



AJ TOTH and JIM ANDRESS

Oak Ridge High School, Oak Ridge, Tennessee

HOMETOWN: Oak Ridge, Tennessee

PROJECT: Creating a Higher-Efficiency Machine Learning Algorithm to Facilitate the Development of Cancer Treatment Drugs

FIELD: Computer Science

MENTOR: Chris Symons, Oak Ridge National Laboratory

"We were excited by the potential we saw for machine learning to improve the search for new treatment options."

In their research, AJ Toth and Jim Andress created a higher-efficiency method for finding cancer-suppressing mutations in a protein. In the majority of cancers, the p53 protein has been mutated and can no longer perform its function. However, some secondary mutations can cancel the effects of the original mutation, restoring p53 activity and causing tumor regression. There are thousands of possible second-site mutations, and determining which successfully reactivate the p53 protein's function is a difficult and expensive task. The team used a stochastic discrimination machine learning algorithm to accurately model and classify p53 mutation data. Experiments show that their algorithm is more efficient than other active learning techniques. Their work could lead to fewer costly tests and potentially expedite the development of cancer medications.

AJ Toth

"Knowledge in math, science, and technology gives the potential to create innovative solutions to major world problems and improve the human condition."

AJ, a senior, plans to study and pursue a career in electrical engineering. He hopes to work in management and travel as much as possible. He is an Eagle Scout, National Merit Semifinalist and AP Scholar who tutors algebra and trigonometry. AJ and his partner Jim Andress play piano and bass, respectively, in a local ensemble called The Magical Jazz Trio. AJ also plays upright bass in his church choir and has played piano in the ETSBOA Jazz Clinic Blue Band for the last three years.

Jim Andress

"I like the elegant and logical nature of mathematics where each idea builds off of those which came before."

Jim is a National AP Scholar, National Merit Semifinalist, and national winner of the EnergySolutions Scholarship. He is proud to be the lead author of a paper submitted to "Computational Mechanics" on the topic of the Boundary Integral Method. A senior, he is vice president of the senior class and plays bass in both the school jazz band and The Magical Jazz Trio (with partner AJ Toth on piano). Jim plans to major in math, physics or computer science and would like to become a researcher or professor with the time and money to travel.