Lawrence Livermore Engineering Fellowship Program at Texas A&M

Description

Opportunity for domestic Engineering Undergraduate students (Junior and Senior) with excellent academic records who plan to continue their Ph.D. degree at Texas A&M to get involved with cutting edge engineering research at Lawrence Livermore National Laboratory.

Upon selection, students will spend one summer internship at Lawrence Livermore’s Engineering Laboratory in Livermore, CA. Next, they will establish an academic plan for Ph.D. studies with a designated faculty at Texas A&M that includes a second internship at Lawrence Livermore Engineering Laboratory. Depending on student performance, Texas A&M and Lawrence Livermore will consider providing financial support to the students’ graduate degrees.

Eligibility
- Engineering undergraduate students at Texas A&M
- Senior level preferred. Junior level will be considered.
- U.S. Citizen (Consideration may be given to permanent residents)
- Excellent academic record (GPA > 3.5)
- Clear interest in pursuing research in technical areas aligned with Lawrence Livermore Engineering Laboratory (https://engineering.llnl.gov/core-competencies)

To Apply: submit to the program point of contact in a single pdf: (a) 1-page resume, (b) 2-page statement summarizing your credentials, research areas of interest, and why this fellowship is aligned with your study and career goals, (c) two strong letters of recommendation endorsing your application, (d) unofficial undergraduate transcript, as well as any other supporting documents.

Application Packets are due by January 25, 2018.

Point of Contact

Dr. Alaa Elwany
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Find out more about LLNL’s Engineering Laboratory at https://engineering.llnl.gov/
Porosity Modeling of Materials under Extreme Loading Conditions

Ductile alloys fail due to porosity nucleation, growth, and coalescence. Predicting this behavior is critical for high-strain rate scenarios caused by lasers, explosions, and impacts. This project seeks to characterize the effect of various porosity models on the response of (computationally) large impact problems.

Class Level/Desired Major: 1 graduate: mechanical, aerospace, or civil engineering majors

Essential Skills: Students should have completed classes in continuum mechanics and nonlinear finite elements and have some familiarity with C++ programming and high-performance computing (HPC).

What they will learn: Material modeling, fracture, and HPC simulations of (computationally) large 3D solid mechanics problems under extreme loading conditions.

Apply to careers.llnl.gov job 102900 refer to Project Title in Application
Additive manufacturing (AM) describes a host of fabrication technologies wherein a digital set of design and processing instructions are fed to a system that builds objects in a layer-by-layer fashion. Here at LLNL, we specialize in developing and improving novel AM systems that can fabricate architected materials with novel properties. Interns will work in a collaborative work environment and interface with both experimental and modeling experts that drive this technology forward. Projection microstereolithography (PµSL) is a technique we have developed to additively manufacture highly three-dimensional microscale structures. For the PµSL project, interns will design microstructure lattices, build structures with the PµSL apparatus, and perform mechanical testing. A detail oriented intern will execute systematic studies to optimize the PµSL process and part design. The intern will extract relationship trends between process parameters and mechanical testing data and be able to effectively communicate findings to the team.

**Desired Major:** mechanical engineering, materials engineering, chemical engineering

**Class Level:** undergrad or grad

**Essential skills:** Students should have completed classes in statistics, mechanics of materials, materials engineering and/or mechanical testing. Skills in Solidworks, AutoCAD, Matlab, or Python are advantageous.

**What they will learn:** Effective data collection and analysis via mechanical testing and printing additive manufactured parts.

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**Desired Major:** Mechanical engineering, materials engineering, chemical engineering

**Class Level:** Undergrad or grad

**Essential skills:** Students should have completed classes in dynamics, statistics, mechanics of materials, materials engineering and/or mechanical testing. Skills in Solidworks or AutoCAD are required. Matlab or Python knowledge is an added benefit.

**What they will learn:** Effective design and testing of three-dimensional objects that benefit the goals of cutting edge projects.

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Additive manufacturing (AM) describes a host of fabrication technologies wherein a digital set of design and processing instructions are fed to a system that builds objects in a layer-by-layer fashion. Here at LLNL, we specialize in developing and improving novel AM systems that can fabricate architected materials with novel properties. Interns will work in a collaborative work environment and interface with both experimental and modeling experts that drive this technology forward. For the capsules project, interns will focus on designing and production of microcapsules, either through microfluidic manufacturing technique, or other advanced manufacturing techniques. The final materials typically have a core-shell structure. The core is the chemical that reacts with CO2, behaves as display (liquid crystal), or performs its designed function (cell). The shell is the material that isolates and protects the core. Interns may help on development of new manufacturing tools for mass production that can be commercialized.

