LISTA DE OPORTUNIDADES DE ESTÁGIOS NA NASA - 2018

Opportunity	Project Title	Project Description	Specific Requirements	NASA Center
1	Small Satellite Swarm Interactions	Very small spacecraft (also known as CubeSats or Nanosatellites) have not yet realized their full potential regarding swarm operations in low Earth orbit or beyond. The relatively low Technology Readiness Level (TRL) is due in part to a lack of sufficient testbeds with which to test the enabling technologies. The Generalized Nanosatellite Avionics Testbed (G-NAT) lab at NASA Ames seeks an intern to research foundational technologies associated with CubeSat swarm operations. Over the course of the internship period the intern will investigate the use of commercially available sensors and actuators for sensing the state of individual members of a satellite swarm and sharing that state information to enable distributed science operations. The successful candidate should possess strong MATLAB/Simulink programming skills, and also be proficient in C and Python. Familiarity with Linux operating systems and embedded systems/single board computers is also desired. The intern will be given access to two separate CubeSat-scale hardware testbeds, each of which utilize commercially available sensors and actuators to enable attitude determination and control. Desired outcomes of the research period include: • Develop real-time MATLAB (or other) visualizations of spacecraft attitude state for both CubeSat testbeds during air bearing operations • Study the efficacy of demonstrating swarm communications by way of Xbee wireless transponders • Study/develop operational modes that are relevant to possible swarm science operations, such as GPS Radio Occulation		Ames Research Center
2	Hybrid Rocket Modeling and Experiments	"This internship will have two primary focuses. The first will be using ANSYS Fluent to model a small-scale hybrid rocket motor that will be used in upcoming experiments. This problem is challenging as it involves using deforming meshes to model the regression of the solid fuel grain over time and the continued combustion as oxidizer is added. It should be noted that the only part of the motor that is ITAR restricted is the rocket injector. This part will not be modeled by the student and the student will not have access to any designs or models including the injector."		Ames Research Center

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		The second will be aiding in physical experiments. This may include completing tests using an oxyacetylene torch with an optical setup to prove that the sodium line reversal technique works or helping to setup and run small-scale rocket motor tests. Again, the only component in these tests that is ITAR restricted is the injector and the student will not have access to this part.		
3	Nanotechnology in electronics and sensor development	Nanomaterials such as carbon nanotubes (CNTs), graphene and a variety of inorganic nanowires offer tremendous potential for future nanoelectronics, nanosensors and related devices. We have active ongoing programs in these areas. Several examples are given below. Chemical sensors to detect trace amounts of gases and vapors are needed in planetary exploration, crew cabin air quality monitoring and leak detection; there are numerous societal applications as well. We have been working on CNT based sensors amenable for various platforms including smartphones. Flexible electronics on substrates such as textile and paper is of great deal of interest to us. We have fabricated gas/vapor sensors on cotton textile as well as cellulose paper. Other interests in paper electronics and flexible substrates include memory devices, energy storage devices, displays and detectors. Finally, we have also been revisiting vacuum tubes although in the nanoscale, using entirely silicon based technology. These radiation resistant devices offer exceptionally high frequency performance. Our interest here extends to exploring the nano vacuum tubes for THz electronics applications. In all the areas, the projects include material growth, characterization, device fabrication, device testing and evaluation, reliability and lifetime assessment.	For device related aspects, majoring in electrical engineering or physics is preferred. For the remaining aspects of the project, majors in material science, chemistry and other engineering disciplines are welcome. PhD candidates and talented undergraduates will get preference.	Ames Research Center
4	Orbit Analysis for LEO CubeSats and Low Lunar Orbits	The intern will fulfill assignments as a member of the orbital dynamics team in the Mission Design Division at NASA Ames Research Center. The Mission Design Division conducts early-stage concept development and technology maturation supporting the Center's space and aircraft mission proposals. Personnel have experience in mission planning, small spacecraft design, and engineering analysis. The Mission Design Division, or MDD, supports the full mission life cycle in the areas of:		Ames Research Center

