirah Jahari (Female), Senior Lecturer, Faculty of Engineering, University Putra Malaysia, Email: [jmahirah@upm.edu.my](mailto:jmahirah@upm.edu.my),Proposed Title: Embracing the future: advancements and impact of smart agriculture technology in Malaysia

3.Johann Laconte, Professor, French National Institute for Agriculture, Food, and Environment (INRAE). Email: [johann.laconte@inrae.fr](mailto:johann.laconte@inrae.fr) Proposed Title: Navigating Nature's Dance: Robotics for Agriculture and Environmental Monitoring in Ever-Changing Landscapes

4. Wei Guo, Associate Professor, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Email: [guowei@g.ecc.u-tokyo.ac.jp](mailto:guowei@g.ecc.u-tokyo.ac.jp), Proposed Title: Before and After: Transforming Orchard Pruning with 3D Sensing and Visualization.

5. Hao Guo, Associate Professor, China Agriculture University, China Email: [guohaolys@cau.edu.cn](mailto:guohaolys@cau.edu.cn). Proposed Title: 3D Vision Unveiled: Precision Livestock Insights through Animal Shape Analysis

6. Manoj karkee, Professor and Director, Center for Precision and Automated Agricultural Systems and Dept. of Biological Systems Engineering,Washington State University. Email: [manoj.karkee@wsu.edu](mailto:manoj.karkee@wsu.edu).Proposed Title: AI and Robotics in Specialty Crop Production

7. Lei Shu, Professor, Nanjing Agriculture University, Nanjing, China. Email: Proposed Title: The Revolution in Plant Disease Detection Applications of Emerging Technologies and Intelligent Analysis

8. Zhenjiang Zhou, Professor, College of Biosystems Engineering and Food Science, Zhejiang University, Email: [zhenjiangz@zju.edu.cn](mailto:zhenjiangz@zju.edu.cn),Proposed Title: Diagnosis of Water and Nitrogen Status of Field Crops using Spectral and Imagery Methods

9. Dr. Jiajun Zhu, Smart Agriculture Technical Expert, Weichai Lovol Intelligent Agricultural Technology Co., Ltd, Email: [zhujiajun@lovol.com](mailto:zhujiajun@lovol.com),Proposed Title: AI-Driven Robotic Tractor System for Autonomous Vineyard Operations

10. Deqin Xiao (Female), Professor，College of Mathematics and Informatics, South China Agricultural University. Email: [deqinx@scau.edu.cn](mailto:deqinx@scau.edu.cn),Proposed Title: Research Exploration and Practice of Agricultural and Livestock Farming Robots

11. Josie Hughes (Female), Institute of Mechanical Engineering, École Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland. Email: [josie.hughes@epfl.ch](mailto:josie.hughes@epfl.ch),Proposed Title: Lab2Field translation for Agri-food technologies

12. Qiankun Fu, Associate Professor, College of Biological and Agricultural Engineering, College of Bionic Science and Engineering, Jilin University, Email: [qkfu@jlu.edu.cn](mailto:qkfu@jlu.edu.cn).Proposed Title: Exploration and Application of Bionic Technology in Intelligent Corn Picking

13 Dr.Muharfiza,Director, Indonesian Agricultural Engineering Polytechnic, Ministry of Agriculture, Republic of Indonesia, Email: [muharfiza@pertanian.go.id](mailto:muharfiza@pertanian.go.id), Proposed Title: TBD

**6. Structure of the workshop**

The "Agricultural Robotics and Automation: Driving Innovation in Agri-Food Systems" workshop, designed as in-person attendance along with an online broadcast option, aims to foster extensive interaction among attendees and facilitate meaningful exchanges between established experts and early-career researchers. The structure of this half-day workshop is designed to ensure open-ended discussions and active participation across all sessions. Proposed workshop structure is as follows:

**Invited Speaker Presentations:** The workshop will begin with presentations from invited speakers, each allocated a 15-minute presentation slot followed by a 5-minute Q&A session. Two thematic sessions are considered.

