INTERNSHIPS AT NASA AMES RESEARCH CENTER

Unique internship opportunities open doors for careers in STEM fields.

NASA Academic Mission Services (NAMS) Student Research & Development (R&D) Program, led by USRA, supports current and future research by encouraging students to continue education in Science, Technology, Engineering and Mathematics (STEM) fields to support NASA’s Mission. The goal of the program is to advance research under the NAMS task orders and provide students with research projects that align with their education goals.

NAMS R&D student program interns have been diligently working on their research projects at the NASA Ames Research Center, USRA business office, or virtually from their university campus.

For more information on USRA’s NAMS program, please visit:

http://nams.usra.edu
USRA R&D STUDENT PROGRAM PARTICIPANTS AT NASA AMES

R&D Program Activities and Tours at Ames

During their internship, students are acquainted with NASA Ames facilities and labs across technical disciplines. They participate in activities such as, facility tours, the center-wide seminar series program, Ames poster session, happy hours and other summer activities. The tours and activities are facilitated by USRA to give students a full experience and an in-depth view of the technical disciplines at Ames.

Facility tours have included the Centrifuge, Ballistic Range, Fluid Mechanics Lab (Myth Busters have been there!), Roverscape – Super Bot Ball, SPHERES/Astrobee, Vertical Motion Simulator and the largest wind tunnel (80x120) in the world! The students also visited the Supercomputer/Hyperwall, Quantum Artificial Intelligence Lab, Arc Jet, Space Biology Sciences and Sustainability Base.

Interns worked hard on their research and presented their results at the Ames Poster Session on August 9th, 2018. They shared their projects with NASA Management and PI’s. The poster session was attended by Ames Management, PI’s, mentors and students from across the campus. The students worked with their mentors to incorporate their research into the poster and some published papers in various conference proceedings. Student R&D Program provides interns with a full experience at Ames and encourages them to advance in the STEM field. From this cohort of students, 10% were hired as staff supporting NAMS tasks.

As part of the safety and security program, students also received Ames lab and office environment safety and harassment prevention training. Safety and proper training is of utmost importance to NASA and USRA.
STUDENTS COMPETE FOR SYNTHETIC BIOLOGY AWARD

USRA and NASA Sponsored iGEM Team in International Competition.

The iGEM foundation is an independent, non-profit organization dedicated to the advancement of synthetic biology education. The iGEM competition gives students the opportunity to push the boundaries of synthetic biology by tackling everyday issues. Teams from around the world work together to design, build, test, and measure a system of their own design using interchangeable biological parts and standard molecular biology techniques. Every year nearly 6,000 students participate in the iGEM competition and present their projects at the annual Jamboree. This year the Stanford- Brown-RISD iGEM student team worked in the Synthetic Biology Lab with mentor Dr. Lynn Rothschild, Research Scientist at Ames. The team traveled to Boston, MA for the competition. The program was funded by USRA NAMS Strategic Investment Funds to provide seed funding for advancing projects across various technical areas.

EARTH SCIENCE

The Earth Science Division at Ames conducts research in various science focus areas including Carbon Cycle and Ecosystems, Atmospheric Composition, Climate Variability and Change, Weather, Geology, and Water and Energy Cycle. NAMS supports the Airborne Science Program, designed to study the Earth’s atmosphere, land surface and biosphere.

NANOTECHNOLOGY

An ongoing project by USRA scientists Myeonglok Seol and Jinwoo Han involves an All Printed Supercapacitor for energy storage that could be an alternative to conventional electromagnetic motors. This concept has potential for NASA in terms of Mars exploration and great benefits for societal and commercial applications. In terms of energy scavenging from vibrations, movements and other sources this generates enough power for self-powered sensor systems for remote deployment, charging cell phones, pace makers and other medical equipment etc. This summer, interns Michael Munther and Tyler Palma from Lamar University worked on Numerical Optimization all Printed Gas Sensor project.

Photo: Airborne Science Lab, Kevin Toner (Cal Poly Pomona)

NAMS R&D Student Program intern, Kevin Toner (above) from California State University, Pomona, worked on assignments at the NIST-certified instrument calibration laboratory and the Ames Airborne Sensor Facility (ASF), which develops and operates an evolving suite of advanced airborne remote sensing systems, including the MODIS Airborne Simulator. Kevin has accepted a full time position with the Airborne Science Group.

