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Mass number-crunching may help crack Alzheimer's disease code

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By lending a little computer power, people can join a new George Mason University project and help crack the Alzheimer's disease code.

George Mason is teaming with Reston-based Parabon Computation to ask volunteers to install software on their personal computers that will crunch numbers when the computer isn't in use. Notable projects from Stanford University and the University of California, Berkeley, such as Search for Extraterrestrial Intelligence, have used similar approaches.

"It's a way to involve people in real research," says Dmitri Klimov, associate professor of bioinformatics and computational biology in the School of Systems Biology, who is leading Mason's efforts on the project.

Alzheimer's is a devastating disease for which there is no cure. Dementia—its hallmark—robs people of their memories and who they are. More than 5 million Americans have the disease; it is the sixth leading cause of death in the United States and is expected to account for $214 billion in health care spending this year, according to the Alzheimer's Association.

Researchers are working on finding elusive answers. "Despite all the efforts, we still don't know how the disease develops on a molecular level," Klimov says. "Exactly what causes Alzheimer's is not known."

Klimov has a $300,000 grant from the National Institutes of Health

(NIH) to work on the problem. Researchers have identified Ab protein, which appears to have a key role, but exactly how the protein plays out in the process is speculation at this point, he says.

This protein is just fine on its own and belongs in the brain, but trouble seems to occur when these protein molecules group together in a ball called an oligomer, Klimov explains, and it's this possibly destructive grouping that needs a closer look.

Citizen scientists can help researchers find the answer by joining the Compute Against Alzheimer's Disease (CAAD) project.

"Volunteers simply download the software at http://www.computeagainstalzheimers.org, which was developed for Parabon's Frontier Compute Platform," says Steven Armentrout, Parabon founder and chief executive. "The software is completely benign and does not interfere with ordinary computer use. The software unobtrusively harnesses idle computing capacity from computers when they are not otherwise being used. Like a screensaver, it works only when you are not."

Klimov, his graduate student Chris Lockhart, and Parabon software developers collaborated on the NIH grant to not only build computer models of molecules that could be responsible for Alzheimer's disease, but to make it possible for many computers to work together on a complex problem.

This distributed software approach "allows thousands of computers to cooperatively work on a single computational problem," Armentrout says. "Because the computer simulations involved take months or even years to complete using traditional computing methods, it is desirable to distribute the workload across many computers to accelerate the research, which is how Frontier adds value to the effort."

Computers are changing the classical laboratory and microscope approach. "That approach has limitations because it is difficult to study individual molecules," Klimov says. Computer software creates molecular models to re-create what is happening to the cell on a level of single molecules.

The end result will be a data boost "by orders of magnitude" to help researchers discover the clues that could lead to understanding of what causes Alzheimer's, he says.

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