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		• Early Concept Development • Mission Design • Rapid Prototyping • Mission Implementation The candidate will work closely with flight dynamics engineers to expand existing innovative approaches to low altitude orbit design. This work includes the effects of differential drag in Low Earth Orbit (LEO), as well as, the effects of mascon perturbations in low lunar orbits. SmallSat and CubeSat missions are a specialty of Ames Research Center and current research addresses practical issues with small spacecraft missions in a LEO and an interplanetary environment. Another orbital mechanics specialty of ARC is low, equatorial lunar orbits and design tools for addressing lunar gravitational perturbations. For lunar orbits, we plan to expand the research on equatorial frozen orbits and the visualization displays for characterizing gravitational perturbations. For LEO, the characterization of the effects of drag in relative satellite disposition is in the scope of this position. The goals of this assignment include documentation and display tools that will reside as part of the Mission Design Division's computational capability. Additional assignments as needed may involve CubeSat low thrust trajectory design, multiple CubeSat swarms, and CubeSat reentry calculations. Candidate's Computer and/or special skills: GMAT or STK/Astrogator, Matlab or Visual Basic. Strong writing skills are expected, both for internal documentation of work accomplished and for publications resulting from this work.		
5	Small Satellite Swarm Mission Design and Implementation	Recent advances in small spacecraft capabilities (particularly in CubeSats, NanoSats, and PicoSats) hold the promise that swarms or constellations of small satellites could perform NASA science, exploration, and technology demonstration missions that traditionally were the realm of large, expensive, and complex platforms. As a result, NASA Ames is embarking on a number of small satellite demonstration missions aimed at validating new approaches and processes needed to design, build, test, launch, and operate a large number of identical satellites in a cost-effective manner. Several internship positions are open to engineering students in all areas of SmallSat swarm and constellation mission design and implementation.		Ames Research Center

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		"Particularly needed skills and mentoring opportunities include: • Avionics and embedded systems hardware and software design, simulation and test. • Laboratory simulation and validation of network system architectures of various swarm and constellation mission concepts based on low-cost, commercial-off-the-shelf (COTS) components and systems. • Computer-aided spacecraft thermal analysis, simulation, and test procedures, using commercial software products such as Thermal Desktop." Selected candidates will join small teams of NASA Ames engineers and on-site contractors, with ample opportunities for mentorship as well as independent learning and technical development.		
6	Lunar Topographic Products from Orbital Images	Digital terrain models are essential for cartography, science analysis, mission planning and operations. The NASA Ames Intelligent Robotics Group (IRG) has developed software to automatically generate high- quality topographic and albedo models from satellite images. Our software, the Ames Stereo Pipeline (ASP), uses stereo vision and photoclinometric techniques to produce 3D models of the Earth, Moon, and Mars with very high accuracy and resolution. The intern will assist IRG to improve the quality of topographic products from lunar orbital images. In particular, the intern will help develop multi-stage stereogrammetric methods to exploit the full potential of multiple, overlapping views of a planetary surface. The intern will work closely with NASA researchers and engineers throughout the internship. Very strong emphasis is placed on incorporating and integrating the intern's research into IRG's on-going projects. Research results may be published in one (or more) technical forums: as a NASA technical report, a conference paper, or journal article.	The intern must have a background in Computer Science or Mathematics. Practical experience with computer programming, Linux-based software development and open-source tools (gcc, git, etc) is required. Experience with C++ is strongly encouraged.	Ames Research Center
7	Robotic 3D Mapping for Exploration of Planetary Caves	BRAILLE (Biologic and Resource Analog Investigations in Low Light Environments) is a new astrobiology project at NASA Ames which is investigating technologies and developing a concept robotic mission for exploration of planetary caves on Mars. Martian caves may be hospitable environments for microbial life due to temperate conditions, radiation shielding, and presence of water. BRAILLE will conduct terrestrial testing in	The applicant should, at a minimum, have experience with Linux (Ubuntu) and be able to program well in C or C++. Independent problem solving under guidance of the mentor is expected.	Ames Research Center

