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New technologies and integration of Artificial intelligence for monitoring insect pollinators

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Abstract: Current studies indicate that integrating Artificial Intelligence into various domains of insect science is driving notable advancements. Deep learning and computer vision technologies are already employed for the identification and classification of insect species using both visual and acoustic data, demonstrating promising prospects for incorporating these approaches into future monitoring frameworks.
The "Standardized European monitoring of plant-pollinator interactions" (SEPPI) project proposes an automated approach based on Artificial Intelligence, to facilitate data collection and analysis for plant-pollinators interactions. In 2024, the SEPPI team developed a protocol that underwent testing across eight European countries: Germany, Belgium, Hungary, Czechia, Latvia, Finland, Italy, and Romania. In this project, non-lethal technologies were implemented by deploying Insect Detect camera traps to capture images of pollinators interacting with flowers within their natural habitats. AI tools, such as YOLO object detection models were utilised to classify and identify the insect species present in the captured images.
Preliminary findings indicate that the automated pollinator monitoring method is more time-efficient than traditional techniques. This approach is straightforward to implement in the field and considerably reduces human workload. We consider that once the AI tools is fully trained to identify pollinators, they have the potential to deliver standardized methodologies that can be scaled without necessitating prior taxonomic expertise.
While artificial intelligence tools may not match human experts in species-level identification, they can exhibit considerable speed and efficiency in detecting trends among pollinators and assessing ecosystem services related to pollination, thereby facilitating prompt management interventions. Moreover, these AI tools demonstrate adaptability for various ecological research applications.

Keywords: Plant-pollinators interactions, automated monitoring, Artificial Intelligence, Insect Detect camera traps, YOLO object detection models.

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