Barbara A. Han, Disease Ecologist

Research mission:
- Predict and understand pathogen spillover
- Reform global disease management from reactive to preemptive
- Push the frontiers of ecological prediction with AI and machine learning

Summary:
Barbara Han’s research is at the intersection of ecology, computing, and global health. Han uses machine learning and artificial intelligence tools to understand when and where new zoonotic diseases are likely to emerge, and why.

Han employs complex algorithms to analyze patterns and processes in nature that could result in the next Ebola, Zika, or SARS-CoV-2. Some of these models compare traits of known animal disease carriers – size, diet, reproductive habits, biogeography – with thousands of species not yet known to carry disease, in order to predict which animals might become disease carriers in the future, and where these emergence events are most likely to occur globally. Underlying these research topics is the creative application of AI and the co-development of new AI approaches that enhance prediction and infectious disease intelligence for stakeholders across disciplines.

This research is actively contributing to a shift toward preemptive management for infectious disease spillover. Han is an interdisciplinary connector, and routinely partners with diverse collaborators including scientists from IBM, NASA, and numerous national and international universities to advance research on global disease prediction. Combining tools, data, and concepts across multiple domains lends a synthetic approach to addressing the complexity that underpins the phenomenon of disease emergence and spread. She contributes to efforts led by WHO, CEPI, the Wellcome Trust, and multiple agencies within the US government to apply this research to disease preemption.

Select publications:

Scientific Exhibition: The Natural History of Pandemic Risk