Opportunity	Project Title	Project Description	Specific Requirements	NASA Center
		an analog environment (at Lava Beds National Monument) in order to learn what sensors, samples and operational strategies are best suited for Martian missions to detect and characterize life. To this end, we are developing a robotic platform that will carry science sensors, perform high resolution 3D mapping of cave interiors, and return this information to scientists for analysis. Creating 3D maps is a challenge because planetary caves are GPS-denied, so any position estimates from the robot must be strictly local and incremental. Increment drift in maps can be further compounded by the irregular nature of cave features. Lastly, lack of natural illumination presents an issue with producing quality images and sensing at range. Solutions to this problem have far-reaching impact to future missions which will venture to such extreme locales.We are looking for a student intern to help with software development and research on the BRAILLE project. The student will have the ability to work on a self-contained, but impactful problem at the forefront of planetary exploration research at NASA. Projects will be tailored to areas of interest and experience. Examples include multi-view stereo mapping with active flash illumination, sensor fusion (LIDAR, imaging, multispectral), or machine learning for detecting interesting science features.	Ideally, you will have taken some upper division computer science and introductory robotics classes. Be familiar with data structures applicable to autonomous systems, like voxel grids, point clouds, octrees, range images, and triangulated meshes. Be familiar with the research process: literature survey, problem formulation, hypothesis, implementation, experimentation and statistical analysis. Priority will be given to those who have some prior field experience with caves and other underground environments, or high enthusiasm for such. Any significant experience with one or more areas of robotics research, particularly perception, localization or machine learning is also a plus.	
8	SUPERball 2.0 Tensegrity Robot	We are looking for a student intern to help with electronics design and integration for our SUPERball 2.0 tensegrity robot. The participant will conduct basic research in mobile robotics in the Intelligent Robotics Group (IRG) at the NASA Ames Research Center. Research will involve development of advanced mobile robots, including design and testing of novel mechatronic systems with SUPERball 2.0. Developing advanced mobile robots is critical to improving the performance and productivity of future NASA exploration missions. In particular, methods that enable dynamic tensegrity system to function robustly and autonomously under a wide range of environmental and operational conditions will enable robots to be used for a broader set of missions than is currently possible.	The applicant should be enrolled in a master level engineering program and have previous experience in electronics development. Good knowledge of C and Matlab and a Linux environment is preferred. Ability to work independently and effectively as part of a multidisciplinary team, prioritize tasks, coordinate tasks with others, and meet deadlines are a major	Ames Research Center

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			plus.	
9	VESsel GENeration Analysis (VESGEN)	Students of relevant disciplines, such as computer science, and biomedical engineering and imaging, and mathematics, are welcome to consider our multidisciplinary research on NASA's innovative research and discovery software tool, the VESsel GENeration Analysis (VESGEN). For this biomedical data visualization and analysis research, the intern will investigate existing data analysis techniques and apply the results to 3D microvascular data from clinical and research microscopic imaging. The intern will gain a good understanding of existing data analysis techniques (which are implemented in JAVA and C) and then develop an ImageJ plugin based on these pioneering methods. ImageJ, a public domain JAVA image processing program. The plugins will be used for designing new, globally requested 3D visualization and analysis software capabilities. VESGEN is requested by scientists, engineers and physicians around the world for biomedical research on vascular-dependent diseases such as inflammation, cancer, heart disease and reproductive disorders. Request specific expertise in 3D image reconstruction/3D medical image analysis, JAVA programming, and/or extensive computer programming experience. Expected outcome: development of ImageJ plugins, research experience, and co-authorships on conference presentations. A poster/paper presentation of the internship work.	Required Skills: Graduate majors in computer science, biomedical engineering, and mathematics are welcome to consider this multidisciplinary research. Relevant skills include C, Java, openGL, NIH ImageJ, and image and signal processing.	Ames Research Center
10	Software for Autonomous Robotic Landing on Icy Moons	Do you want to help NASA land in extreme icy environments? Icy moons, such as Europa, Enceladus and Titan, are the among the most likely locations for finding life elsewhere in the solar system. NASA is developing future missions to explore Europa in particular, beginning with orbital assets in the next decade and eventually leading to robotic surface probes. A leap in autonomous capability is necessary for robotic landers to aerially explore and touch down in environments as remote and unknown as icy moons. Uncharacterized features on these worlds such as fractures, crevasses, plumes, jagged penitente fields, and textureless surfaces will push the limits of current entry, descent and landing (EDL) approaches. ICICLES (Intelligent for Choosing Icy Candidate Landing and Exploration Sites) is a new funded		Ames Research Center