Photo: Nanotech interns working with a 3D printer

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DATA MINING

The Data Science group at NASA Ames is currently working on developing an active deep learning strategy for collecting labels for classification in domains where labels are scarce. Students are working closely with the group to accomplish this goal.

“Carbon dioxide is one of the leading causes for global warming and as a result is a major driver of climatic conditions throughout the world. During my summer internship I was working on a project with mentor Dr. Kamalika Das, USRA Data Scientist, to accurately predict the carbon dioxide levels at fine granularities throughout the state of California. Today’s state of the art estimates of carbon dioxide levels that are obtained from satellite data such as MODIS are available at a resolution of 500 km/pixel. In order to better understand the effects of CO2 in small local regions data is needed at higher resolutions. During my internship we developed a Deep Learning model to perform Super Resolution on low resolution CO2 data to obtain high resolution CO2. It is hoped that the research will aid in helping the State of California identify regions and causes for the presence of high quantities of CO2, so that they can reach the goals set out by the California Global Warming Solutions Act.” - Pramodith Ballapuram, Georgia Institute of Technology.

ROBOTICS - ASTROBEE

Ruben Garcia, an intern from Universidad Tecnologica de la Selva, Mexico, was selected to participate on the Astrobee project for the Summer and Spring 2017 session through the NASA International Internships Program on NAMS. This project was aligned with his degree and together with his NASA mentor and college advisor, he started to work on the project milestones and incorporated them into his Bachelor degree thesis.

Astrobee consists of three free-flying, cube-shaped robots. The robots are designed to help scientists and engineers develop and test technologies for use in microgravity to assist astronauts with routine chores, and give ground controllers additional eyes and ears on the space station. The autonomous robots, powered by fans and vision-based navigation, perform crew monitoring, sampling, logistics management, and accommodate up to three investigations. is planned to be ready for launch to the ISS in 2019. Astrobee is the second-generation model of SPHERES, NASA’s first generation free-flyer now aboard the ISS. The Astrobee robot includes upgrades and is able to operate either in fully automated mode or under remote control from Houston.

After the term of his NASA International Internship, Ruben returned to complete project milestones through the NASA Student R&D Program, this allowed him to continue his capstone project. In Fall 2018, after successfully completing his two-year internship in the Astrobee, Mr. Garcia became a full time USRA Software Engineer, as part of the SPHERES/Astrobee Facility Team.
AERONAUTICS

NAMS supports NASA in conducting air traffic management (ATM) research and development to help achieve the NextGen Air Transportation System. The ultimate goals behind this research and development activities under NAMS are to improve the safety, capacity and efficiency of the National Airspace System (NAS), reduce the environmental impact of air transportation operations, and increased autonomy towards aircraft and airspace operation.

Intern Conducted Research Supporting Development of Model Deformation Measurements (MDM)

NAMS R&D Student Program intern, Udit Chopla from San Jose State University, worked as an Experimental Aero-Physics Intern at NASA Ames Research Center this summer, where he focused on software integration for Model Deformation Measurement Techniques (MDM) and Optical Angle of Attack (OAOA). He worked with existing MDM techniques used to track model movements while being tested in the wind tunnels. “Under poor aerodynamic conditions aircraft wings fluctuate,” Chopla said. “I am currently studying that behavior while recording and measuring what happens to the wings. I created a test environment and lab setup with these conditions and am using software programs so that I can measure what is occurring.”

The purpose of this internship was to produce an integrated MDM/OAOA software. His internship encompassed a variety of experimental projects, which investigated the fluid mechanic, aerodynamic, and aeroacoustic characteristics of manned and unmanned spacecraft, aircraft, rockets, rotorcraft, ground vehicles, ships, structures, sports balls, and other objects.

“This has been a great program overall. USRA’s NAMS Student R&D Program allowed me to work in the Fluid Dynamics Labs with my amazing NASA mentor, Christina Ngo”, he explained. The Program management guided me throughout the processes at Ames, I got an overview of Ames technical areas through tours and they made sure my internship project was a success.”
AEROFLIGHTDYNAMICS

NAMS supports the U.S. Army Aviation Development Directorate - Ames (ADD-A) Vehicle Management & Control Technical Area (NASA Ames Code YH) in producing software for the design and testing of flight control systems, particularly with respect to rotorcraft. In addition, NAMS supports the Human Systems Interface Technical Area (NASA Ames Code YN), which performs research into the design and testing of human/machine interfaces, particularly with respect to helicopter pilot interfaces and unmanned aerial systems (UAS) ground control stations (GCS).