Session1: *Autonomous Systems for Agricultural Operations*: Focusing on the application of autonomous robotic systems in performing various farming operations, covering current innovations, challenges, and future directions.

Session2: *AI and robotics-driven Solutions for Farm Management*: Showcasing novel AI methodologies and their impact on enhancing farm management and productivity.

**Poster Presentations:** A dedicated session for poster presentations will allow young researchers and industry participants to showcase their work, each given a 3-minute spotlight to present their research, followed by interactive discussions during the coffee break.

**Panel Discussions:** Two 15-minute panel discussions will provide a platform for more in-depth exploration of the themes discussed during the presentation sessions, featuring representatives from academia, industry, and relevant professional societies. These discussions aim to bridge gaps between research findings and practical applications in the farming sector.

**Remote Participation Engagement:** Online attendees will follow the presentations via ZOOM. This set-up will allow for further discussion of presented posters and an opportunity for early-career researchers to engage with other researchers and professionals. Encourage participation by explicitly inviting questions and comments from early-career researchers during Q&A sessions.

**Networking Event:** An onsite networking event will be organized at the end of the workshop, offering an informal environment for all participants to connect, reflect on the day's learnings, and discuss potential collaborations.

**Post-Workshop Engagement:** Encourage and support the formation of collaborative research groups or consortia among participants to pursue follow-up projects, joint research proposals, or grant applications. Facilitate connections with industry representatives who participated in the workshop to explore potential applied research collaborations, pilot projects, or technology transfer opportunities.

**7 Tentative schedule**

## *Program*

Provide a (tentative) program for the workshop.

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| --- | --- | --- |
| Time | Speaker  /Affiliation | Topic/title |
| 8:30 – 8:30… | All organizers | Welcome and Introduction |
| **Session 1: Autonomous Systems for Agricultural Operations: novel methods, dedicated robotic concepts, prototypes and applications.**  **Co-Chairs: Qiao** | | |
| 8:30 – 8:45 | Prof. Daobilige Su  University of Florida | The progress of Agricultural Robotics in China |
| 8:45 – 9:00 | Dr.Mahirah Jahari  Universiti Putra Malaysia | Embracing the future: advancements and impact of smart agriculture technology in Malaysia |
| 9:00 – 9:15 | Dr. Johann Laconte  French National Institute for Agriculture, Food, and Environment (INRAE) | Navigating Nature's Dance: Robotics for Agriculture and Environmental Monitoring in Ever-Changing Landscapes |
| 9:15 – 9:30 | Prof. Wei Guo  University of Tokyo | Before and After: Transforming Orchard Pruning with 3D Sensing and Visualization |
| 9:30 - 9:45 | Manoj karkee  Washington State University | AI and Robotics in Specialty Crop Production |
| 9:45-10:00 | Jilin University | Exploration and Application of Bionic Technology in Intelligent Corn Picking |
| 10:00-10:20 | 3-min Paper/Poster Presentations (breaks included) | |
| **Session 2: AI and robotics-driven Solutions for Farm Management: current status, needs**  **and demands for sustainable food production**  **Co-Chairs: Huang** | | |
| 10:20 – 10:35 | Dr. Lei Shu  Nanjing Agriculture University | The Revolution in Plant Disease Detection Applications of Emerging Technologies and Intelligent Analysis |
| 10:35 – 11:00 | Zhenjiang Zhou  Zhejiang University | Diagnosis of Water and Nitrogen Status of Field Crops using Spectral and Imagery Methods |
| 11:00 – 11:15 | Deqin Xiao  South China Agricultural University | Research Exploration and Practice of Agricultural and Livestock Farming Robots |
| 11:15 – 11:30 | Hao Guo  China Agriculture University | 3D Vision Unveiled: Precision Livestock Insights through Animal Shape Analysis |
| 11:30 – 11:45 | Josie Hughes  École Polytechnique Fédérale de Lausanne (EPFL) | Lab2Field translation for Agri-food technologies |
| 11:45 – 12:00 | Dr. Jiajun Zhu  Weichai Lovol Intelligent Agricultural Technology Co., Ltd | : AI-Driven Robotic Tractor System for Autonomous Vineyard Operations |
| 12:00 – 12:15 | Dr.Muharfiza  Indonesian Agricultural Engineering Polytechnic | TBD |
| 12:15 – 13:30 | Networking and lunch | |