Opportunity	Project Title	Project Description	Specific Requirements	NASA Center
		project at NASA Ames that will look at autonomy approaches for assisting landing in safe-but- scientifically interesting locales on icy bodies. We are looking for a student intern to help with software development and research on the ICICLES project. The student will have the ability to work on a self-contained, but impactful problem at the forefront of science autonomy research at NASA. Projects will be tailored to areas of interest and experience. Examples include hazard avoidance algorithms for landing near icy features, trajectory planning for exploring vapor plumes, or 3D thermal mapping in cryogenic environments. The intention is to push hard for results to set the stage for publication by the end of the internship period.		
11	Shockwave Radiation Testing	The Electric Arc Shock Tube (EAST) Facility is NASA's only remaining shock tube capable of obtaining hyperorbital velocities (Mach 10-50, velocities up to ~15 km/s). The EAST data is the primary source of data for informing NASA's radiation modeling practices and associated uncertainties. The intern will participate in planning and conducting tests in the EAST facility, operating the diagnostics, performing calibrations, and analyzing data. The exact tests being performed in EAST will depend on the term of the intern's residency. Current plans for 2018 are to study radiation from expanding flows in the newly refurbished 20º expansion nozzle.	Experience with spectroscopic techniques and/or hypersonic testing facility, esp. shock tubes/tunnels desired. Graduate level (MS or PhD) strongly preferred.	Ames Research Center
12	Rotorcraft Aeromechanics	The Aeromechanics Branch is responsible for aeromechanics research activities that directly support the civil competitiveness of the U.S. helicopter industry and the Department of Defense. Branch programs address all aspects of the rotorcraft which directly influence the vehicle's performance, structural, and dynamic response, external acoustics, vibration, and aeroelastic stability. The span of research also includes unmanned aerial vehicle (UAV) platforms, including quadcopters and other advanced, small remotely piloted vertical takeoff and landing (VTOL) aircraft. The programs are both theoretical and experimental in nature. Advanced computational methodology research using computational fluid dynamics and multidisciplinary comprehensive analyses seeks to understand the complete rotorcraft's operating environment and to	Broad background in science and math classes typical of an upper division undergraduate in mechanical, aeronautical or aerospace engineering. Knowledge of MatLab, Simulink, CREO ProE/SolidWorks/AutoCad,, VSP, Rhino, C++, python, or other programming/software languages is desired, but not mandatory.	Ames Research Center

