PUBLIC SUBMISSION

Received: May 29, 2025
Tracking No. mb9-y1n9-cuqt
Comments Due: May 28, 2025 **Submission Type:** API

Docket: NSF-2025-OGC-0001
NITRD_FRDOC_0001

Comment On: NSF-2025-OGC-0001-0001
Request for Information: Development of a 2025 National Artificial Intelligence Research and Development Strategic Plan

Document: NSF-2025-OGC-0001-DRAFT-0283
Comment on FR Doc # 2025-07332

Submitter Information

Organization: Entomological Society of America

General Comment

Please see the attached comments submitted on behalf of the Entomological Society of America. Thank you for the opportunity to provide input.

Attachments

ESA_NITRD_NCO_AI_RFI

ENTOMOLOGICAL SOCIETY OF AMERICA
SHARING INSECT SCIENCE GLOBALLY

170 Jennifer Road, Suite 230
Annapolis, MD 21401 USA
Phone: 1-301-731-4535
esa@entsoc.org
entsoc.org

May 29, 2025

Mr. Faisal D'Souza, NCO
National Coordination Office (NCO)
Networking and Information Technology Research and Development (NITRD)
2415 Eisenhower Avenue
Alexandria, VA 22314

Submitted electronically

RE: Request for Information on the Development of a 2025 National Artificial Intelligence (AI) Research and Development (R&D) Strategic Plan

Dear Mr. D'Souza,

The Entomological Society of America (ESA) is the largest organization in the world serving the professional and scientific needs of entomologists and individuals in related disciplines. Founded in 1889, ESA has nearly 7,000 members affiliated with educational institutions, science agencies, private industry, and government. Please accept the following comments submitted on behalf of the ESA in response to the "Development of an Artificial Intelligence Action Plan" on behalf of the Office of Science and Technology Policy (OSTP) and Networking and Information Technology Research and Development (NITRD).

Entomology, while focused on insects and arthropods, is a very wide and diverse discipline cutting across many different global challenges as well as domestic ones. These include, but are not limited to, food security, vector-borne disease prevention, invasive species, and protecting biodiversity. To that end, a brief survey of the membership indicates AI is already being integrated into many of these spaces but there are ample opportunities to grow in terms of helping protect American agriculture, public health, military, and citizens.

One challenge to all of this is that more than half of all species on Earth are insects and their relatives, with more than 1.5 million species described (known to science and assigned a scientific name) and at least that many more awaiting discovery or description. Insects are the largest and most diverse lineage of living organisms, and the amount of information required to train AI when there is so much biodiversity is a serious challenge. This is especially so when one considers how many insects have yet to even be discovered. Studying some species of insects is challenging given their small size and, in some cases, the only way to distinguish one species from another is by dissection at this time, external physiology is nearly identical. Additionally, balancing the environmental impacts of AI through pollution, water usage, and the depletion of other natural resources poses a real risk to increasing many of the global challenges we are trying to address. AI technologies offer real potential benefits to expand American leadership in this branch of science and today ESA wishes to offer constructive ideas and opportunities on the development of these tools.

ENTOMOLOGICAL SOCIETY OF AMERICA
SHARING INSECT SCIENCE GLOBALLY

170 Jennifer Road, Suite 230
Annapolis, MD 21401 USA
Phone: 1-301-731-4535
esa@entsoc.org
entsoc.org

To that end, we have highlighted a handful of areas where applying AI currently is and/or can help advance the field further. However, any success in this space requires additional funding to ensure the development of future technologies and then align those with where data is held. As much as possible, data should be held by individuals instead of corporations or government. Without a funding plan, however, there is little chance of developing systems that will keep America as a leader in technology, so we encourage the Administration to work with Congress on developing a strategy to advance American competitiveness in this space.

Agriculture: AI can be an additional tool for integrated pest management (IPM), which is a science-based approach to pest management that relies on both chemical and non-chemical tactics to suppress pests, weaving together biological, cultural, physical, and chemical tools to manage pests in a way that reduces overall economic, health, and environmental risks. AI-powered image recognition could rapidly identify insect pests from images captured via tractor, drone, or satellite, helping farmers detect infestations early and apply targeted treatments. This could both save farmers money on inputs like pesticide, increase crop productivity and yield, and benefit the environment by using less chemicals. AI could also be used for predictive modelling of pest outbreaks by analyzing climate, crop, and insect population data to predict outbreaks and suggest proactive management strategies.

Public Health and Vector-Borne Diseases: AI can be deployed to help increase vector-borne disease surveillance and monitoring. AI can track and predict the spread of disease-carrying insects like mosquitoes and ticks by analyzing environmental and population data, aiding in disease prevention. AI models can also process image and video data to study insect behaviors, such as feeding or mating, which would increase our understanding how vectors spread diseases, especially with new and emerging vectors.

Biotechnology and biodiversity: AI can help increase the power of genetics and genomics. AI can analyze massive genomic datasets of insects to identify genes associated with pesticide resistance, disease transmission, or beneficial traits for biotech applications. AI could also be deployed to help reduce the number of insects which must be collected for biodiversity surveys, instead using images and video to analyze species, population density, and behaviors.

Invasive Species: AI could analyze shipping and trade data alongside environmental conditions to help predict routes of high-risk invasive insect species and prevent the spread and establishment on U.S. lands. New technologies integrating AI could be applied at ports when cargo arrives. AI-driven simulations can help identify new biocontrol opportunities by designing and optimizing the use of beneficial insects (like parasitoids) for controlling agricultural pests more effectively to help speed laboratory testing. This would be particularly useful applied to the foreign insects with the highest risk of becoming invasive species here, so we are better prepared if they are detected after they have become established.

National Security and Military Preparedness: AI could be used for insect-borne threat detection by monitoring insects near military bases, identifying potential disease vectors like mosquitoes, ticks, and sand flies, predicting outbreaks that could affect troop health and readiness. AI-driven drones equipped with insect-detection sensors can scout the landscapes around domestic bases as well as deployment

ENTOMOLOGICAL SOCIETY OF AMERICA
SHARING INSECT SCIENCE GLOBALLY

170 Jennifer Road, Suite 230
Annapolis, MD 21401 USA
Phone: 1-301-731-4535
esa@entsoc.org
entsoc.org

zones for signs of insect-borne disease risks or invasive species, providing real-time data for situational awareness.

Museums and Collections: Museum collections can be used to help train AI. In turn, AI-based image analysis can help identify and classify insect specimens in museum collections, making taxonomy more efficient and consistent. AI can also assist in transcribing and organizing historical entomological data from specimen labels and field notes, making them more accessible for researchers.

Pest Management: In addition to all these other applications, pests are also a nuisance and sometimes health risk in homes, schools, hospitals, restaurants, and other businesses. AI-powered insect traps equipped with cameras and sensors can identify and count pest species, providing automated, real-time population data for more precise pest control strategies. AI can also analyze environmental and pest data to guide precise pesticide application, minimizing chemical use while maximizing effectiveness — especially important for protecting human health and infrastructure.

If you have additional questions, please don't hesitate to contact Erin Cadwalader, Ph.D., ESA Director of Strategic Leadership and Policy. ESA would be more than happy to have a more robust conversation on these opportunities and how the Society can help support NITRD and OSTP's objectives in this space. Certainly, we all want the same outcome, protecting America's biosecurity. ESA thanks you again for the opportunity to weigh in on this and provide some suggestions on entomological applications of AI.

Best Regards,

Chris Stelzig, CAE
ESA Executive Director