Zoological Society of London: Taking the pulse of the planet with AutoML

About ZSL (Zoological Society of London)

ZSL (Zoological Society of London) is an international conservation charity working to create a world where wildlife thrives.

Industries: Non-profit

Location: United Kingdom

Products: BigQuery

With the earth's biodiversity in crisis, and species increasingly at risk from a number of threats, ZSL is using AutoML to identify animals in vast camera-trap datasets to help save species.

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About Datatonic

Google Cloud Results

Identifie

- Capable of identifying species from thousands of images in days instead of months
- Trains new machine learning models using ZSL's archival images
- Could enable real-time monitoring of the world's biodiversity in the future

in days, months

Google Cloud Premier Partner Datatonic delivers big data and machine learning solutions for telecommunication, media, retail, and finance clients.

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About Datatonic

delivers big data and machine learning

BigQuery (https://cloud.google.com/bigquery/)

Cloud AutoML (https://cloud.google.com/automl/)

Cloud Storage (https://cloud.google.com/storage/)

Cloud Dataflow (https://cloud.google.com/dataflow/)

Google Data Studio (https://datastudio.google.com/overview)

App Engine (https://cloud.google.com/appengine/)

Over the last 40 years, the average size of wildlife populations has shrunk by around 60 percent. On every continent, populations of wild species are being driven to the limit as habitats are destroyed, hunters

feed an illegal trade in wildlife, and man-made climate change disrupts whole ecosystems.

The [Zoological Society of London](https://www.zsl.org/) (ZSL), an international conservation charity, tracks this worrying trend and fights against it. A 180-year-old institution, ZSL runs wildlife conservation projects in over 50 countries worldwide, working with local communities to improve sustainability and preserve environments. As well as conducting scientific research, ZSL promotes engagement with its two zoos in London and Whipsnade, United Kingdom, helping to raise awareness of the problems animals face.

The stakes could hardly be higher, as Robin Freeman, head of the Indicators and Assessments Unit at ZSL, explains:

"Biodiversity supports our everyday lives. We continue to observe dramatic declines in the abundance and richness of wildlife, globally. Understanding the processes that drive these declines is critical, and new technologies can help us achieve this."

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each and every camera trap and many of these may be blank. Using these automated machine learning tools to identify species or sift out blanks can dramatically change how we work, saving our limited resources to focus on our conservation work."

—Robin Freeman, Head of the Indicators and Assessments Unit, ZSL Institute of Zoology

To track life in the wild, ZSL's conservation team uses camera traps to capture wild animal behavior and estimate population numbers. Camera traps use a

passive infrared sensor to detect passing animals and digitally photograph them.

Affordable digital camera traps have had a massive impact on conservation work, but the innovation has brought challenges, too. A single camera trap attached to a tree can record images for six months, taking about 60 images a day, so when ZSL collects it, they typically retrieve over 10,000 images from a single device. Each individual image must be manually tagged to identify species. And because a survey area might include 100 cameras, there may be more than 1 million images to manually analyze and annotate in a process that takes months.

ZSL is working with Google Cloud to try to speed that up, using machine learning tools to automatically recognize animals with great detail and dramatically reduce the time and resources needed.

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Training machine learning models, no expertise required

ZSL employs expert conservationists who spend a lot of time manually labelling images. This is time they could use working on other tasks. That made tagging photographs expensive for ZSL, a non-profit charity. And because the process could take months, by the time a report on an endangered species arrived, it might be too late to act.

ZSL has been exploring whether Cloud AutoML (https://cloud.google.com/automl/) could transform this process. "AutoML dramatically simplified the process of creating new models," says Robin. "This may dramatically change their accessibility, enabling many new users to benefit from them."

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—*Sam Seccombe, Technical
Field Specialist, Conservation
Technology, ZSL*

Without a team of machine learning experts, ZSL can create and train the models it needs. "Developing image recognition algorithms to identify species is complicated and time consuming," adds Sam Seccombe, Technical Field Specialist at ZSL. "But AutoML enables non-technical conservations to create bespoke models from their datasets quickly and easily."

The ZSL team uses camera trap images that have already been labeled to train an AutoML model. "Once you have the data in the cloud, it's as simple as

clicking 'train new model'," says Oliver Wearn, AXA Research Fellow at ZSL. "That's really all there is to it. Google has taken all the hard work of optimizing the algorithms out of the process. You literally press 'train' and after a day it comes back to you with a model."

"A successful business relies on being able to collect, analyze, and interpret data rapidly to make the best business decisions," says Sam "The same is true for conservationists using camera trap data. By increasing the speed of image analysis with AutoML, conservation impact can be made more quickly and be more effective."

Oliver agrees. "As a researcher, AutoML has put some very clever machine learning algorithms, and Google Cloud computing power, at my fingertips. For the first time, this has allowed us to really start investigating the power of this technology for clearing the backlog of wildlife imagery we have in conservation."

While conservationists use AutoML directly, development teams are creating a simple, scalable Google Cloud Platform (https://cloud.google.com/) architecture to complement the ZSL solution. Using a combination of Cloud Dataflow (https://cloud.google.com/dataflow/), BigQuery (https://cloud.google.com/bigquery/), and Data Studio (https://datastudio.google.com/overview/), ZSL will analyze the images for insights. Cloud Storage (https://cloud.google.com/storage/) ingests photographs from the camera traps, and ZSL will generate labels

for images from metadata using [AppEngine](https://cloud.google.com/appengine/), ready for them to train models in AutoML.

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Fellow, ZSL Institute of Zoology

Taking the pulse of the planet in real time

ZSL will cut the time needed to review images from months to days. "The aim is to use our time doing more research and conservation, and less data entry," says Oliver. It could also mean that insights from the data are acted upon much more quickly, a feature the team will push further in the next stage of the project.

"We're looking at putting the image recognition on the camera trap itself," says Sam. "That means a camera can detect when it sees a human and send a real-time alert directly to rangers, so that they can go and mitigate the threat to the wildlife, if there is one. When we know both where the animals are, and where the threats are, we're better at protecting wildlife."

Working with Google and partners, including Datatonic (https://datatonic.com/), ZSL is building a platform for conservation organizations around the world to share models and data to collectively save even more time and resources.

In order to understand the processes driving global biodiversity declines we need to use all the tools at our

disposal. New technologies such as AutoML have the potential to both dramatically simplify the creation of models and to make them easier to share.

Learn More

Watch the video on how ZSL is advancing conservation with AutoML.

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