**Desired Major:** Materials engineering, mechanical engineering, polymer science

**Class Level:** Undergrad or grad

**Essential skills:** Students should pay close attention to detail and follow precise instructions. Experience with microfluidics and course work in fluid dynamics is an added benefit.

**What they will learn:** Cutting edge knowledge of encapsulation that is widely used in pharma, bio, cosmetic, and nutrient industries.

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Nondestructive characterization (NDC) is applied to a wide range of problems from characterizing materials, parts, subassemblies and full up assemblies. Scale lengths range from micrometers to meters, materials range from hydrogen isotopes to plutonium, while densities range from mg to 20 grams. Applications include the characterization of inertial confinement fusion materials and targets, weapons materials and assemblies, and inspection of luggage and cargo for security. NDC technologies include the EM spectrum: from radio waves through infrared to x-rays, acoustics and ultrasonic testing. For more information see https://nci.llnl.gov/

Desired Major: Applied Physics, EE, Computer Science, Data Science, Applied Mathematics

Class Level: 3rd to 4th year undergraduates, Graduate students

Essential skills (3 to 4): Physics, data reduction and analysis, signal and image processing, image reconstruction, inverse problems

What they will learn: Real-world NDC problems, technologies and data reduction, and analysis and reporting results to solve them.

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(Multiple Student Project) From Modeling for Prediction to Modeling for Understanding

Whether it’s Chess, Go, or Jeopardy, artificial intelligence approaches are seemingly approaching super human capabilities. Even with this progress, however, AI approaches are not able to teach a human how to succeed at any of these games. This is because AI is not able to self-reflect on its decisions nor is it able to be held accountable. The goal of the project is to build techniques and methods to add introspective capabilities to AI with the goal of not making AI accountable and explainable. These range from simple debugger-like developer tools over new algorithms to log and inspect training and decision making to new explainable AI methods.

Desired Major (one of):
1) Data Science
2) Computer Science with a specialization in machine learning
3) Electrical Engineering with a specialization in information theory
4) Physicist with programming skills, curiosity in machine learning and a specialization in dynamical systems

Class Level: Graduate or undergraduate. Assignments will be scaled accordingly.

Preferred University: UIUC, UC San Diego, UW, Texas A&M, Stanford, Berkeley, CMU.

Essential skills (3 to 4): Programming skills, machine learning and background in information theory, linear algebra, and statistics.

What they will learn: A glimpse on how to conduct cutting edge research in an interdisciplinary environment.

Apply to careers.llnl.gov job 103077 (Refer to Project Title in Application)
(Multiple Student Project) Self-Organizing Collaborative Intelligence

Most of the field of Artificial Intelligence is focused on classification and regression tasks and less work is focused on unsupervised learning. Even less work is focused on the unsupervised collaboration of multiple sensors and artificial intelligence approaches. This project aim at exactly that. Using information theoretic models, like Belief Propagation, the goal is to optimize the collaboration of different AI and other sensor approaches under varying and even adversarial conditions. Applications include autonomous control of drones, combination of sensory input for airport security or multimodal analysis of Internet videos.

Desired Major:
1) Data Science
2) Computer Science with a specialization in machine learning
3) Electrical Engineering with a specialization in information theory

Class Level: Graduate or undergraduate. Assignments will be scaled accordingly.

Preferred University: UIUC, UC San Diego, UW, Texas A&M, Stanford, Berkeley, CMU.

Essential skills (3 to 4): Programming skills, machine learning and background in information theory, linear algebra, and statistics.

What they will learn: A glimpse on how to conduct cutting edge research in an interdisciplinary environment.

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BioPrinting

3D bioprinting brings life to traditional 3D printing—literally! 3D bioprinting executes a similar process to traditional 3D printing where human tissue constructs are fabricated in a layer-by-layer manner using living cells and biomaterials. Here at LLNL we use 3D bioprinting technology to create in vitro microphysiological platforms (e.g. tumor-on-chip systems, brain-on-chip) that aim to recapitulate human response to toxins or drugs. Interns will work in a collaborative and multidisciplinary environment to optimize biomaterials for 3D printing and aid in analysis/monitoring of these living constructs.

**Desired Major:** Biomedical engineer, materials engineering, mechanical engineering, chemical engineering

**Class Level:** Undergrad or grad

**Essential skills:** Students should have completed classes in fluid dynamics, statistics, mechanics of materials, materials engineering and/or mechanical testing. Experience with cell culture is highly desired but not necessary. Experience with microfluidics or course work in fluid dynamics is an added benefit. Other biology skills also desired: imaging or immunohistochemistry.

**What they will learn:** Students will apply engineering principles to orchestrate biology and gain an appreciation/understanding of biomaterial design.

**Apply to careers.llnl.gov job 102900 (Refer to Project Title in Application)**