**8. Plan to solicit participation**

To generate widespread interest and ensure diverse participation in the proposed workshop, we will implement a comprehensive solicitation plan that encompasses several strategic mechanisms:

**Timely Announcements**: We will release an initial “Call for Posters” immediately after the workshop is approved. This announcement ensures potential participants are well-informed and have ample time to prepare their submissions. The call will highlight specific themes within AI and robotics for farming, encouraging submissions that address current challenges, innovative solutions, and future directions in sustainable agriculture.

**Social Media Campaigns**: We will leverage popular platforms such as X, LinkedIn, and Facebook to reach a broader audience. Regular posts will feature workshop highlights, key dates, and teasers of keynote speakers and invited talks. Utilizing existing mailing lists from related technical committees, previous workshops, and conferences, we will send out targeted emails to potential participants who have demonstrated interest in agricultural robotics and AI. The promotional materials will also be pushed out through the social media (e.g, LinkedIn) and mailing list managed by the center, which is expected to reach a wide range of target audience from around the world.

**Technical Committees Engagement**: Direct engagement with relevant RAS Technical Committees, such as Agricultural Robotics and Automation (ARA) and Environmental Monitoring, as well as relevant communities under CIGR (International Commission of Agricultural and Biosystems Engineering), IFAC (International Federation of Automatic Control), and ASABE (American Society of Agricultural and Biological Engineers) will be sought to advertise the workshop and encourage their members to participate or submit abstracts.

Awards and Incentives: To encourage high-quality submissions and presentations, we will offer awards for the best poster/paper, judged on originality, impact, and clarity.

By implementing these strategies, we aim to attract a wide and diverse audience to the " Agricultural Robotics and Automation: Driving Innovation in Agri-Food Systems" workshop, fostering a rich exchange of ideas and perspectives that will contribute to advancing the field of agricultural robotics and AI.

**9. Dissemination**

The organizing committee is committed to disseminating the content and outcomes of the "AI and Robotics for Future Farming" workshop through a variety of channels to ensure wide visibility and impact:

* **Digital Accessibility**: All presentations, posters, and videos from the workshop will be published on the workshop’s dedicated website, ensuring permanent, open access to these resources.
* **Recording and Archiving**: We will record all presentations, making them available on the workshop’s website for enduring access, thereby extending the workshop's reach beyond its temporal confines.
* **Special Issue Proposal**: The workshop's proceedings will be compiled and proposed for a special issue in a robotics-related journal. This initiative aims to highlight exceptional contributions and foster ongoing discussion in the field.
* **Community Outreach**: Dissemination efforts will include announcements on websites and mailing lists relevant to the robotics, control, and aquaculture communities, leveraging the extensive networks of these groups to reach a broad audience.
* **Social Media Engagement and Networks**: Active promotion on platforms like LinkedIn, Facebook, and Twitter will ensure the workshop’s visibility and engagement with a diverse, global audience.

In adherence to RAS Guidelines, the organizing committee guarantees its presence at the workshop and ensures that all aspects of the workshop will comply with these standards, promising a well-organized, accessible, and impactful event.

**10. Equipment**

Describe any additional requests you may have regarding particular equipment or room setup. For instance: seating arrangements, power requirements, demo space, additional microphones, extra projectors/monitors, etc. Please also indicate the number of posters that you are expecting for your event.

Note:

▪ The workshop proposal should fit within a maximum of 10 pages.

▪ IEEE RAS Technical Committee support letters are not allowed in the submission.