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Editorial: Horizons in imaging

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Editorial on the Research Topic
Horizons in imaging

Over the past several years, imaging technology has undergone a rapid wave of innovation, with new applications reshaping a wide range of fields, from healthcare and environmental monitoring to entertainment and civil security. This rapid progression is primarily driven by remarkable strides in computational power, expanded transmission bandwidth, the design of advanced imaging devices, and the revolutionary capabilities provided by Artificial Intelligence (AI) tools.

It is our pleasure to introduce the *Horizons in imaging* article collection, a curated series of high-impact, authoritative, and reader-friendly articles that delve into some of the most current and influential Research Topics in the field of imaging. This Research Topic brings together five cutting-edge papers, each selected for their significant contributions to the theory, methodology, and application of imaging technology. Collectively, these papers showcase the diversity of research performed across the entire breadth of the field, illustrating the vast spectrum of innovative work underway. From foundational theoretical advancements to practical applications in both academic and translational research, the articles reflect on recent developments that are pushing the boundaries of what imaging technology can achieve.

Xiang et al. present an in-depth review on computational optical imaging, exploring the transformative potential of computational imaging technology (CIT) across five forward-looking application dimensions: "higher," "farther," "smaller," "wider," and "stronger". Each of these perspectives is aimed at driving the continuous and integrated advancement of CIT, while also facilitating the rapid adaptation and deployment of this technology across various fields. This study approaches computational imaging from both broad and specialized perspectives, outlining its core components and analyzing the key technologies that underpin its ongoing evolution. The paper synthesizes the technological advancements in CIT, identifying critical challenges and summarizing innovative solutions.

Koutlemanis et al. explore advancements in close-range photogrammetry, a technique used for creating high-precision 3D models of surfaces from short distances. The study introduces a novel computer numerical control (CNC)-based image acquisition apparatus that automates the image capture process, significantly reducing the complexity and likelihood of human error. The apparatus uses a consumer-grade camera and affordable, 3D-printed CNC components to lower costs, drawing on a previous low-cost, contactless flatbed photogrammetric scanner. Additionally, the paper introduces new methods to tackle algorithmic challenges, using auxiliary images captured from multiple distances to enhance the precision of surface reconstruction. The resultant device and approach offer a generic surface reconstruction modality that is robust to illumination specularities, is useful for several applications, and is cost-efficient.

Ouis and Akhloufi address advancements in automated medical imaging report generation, specifically in radiology, with a focus on enhancing diagnostic precision and easing the workload of radiologists. The article introduces a new approach, ChestBioX-Gen, developed specifically for generating chest X-ray reports. This model leverages advanced deep learning techniques to address challenges in report generation that are not adequately handled by traditional image captioning or generic natural language generation methods, which often lack the specificity and structured nature required for radiology. The model's effectiveness was evaluated using the IU-X-Ray dataset, showing strong performance on the BLEU metric, indicating high-quality report generation. This underscores ChestBioX-Gen's potential to assist radiologists by automating coherent, informative reports, ultimately supporting better patient care and clinical efficiency.

Konrad et al. discuss the importance of real-time, accurate occupancy sensing in various settings, including office spaces, retail stores, and large public areas, for purposes such as security, efficient space utilization, and energy conservation. In particular, they provide an overview of recent research efforts in the area of fisheye cameras mounted overhead, that have become the sensing modality of choice because they offer large-area coverage and significantly-reduced occlusions. The authors also describe a framework for people counting using two cameras and demonstrate its effectiveness in a large classroom for location-based person re-identification.

Riekeles et al. present a new method for tracking bacterial movement using Digital Holographic Microscopy (DHM) and the Holographic Examination for Life-like Motility (HELM) tool. Traditional tracking is labor-intensive, especially for high-speed bacteria in 3D, but DHM allows for detailed depth tracking, while HELM uses Motion History Images (MHIs) to create color-coded visuals of bacterial paths over time. By identifying movement patterns first and locating individual bacteria afterward, this approach improves tracking accuracy, reduces processing time, and is particularly well-suited for *in-situ* measurements in contexts where computing power and data transmission volume may be limited.

We are grateful to all the authors for submitting their papers and the reviewers for their valuable comments and suggestions that significantly improve the quality of the articles. We hope that this Research Topic will prove to be a valuable resource for researchers, scientists, engineers, and academics within the imaging field, providing them with a comprehensive reference that informs, inspires, and supports continued advancements and innovation in this rapidly evolving area.

Author contributions

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Generative AI statement

The author(s) declare that Gen AI was used in the creation of this manuscript. ChatGPT was used to refine some sentences.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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