

# AI for Earth Grantee Profile

ATREE

Biodiversity atlas for northeast India

## Summary

The Ashoka Trust for Research in Ecology and Environment (ATREE) plans to use machine learning and computer vision to boost its efforts to map and catalog the unique, resource-rich ecosystem of northeast India. Armed with detailed satellite images of the region and the AI for Earth grant, the team believes AI-enabled tools will help them create a comprehensive database of biodiversity to help policymakers and local communities make better-informed economic, ecological, and infrastructure-related decisions.

## Building a biodiversity atlas for northeast India

Earth has a vast diversity of life—millions of different species from microscopic bacteria to the tallest trees and biggest whales. These species are interdependent in many complex ways, more than we fully understand. And human society relies on the natural ecosystems of this biodiversity, from maintaining water quality to fertilizing our fields to controlling pest populations, for example. As the Convention on Biological Diversity [states](#), “It is the combination of life forms and their interactions with each other and with the rest of the environment that has made Earth a uniquely habitable place for humans. Biodiversity provides a large number of goods and services that sustain our lives.”

To preserve biodiversity and protect threatened species strategically and cost-effectively, scientists need to be able to identify the species present in a given area—traditionally the work of taxonomists, but there simply aren’t enough taxonomists to keep up with the pressing demands. Digital tools such as image recognition algorithms and internet databases can help, giving taxonomists greater access to specimens, research, and tools for identification. However, the currently available resources—particularly those that engage the general public as citizen scientists—tend to focus on the attractive features of plants such as flowers. In some areas such as tropical forests, where flowers are seasonal or high up in the canopy, scientists must rely on other features such as leaves for identification, and digital resources covering these areas are lacking.

## Protecting the unique, biodiversity-rich region of northeast India

The northeast region of India is one such area, a global hotspot of diversity and home to some of the rarest flora and fauna in the world, from the Hoolock Gibbon to the Phayre’s Leaf Monkey. The eight Indian states of this region are also home to millions of humans and many diverse ethnic cultures. The region is ripe for economic

development, but to conserve and manage it sustainably, first the natural resources have to be documented and mapped. And its dense forests covering rugged terrain create extra-challenging conditions for gathering the necessary data.



*Dr. Muneeswaran Mariappan is using satellite images and AI tools to analyze biodiversity data.*

Now, a team of scientists from Bengaluru's Ashoka Trust for Research in Ecology and Environment (ATREE) wants to meet that challenge with AI. With a PhD in the field of urban forest carbon stock estimation, Dr. Muneeswaran Mariappan is working alongside Dr. R. Ganesan, an expert in plant taxonomy and plant ecology, and a group of conservation biology researchers at ATREE. Armed with detailed satellite images of the region and the AI for Earth grant, the team believes AI-enabled tools will help them collect, document, and analyze biodiversity data that has never been captured before.

### **Building the biodiversity maps**

Currently, the team is creating a precise grid map for the region by training an AI algorithm to identify the urban and rural areas, forest cover, river beds, and other water bodies from satellite images. With this capability to classify different types of land use, the computer vision model can focus on the forested areas for the second phase, identifying species to map biodiversity. Field researchers will survey a small portion of the mapped area, documenting the various species found there. This gathered data will be fed into the model to train it to recognize the different types of vegetation at satellite image resolutions as fine as three meters. Eventually, the maps will be used to plot patterns of species distribution, richness, abundance, rarity, and endemism.

The Microsoft virtual machines will provide high computation support for data science tools, which is the primary requirement for this massive project. ArcGIS Pro, with interfaces in R and Python, also will be a huge

asset for spatial data processing, analysis, and visualization. The Azure AI tools make it feasible to map the ecosystems at the three-meter pixel level over a large area, and also provide object-based classifications algorithms which is crucial for the image classification. Deep learning algorithms can be used to identify the flowering plants and plant species by the field photos and herbarium samples.

## Going forward

The team hopes that by applying computer vision to create a comprehensive database of biodiversity in the region, they will help policymakers and local communities make better-informed economic, ecological, and infrastructure-related decisions. Dr. Mariappan explains, “Even the local people are not sure what kind of species are around them, what kind of forest type is around them, and what are the elements they can take from a particular forest.” With this information, the people and governments will know which trees can be used responsibly, which should be preserved for the future, and which are in need of conservation. Further along, these digital tools could be expanded to larger areas and different geographies as well.

## About ATREE

Ashoka Trust for Research in Ecology and the Environment (ATREE) is a global not-for-profit organization which generates rigorous interdisciplinary knowledge to inform policy and practice towards conservation and sustainability. For over two decades, ATREE has worked on social-environmental issues like biodiversity and conservation, climate change mitigation and development, land and water resources, forests and governance, and ecosystem services and human well-being. The organization envisions a society committed to environmental conservation and sustainable and socially just development, and works to enable the use of scientific knowledge by policy makers and society, and to train the next generation of environmental leaders.

## Resources

### Websites

[ATREE home site](#)

### Press

“Green warriors from India receive Microsoft AI for Earth grants to enable a sustainable future.” Microsoft News Center India. November 2018. <https://news.microsoft.com/en-in/features/microsoft-ai-for-earth-grant-recipients-india/>

### Documentation

*Sustaining Life on Earth*. Secretariat of the Convention on Biological Diversity. April 2000. <https://www.cbd.int/convention/guide/default.shtml>