Opportunity	Project Title	Project Description	Specific Requirements	NASA Center
		develop analytical models to predict rotorcraft aerodynamic, aeroacoustic, and dynamic behavior. Experimental research seeks to obtain accurate data to validate these analyses, investigate phenomena currently beyond predictive capability, and to achieve rapid solutions to flight vehicle problems. Databases from the flight and wind tunnel experimental programs are validated, documented and maintained for the benefit of the U.S. rotorcraft technology base.		
13	Novel Planetary Robotic Sensor Development	Recent confirmations of water flow on Mars has refreshed interest in exploration ofcaves and lava tubes on planetary bodies, where temperate conditions present a uniqueenvironment that may harbor trapped liquid water, exotic geologies, and possible life.However, current robotics technology lacks the ability to negotiate such precarious terrains that include very tight operating spaces and partial collapses. Only by reachingthese areas with onboard sensors can astrobiologists and geologists hope to completecomprehensive mapping of cave conditions and sample biofilm candidates. To providesuch reach, we are investigating projectile sensing methodologies in which expendable sensors are lobbed from a mortar-like delivery mechanism and anchored into floors,walls, and ceilings. These sensors can work in cooperation with mobile robots to extendtheir reach, provide situational awareness, and long-duration monitoring capabilities.Constellations of deployed sensors can cooperate, communicating wirelessly duringflight and once anchored, to provide radio or illuminated landmarks aiding photography, mapping, and mobility operations. The exploratory SPEARS (Smart Projectiles forEnvironmental Assessment, Reconnaissance, and Sensing) project here at AmesResearch Center has proven the viability of the projectile sensor concept by developinga rover-mounted platform and evaluating several sensor types.We are now seeking a student intern to develop new and miniaturized sensing payloads.Currently, high priority payload plans include either microscopic imagers for terrainsurface study or fluorescence and spectroscopic instruments for geological compositionsurveys and signs of life detection, closely followed by radio transceivers for selfreorganizingmesh networks. Additional mechanism development is also planned,including refining sensor launcher design, building a micro soil	The ideal intern is a well-rounded student with an interest in sensing instrumentdevelopment and the ability to work well independently on open- ended problems.Depending on the student's interests, valuable skills and experience could lie in optics,RF, electronics, or mechanical design. A self-contained implementation project wouldinclude the design and testing of a useful payload in one of these areas.	Ames Research Center

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		sample collector, andevaluating concepts for projectile self-stabilization in flight. Another particularlyinteresting avenue is actuated or flexible payloads that unfurl or expand a soil collector,solar panel, antenna, or small mobility mechanism such as a wheel or foot.		
14	Machine Learning classification of transit-like signals	Kepler and the upcoming TESS are critical missions to increase our understanding of how common earth-like planets and the chances of alien life are. These telescopes work based on transit photometry and their piplines return a list of threshold crossing events (TCEs) whose light signature resemble a planet. However, not all TCEs are planet orbiting a star and they could be due instrument noise or other astrophysical phenomena. Thus, the TCEs are subject to a vetting process in which they are classified into three categories: Planetary Candidate (PC), Astrophusical False Positibe (AFP), and Non-transiting phenomena (NTP). This classification is currently being done manually and we need machine learning tools to automate it. The kepler teams responsible for this vetting process released multiple data release over time as they have learned how to obtain better diagnostics (features) from the light curve and how to classify the TCEs. However, the values of these diagnostics might not be perfect or representative enough and we are developing deep learning methodology (e.g. LSTM) that work directly on the raw light curves to classify these TCEs automatically. The intern is expected to help us developing parts of this project in Python! Tools we use for this project are scikit-learn and Keras!Specific Tasks and Responsibilities: Python Coding, Research on appropriate deep learning architectures for time series classification	AI general knowledge, Masters or PhD, Python programming	Ames Research Center
15	Rover-Instrument Automation and Data Integration	The Atacama Rover Astrobiology Drilling Studies (ARADS) project is a Science Mission Directorate-sponsored project led at NASA-Ames. ARADS proposes a Mars rover analog mission as a field test of an integrated rover-drill system with prototype life-detection instruments that are flight mission candidates. The essential elements to ARADS are: 1) use of integrated drill and rover at sites in the Atacama Desert in Chile in unprepared "regolith"; 2) field use of instruments with the rover/drill that are flight prototypes		Ames Research Center