Intern Conducted Research Supporting System Identification and Flight Control Optimization

NAMS R&D Student Program intern, Sung Cho from Cal Poly Pomona, conducted research this summer supporting system identification and flight control optimization for Hover dynamics of 3DR X8 UAV. The US Army Aviation Development Directorate (ADD) Vehicle Management & Control Technical Area (NASA Ames Code YH) performs research in the areas of flight control, system identification, and modeling and simulation for both manned and unmanned aircraft.

“My research project is called System Modification of Multiorder UAV. By flight testing and collecting data you can extract mathematical representation of the aircraft dynamics,” Cho said. “The goal is to conduct control log research on multiorder UAV’s. Anyone can buy a drone at the store and start flying which is unsafe because they are inherently unstable. There’s no standardization on safety or laws on how you should fly. The goal of the entire UAV research community is to develop a standardization and come up with requirements on how to develop software to make UAV’s safer.”

The goal of Cho’s research was to conduct system identification testing and extract a flight dynamics model on the 3DR X8 UAV. Cho also optimized the control laws for the X8 using the identified model and compared the flight performance of optimized system vs. the “stock” system.

“I couldn’t get an internship. I went to every single career fair and was turned down due to my citizenship status. I had good grades and project experience but nobody took a chance on me. This internship has provided me with software training and the opportunity to present at conferences, which has given me a boost of confidence and opened up a whole industry for me.”

Sung Cho worked in Dr. Mark Tischler’s US Army Aviation Development Directorate at Ames, alongside mentor, Kenny Cheung. Upon return to Cal Poly Pomona, he plans to incorporate what he learned during his internship into his thesis and will start his graduate degree. In addition, he participated in the USRA funded – Cal Poly Pomona Flight Control Curriculum development collaboration and worked alongside his faculty advisor Subodh Bhandari and USRA mentor, Kenny Cheung. This resulted in development of a new semester long course, funded by USRA, on Optimization Based Flight Control Design. This collaboration utilized a 2018 book on the subject co-authored by Dr. Mark Tichler, Kenny Cheung and the CONDUIT team. The course was taught at the Cal Poly Pomona Antelope Valley facility, 70 miles north of Los Angeles nearby Edward’s Air Force Base (AFB). This allowed students from AFB to benefit from the class and apply learned knowledge to their work environment.

Photo: Sung Cho presenting his research at the NASA Ames Poster Session.
QUANTUM COMPUTING

USRA-NASA-Google Quantum Artificial Intelligence Laboratory (QuAIL) at NASA Ames Research Center’s Advanced Supercomputing Facility introduced graduate students to scientific opportunities in quantum information sciences and trained them to do research on Quantum platforms being developed by industry characterized as Noisy Intermediate Scale Quantum (NISQ) devices. USRA, in partnership with the QuAIL group at the NASA Ames Research Center, ran an exciting and ambitious program in the field of near-term quantum computing, with experts in quantum annealing, quantum optimization, quantum simulation, and quantum compilation/scheduling/planning, working on problems of interest to NASA as well as industry. This summer a cohort of students had an opportunity to be part of USRA’s Quantum Academy through the R&D Student Program.

“At QuAIL this summer, I worked on an optimization algorithm known as the Quantum Alternating Operator Ansatz (QAOA), as applied to the Grover Unstructured Search problem. This problem has been fundamental to the speedup obtained in many other quantum algorithms, and provides a benchmark for any new quantum computational model. I extended an existing QAOA protocol for the Grover Search problem to the most general version of the problem, and developed some theoretical tools to analyze the structure of problems that makes them easy or hard to optimize. I am hoping that this work will allow better design of optimal protocols for QAOA and other optimization algorithms in the future.” – Aniruddah Bapat, University of Maryland
NASA and USRA host Quantum Conference at NASA Ames

NASA and USRA hosted the Adiabatic Quantum Computing Conference at the Ames Conference Center, Moffett Field. Quantum Academy students attended the conference and presented their projects. The conference hosted 223 registrants from numerous countries, included over 50 talks and over 50 poster sessions. Sixteen invited speakers presented on various topics, and USRA sponsored 19 student to attend the conference. For more information, visit http://riacs.usra.edu/quantumaqc2018.com.