TIMESTEP Summer Internship Program

**Company Profile**

Areté is a small, employee-owned business that uses advanced science and technology to solve the most pressing issues affecting our nation’s security and prosperity. Areté's goal is to be the first choice of its customers seeking inventive and decisive solutions to critically important sensing, modeling, information extraction and data analysis problems. At its Tucson office (one of several across the country), Areté is focused on developing and delivering advanced electro-optic sensor systems, including multi-spectral imagers, LIDAR systems, and subsea video camera systems. In addition to developing hardware, the work includes developing physics-based models, performing data analysis, and creating new algorithms for automated processing. Areté has a culture of supporting both teamwork and individual initiative. The Tucson office has an informal atmosphere that belies the work ethic of striving always to meet project goals on schedule and on budget.

**Intern Supervisor**

Dr. John Engel, a Senior Principal Scientist at Areté’s Tucson office, will supervise interns. Dr. Engel has supervised several UArizona interns in the past, as well as regular employees. He has a doctorate in Physics and is a Lead Algorithm Scientist for the Maritime Systems business area at Areté. In addition, he is a UArizona alumnus, Galileo Circle member, and donor for the UArizona Physics Department.

**Job Description**

For this summer internship, Areté is seeking one or two bright students to help with two projects. The first involves creating physical models of the ocean surf zone and developing simulations of surf zone multi-spectral imagery. Interns will be investigating component models of the ocean surf zone, which may include wave propagation, seawater composition, white water formation, and light transmission through seawater and the sea-air interface. This work may involve research into existing physical models, testing and validating models, and developing simulations based on the models. They will have opportunities to learn how to develop physics-based models and simulations, as well as the physics of water and light wave propagation.

The second project involves detecting landmines in airborne imagery. Because landmines are often laid out in patterns, this work will involve developing pattern recognition techniques. In addition, image processing and machine learning algorithms are being developed to enable real-time, in situ processing of the image data. Interns will be investigating methods for extracting information from images that will improve the performance of the landmine detection algorithms. They will gain valuable experience with modern data analytics, machine learning, image processing and computer vision.

**Desired Technical Skills**

- Mathematics: calculus, linear algebra, probability and statistics, graph theory (optional)
- Basic fluid mechanics knowledge (Navier-Stokes equations)
- Machine learning algorithms, including statistical classifiers; general data analytics
- Image processing and computer vision
- Familiarity with Matlab, Python and/or C++

**US Citizenship is Required**