Opportunity	Project Title	Project Description	Specific Requirements	NASA Center
		comparable to those planned for ExoMars and Icebreaker; 3) acquire drilled cuttings and transfer to instruments onboard the rover; 4) on-board autonomy and monitoring to support drilling; mission and demonstrate science support (operations and control) for the rover/drill/instrument operations. This student project will address the fourth element above: integrated remote rover and instrument control in science operations. The current ARADS rover (KREX-2) hosts three instruments, plus a drill and robot arm. The drill and arm are already partially integrated and hosted on the rover CPU. The instruments are controlled and return their data to two auxiliary laptops strapped to the rover. These communicate by wifi and trunk network connections with instrument team members. Intern will assist ARADS developers in developing system operating procedures, drill and arm control software, drilling system diagnosis and executive controls. The student with work with both the KREX2 rover team and the instrument leads and existing ARADS team members (Thomas Stucky, Antoine Tardy) to define the internal interfaces for commands and data to be relayed from the rover. A “data suitcase” of instrument results and images will be defined and a mechanism developed with the rover team to capture the “suitcase” and then forward it intact to a remote science server for offline parallel analysis by the science team. Likewise, a command dictionary to each instrument will be defined.		
16	Erosional Studies of Mars and Earth Using Digital Terrain Models	Fluvial and hydrothermal studies using HiRISE images and Digital (Terrain) Elevation Models, combined with CTX, HRSC, CRISM, and other Mars or terrestrial data sets. These studies are focused mainly on the formation of gullies, channels, valleys and other fluvial landforms on Mars and Earth. Terrestrial analog sites or hydrologic or landform models will be used to illuminate the importance of various processes as well as understanding the implications for paleoclimatic change. Additional opportunities may also be available in assisting with HiRISE science planning and targeting support, submitting image requests, and analysing acquired image data. Geology, geography, or planetary science background is desired.	Experience working with ENVI, Matlab, Photoshop, USGS Integrated Software for Imagers and Spectrometers (ISIS), Geographic Information Systems GIS (e. g., ArcGIS, GRASS), SOCET SET, Ames Stereo Pipeline, and Python programming is helpful. Excellent communication and writing skills are desired. Enjoys working both individually and in	Ames Research Center

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			teams, with creativity, positive energy, and determination.	
17	Biosensor Development	Development of biosensors is an active field due to a wide range of applications in lab-on-a-chip, diagnostics of infectious diseases, cancer diagnostics, environment monitoring, biodetection and others. One of the strategies used for selective identification of a target is to /preselect/ a probe that has a unique affinity for the target or can uniquely interact or hybridize with the target: sort of a "lock and key" approach. In this approach, one then needs a platform to support the probe and a recognizing element that can recognize the said interaction between the probe and the target. The interaction result can manifest optically (by using dyes, quantum dots for example) or electrically. The platform design and configuration may vary depending on whether optical or electrical readout is used and what environment the sensor will be utilized. Recently, printed biosensors on paper substrates have gained much attention for their low cost of manufacture. Within NASA, such printed devices are being investigated because of our potential ability to manufacture in an in-space environment. Such a biosensor would be a print-on-demand device. The current project involves fabricating and validating a printed, electrical biosensor for cardiac health monitoring from a whole blood sample. The intended NASA application is point of care diagnostics for astronaut health monitoring.		Ames Research Center
18	Experimental Aero-Physics Engineering Intern	The intern will help with a variety of experimental projects which investigate the fluid mechanic, aerodynamic, and/or aeroacoustic characteristics of manned and unmanned spacecraft, aircraft, rotorcraft, ground vehicles, ships, structures, sports balls, and other objects. The experimental projects will be conducted in conjunction with on-site research mentors, using NASA Ames wind tunnel, water channel, lab, and/or computer facilities. The intern will assist with many different phases of one or more test programs; these phases may include prior data review and test planning, test logistics, experimental design and setup, model construction and installation, instrumentation calibration, installation, and	Physics, Science, Math, Engineering backgrounds preferred	Ames Research Center

