# Designing software to protect against mosquito-borne diseases

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A team of undergraduate computer scientists and their professor at South Dakota State University are building software to protect people in Africa and North America from mosquito-borne illnesses.

Assistant professor Yi Liu in SDSU's Department of Electrical Engineering and Computer Science and her team of four undergraduate students are collaborating with associate professor Mike Wimberly of SDSU's Geographic Information Science Center of Excellence on the project.

Wimberly knows how to interpret remote sensing data and has developed computational methods to project when conditions are right for populations of the mosquitoes that spread diseases to spike. But what he and his collaborators in Africa needed was a software product to take his early warning system out of the lab.

"Last year, I received an American Recovery and Reinvestment Act supplement from the National Institutes of Health to support my research using remote sensing to develop early warning systems for West Nile virus and malaria," Wimberly explained. "The supplemental funding is to support accelerated developed of a computer system for downloading, processing, analyzing and visualizing remote sensing data for public health applications. My colleague, Dr. Yi Liu, is currently leading a team of computer science students who are developing the system."

Liu said the project gives her undergraduate students invaluable experience figuring out what is needed and how to develop software to do it. The final product is to be done by the end of July.

“This is an entire software development process,” Liu said. “In the classroom we teach the students about the requirement stage, the design stage, and the testing stage. The students learn about each of these areas in the individual courses, but now is the time for them to apply all this knowledge in a real-world product.”

They also encounter real problems that need to be addressed and solved.

Liu’s students are Isaiah Snell-Feikema, who is making a graphical user interface for the system and working on data processing; Dan Woodward, who is focused on how the system will download data; Michael VanBemmel, who is working on statistical processing; and Sangik Kim, who is working on a re-projection model for different types of data.

Wimberly’s model uses several data sources, including MODIS (Moderate Resolution Imaging Spectroradiometer), a satellite system that views the entire Earth's surface every one to two days; and TRMM (the Tropical Rainfall Monitoring Mission), a satellite mission which measures precipitation from space.

Wimberly said the application that Liu and her students are building makes it possible to analyze the factors that could add up to a set of conditions ideal for a mosquito-borne illness outbreak. Importantly, it will make it possible to do the analysis without the bandwidth that Wimberly needs to do the analyses in his lab starting from scratch.

“One of the things the system does is distill the information,” Wimberly said. “It takes terabytes of information and summarizes it so that it is

relevant to public health. You're taking a huge amount of data and you're turning it into a much smaller stream of information and maximizing its usefulness."

VanBemmel, who has the most programming experience on Liu's student team, said one important goal for the development team is to make analysis of data far more efficient.

"If you ended up doing it by hand, you would be downloading hundreds of thousands of files," he said.

The end product will help other researchers and perhaps government health agencies monitor conditions that could contribute to outbreaks of mosquito-borne diseases.

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