Microsoft

AI for Earth Grantee Profile
The SeaDoc Society
Killer whale health database

Summary

The SeaDoc Society (SeaDoc) and its partners proposed the creation of a killer whale health database to facilitate health evaluation of individual animals. This database would enable a variety of scientists to cross-analyze multiple well-developed datasets to better evaluate the interaction of threats and define recovery options for this endangered killer whale population. With a Microsoft AI for Earth grant, SeaDoc was able to migrate its database to Microsoft Azure, where it is readily available to many researchers for real-time data entry and analysis.

Improving killer whale conservation through data in the cloud

Salish Sea salmon-eating orcas, known scientifically as southern resident killer whales, are in danger of extinction due to multiple threats, including reduced food supplies, increased underwater noise, environmental contaminants, disease, oil spills, and boat strikes. The impacts of multiple stressors hinder the recovery of this endangered population. Despite these whales being arguably one of the best-studied whale populations in the world, copious scientific data has had limited success in benefiting their recovery.

> The Salish Sea southern resident killer whale population is at a 30 year low following three deaths in 2018.

A review of southern resident killer whale recovery efforts identified the need to better understand the health status of individual animals and to better track the health of the population. A comprehensive killer whale health database could help scientists in the US and Canada better pinpoint times and places where individual whales are stressed, improve understanding of the highest stressors, and facilitate scientifically based decisions made to ensure the recovery of this local population segment. If southern resident killer whales can be saved, it will contribute to a healthy Salish Sea for wildlife and the humans that reside on the shores, as well as ensure positive contributions to local economies.

Creating a central database of killer whales

In 2016, the SeaDoc Society and its partners proposed the creation of a killer whale health database to facilitate health evaluation of individual animals. This database would enable a variety of scientists to cross-analyze multiple well-developed datasets to better evaluate the interaction of threats and define recovery options for this endangered killer whale population.

Lisa Clowers, a software engineer at the National Marine Mammal Foundation, developed a relational database front-end application in Microsoft Access 2016, with linked Access 2016 tables. The database is currently focused on the iconic endangered southern resident killer whales, but also includes data from all killer whales in the northeast Pacific Ocean. This allows for comparisons between populations that are thriving and those that are endangered. The database currently houses records for 308 killer whales both dead and alive, 215 of which are southern residents.

SeaDoc and its partners developed a central database to better evaluate the interaction of threats to killer whales.

Multiple researchers and organizations, including the Center for Whale Research, Fisheries and Oceans Canada, NOAA Fisheries, SeaWorld, SR3 - Sealife Response, Rehabilitation and Research, and marine mammal stranding networks all over the West Coast have been actively uploading data, including information on individual animal photo identification and life history, observational health records, killer whale stranding, and necropsy findings.

The shared database was initially developed and housed on-premises, but it was cumbersome, limiting real-time data entry and preventing rapid data queries, which limits the overall value of the database. And SeaDoc hoped to greatly expand the database, including numerous photos of individual animals with skin disease, photogrammetry taken from drones to evaluate individual animal body condition, and postmortem examinations of animals that die and strand on the beach—all of which provide important data on overall killer whale health.

Expanding research capabilities in the cloud

Thanks to a Microsoft AI for Earth grant, SeaDoc gained access to the Microsoft Azure cloud platform and assistance with AI computing tools for data analysis. The grant enabled SeaDoc to transform the locally hosted killer whale database into a password-protected, cloud-based dataset. Through Azure, SeaDoc and its partners have real-time data entry and evaluation, enabling faster and more effective response to threats—which is particularly important for critically endangered species like killer whales. The added computing power and help

in analyzing multiple complex factors will help researchers better understand what causes disease and work to prevent it. Individual animal immune status, disease agents themselves, and a vast number of environmental factors influence diseases, so having a simultaneous snapshot of all those factors helps identify how SeaDoc can improve the whales' situation.

On Azure, the killer whale health database enables faster and more effective response to threats.

Once the database is available online, different studies can be conducted using AI and the Microsoft Cognitive Toolkit to cross-analyze different health factors for the killer whale population. This collaborative project will bring together a variety of scientists and statisticians to help build and train the AI model to surface the most insights.

Going forward

Now that the database has been moved onto the cloud and data, and images are being added, the killer whale health database will be available as a one-stop-shop for complex analysis of the many stressors affecting the whales. This will centralize disparate data sources, so analysis can identify trends and determine how factors affect different animals based on their pod, matriline, age, and other demographic factors. Additionally, SeaDoc will use the database to evaluate different health parameters and their interactive effect on reproduction, disease, and other factors.

About the SeaDoc Society

The SeaDoc Society, founded in 1999, works to protect the health of marine ecosystems in the Salish Sea using science and education. Through both funding and conducting scientific research, SeaDoc helps to protect at-risk places, respond to emergency ecosystem health issues, educate communities, and train environmental stewards. SeaDoc also shares their findings with local agencies, governments, and individuals to help shape decisions that will protect and maintain the health of marine ecosystems.

Resources
Websites
The SeaDoc Society
National Marine Mammal Foundation
NOAA Fisheries southern resident killer whales (SRKW)
Fisheries and Oceans, Canada SRKW

[AI for Earth](#)

Press

Lisa Stiffler. "[Microsoft says AI is finally ready for broader use to help solve Earth's environmental woes](#)." GeekWire. May 23, 2018.

Alison Morrow. "[Endangered orcas helped by Artificial Intelligence](#)." KING 5 News. April 19, 2018.

"[Artificial Intelligence and the Health of Killer Whales](#)." The SeaDoc Society Blog. February 5, 2018.