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		operation, test video/photo documentation, post-test data plotting and analysis, and report development. The intern may also assist with the development and execution of various computer programs used to analyze or simulate the results of experimental test programs. The main outcome of this internship will be experience with a variety of disciplines related to fluid mechanics, aerodynamics, and/or aeroacoustics		
19	Experimental Visualization of Shock Structure in a Miniature Arc Jet	The Thermophysics Facilities Branch is upgrading its 30 kW miniature arc jet (mARC). These upgrades will result in a high-speed, high- temperature jet with a new shock structure. Visualization of this new shock structure will allow the mARC operators and any future investigators to carry out testing in the regions of the jet with the most uniform conditions. The intern will be responsible for studying the shock structure of this plasma jet with experimental flow visualization techniques. Specifically of interest is the Background Oriented Schlieren (BOS) technique. It is expected that the intern will review prior similar work and seek input from Ames researchers who are experts in flow visualization methods to guide the experimental strategy. The intern will work closely with the team that operates and maintains the mARC. Student will give a final presentation and compile a final report documenting the work completed at ARC. If the results support it, the work will be considered for submission to a conference or journal publication.	Student should be a graduate student with a solid background in aerospace or mechanical engineering and familiarity with fluid flow, optical diagnostics, and experimental research. Student should have experience with flow visualization techniques, particularly the BOS technique. The student should be able to work as part of a team. It would also be desirable (though not mandatory) for the student to have experience writing conference and/or journal publications. Pursuing Masters Pursuing Doctorate Pursuing Post Doctorate "Engineering - Aerospace Eng. Engineering - General Engineering - Instrumentation Eng. Engineering - Materials Eng. Engineering - Mechanical Eng. Engineering - Optical Eng."	Ames Research Center
20	Aerothermodynamics Modeling	The Aerothermodynamics Branch at NASA Ames Research Center focuses on advancing the understanding of the fundamental aspects of hypersonic flows for multiple planetary atmospheres including Mars, Venus, Titan, and	Experience with Fortran and shell scripting. Experience with computational	Ames Research Center

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		Earth. Computational Fluid Dynamics solvers, coupled with non-equilibrium radiation codes, are employed for this purpose. Interns will collaborate with engineers and scientists to enhance the capabilities of the current software to better capture the fundamental aspects of the basic physical phenomena in hypersonic flows. They will have access to a world class HPC machine and will be using state-of-the- art physical models and numerical methods. Multiple openings are available in the following areas: """Develop an accurate and efficient radiation-flow solver coupling strategy. ""Support the development of a robust and scalable adaptive mesh refinement algorithm. ""Assess the performance of the shockwave radiation solver, NEQAIR, on hybrid nodes (CPU/GPU) and investigate optimization strategies."	modeling and parallel simulations.	
21	Robotic Sample Transfer Automation	The Atacama Rover Astrobiology Drilling Studies (ARADS) project is a Science Mission Directorate-sponsored project led at NASA-Ames. ARADS proposes a Mars rover analog mission as a field test of an integrated rover-drill system with prototype life-detection instruments that are flight mission candidates. The essential elements to ARADS are: 1) use of integrated drill and rover at sites in the Atacama Desert in Chile in unprepared "regolith"; 2) field use of instruments with the rover/drill that are flight prototypes comparable to those planned for ExoMars and Icebreaker; 3) acquire drilled cuttings and transfer to instruments onboard the rover; 4) on-board autonomy and monitoring to support drilling; mission and demonstrate science support (operations and control) for the rover/drill/instrument operations. This intern project will address the third element above: automated sample transfer between a drill (on one side of the KREX2 rover) and instrument intakes (on the other side of the rover). The ARADS sample transfer arm is mounted on a KREX2 rocker, which rotates relative to the central platform on which both the drill and instruments are mounted. Hence, as the rover moves, the trajectory between the drill and instruments will rotate relative to the sample arm's origin point. The arm is powered by servo motors which respond to pulse width modulation signals from the arm interface – two		Ames Research Center

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		extra servo control channels support the testing of end effectors with up to two actuators. The intern will assist an existing ARADS staff member in developing a dynamic transformation for arm trajectories that will automatically compensate for rocker rotation and for vertical drill movements. This will be coded and tested with the actual arm, drill and rover mechanisms.		
22	Evaluation of a Variable Density Approach to Modeling Cryogenic Jets	The intern will assist ARC researchers in extending user defined equation of state routines to include Real Gas effects and analyze the difference between mass fraction and volume fraction formulations for modeling variable density flows. The intern will evaluate the models on existing cryogenic jets and compare with existing experimental and numerical data. "Outline for 6 months: - Discuss and analyze differences between mass fraction and volume fraction formulations of the variable density formulation - Begin interaction with the ARC researchers using the user-based source routines which can be linked into the existing libraries - Apply the implemented user routines to existing cryogenic jet problems - Compare current results with existing experimental and numerical results in the literature"		Ames Research Center