Incentivizing citizen science discovery for a sustainable world

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Strides are being made with wildlife conservation that invites recreational wildlife enthusiasts to report online observations that help with modeling and migration. Work is also being done to use crowdsourcing to help discover new materials for more environmentally friendly fuels, batteries, etc.

Gomes will talk about eBird, a citizen science program of the Cornell Lab of Ornithology. eBird has collected millions of bird observations that, combined with environmental data, allow scientists to develop predictive models of bird occurrences. In order to address spatial bias, a prevalent challenge with citizen science, Gomes and colleagues developed a game called Aviaching to incentivize birders to submit bird observations from habitats that are generally under-represented by normal eBirding, In another project, GrazeIt, herders in Kenya, using smartphones, submit vegetation images and surveys to help researchers develop better rangeland and forage maps. In just a few months, herders have submitted over 100,000 surveys.

Citizen science and crowdsourcing can also help accelerate the discovery of new sustainable energy materials. Gomes will discuss another exciting UDiscoverIt application that aims to speed up the identification of the crystal structure of materials based on x-ray diffraction data. The approach combines the human pattern recognition abilities to interpret the x-ray diffraction data with advanced computational techniques. The resulting hybrid algorithms, merging human and computational capabilities, outperform those produced solely by humans or computers.

Gomes has recently been awarded a $10 million Expeditions in Computing Grant from the National Science Foundation. Gomes' grant will help cultivate a large international research network called CompSustNet that will explore new research directions in computational sustainability. With Cornell University as the lead, CompSustNet will partner with 11 other US academic institutions as well as with other key organizations in the areas of conservation, poverty mitigation and renewable energy.

"We will launch CompSustNet, a transformative Computational Sustainability Network, bringing together computer scientists, environmental and social scientists, biologists, physicists, and material scientists to expand the new nascent field of computational sustainability," said Gomes. "Computational sustainability aims to develop novel computational solutions to tackle challenges facing humanity in order to ensure a sustainable future. Research will focus on cross-cutting computational topics such as optimization, dynamical models, big data, machine learning, and citizen science, applied to sustainability challenges. Advances in computational sustainability will lead, for example, to novel strategies for helping herders and farmers in Africa improve their way of life, saving endangered species, and scaling renewables up to meet 21st century energy demand." Gomes also led a team that received one of the first Expeditions awards in 2008. Initial funding from NSF has led to more than $80 million in support from other agencies and organizations and helped stimulate a new field that now is taught in many universities and has its own dedicated conferences.

"The Expeditions in Computing program enables the computing research community to pursue complex problems by supporting large project teams over a longer period of time," said Jim Kurose, NSF's head for Computer and Information Science and Engineering. "This allows these researchers to pursue bold, ambitious research that moves the needle for

not only computer science disciplines, but often many other disciplines as well."

While ambitious, Expeditions projects are also focused on achieving concrete progress and typically involve community engagement, education and workforce development and knowledge transfer. CompSustNet will be a virtual research lab, including educational, community building, and outreach activities to ensure that computational sustainability becomes a self-sustaining discipline.

Gomes is a professor of computer science at Cornell University, with joint appointments with the departments of computer science, information science and the Dyson School of Applied Economics and Management. She is the director of the Institute for Computational Sustainability at Cornell University. She is a fellow of AAAI and AAAS.

Provided by Cornell University

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