Job Description for Microelectronics Estimates of Energy Efficiency for Algorithms and Software

Stanford Synchrotron Research Laboratory

Postdoctoral position focused on sustainability in computing algorithms and software

Position Overview:
We are currently seeking a postdoctoral scholar to support research efforts in developing estimates of energy consumed by compute-intensive algorithms including the applications ranging from crypto coin mining, and machine learning to scientific simulations: Natural Language Processing in major online platforms; Machine Learning for high end scientific applications such as including simulations of chemistry, materials, protein folding, etc.; high-performance computing simulations of fluid flow, weather changes etc.; molecular dynamics and atomic simulations. The candidate is expected to be proficient in the following areas: algorithm and computational complexity, algorithm implementations for machine learning for various scientific simulations such as molecular dynamics, Monte Carlo methods in different computer architectures. Familiarity with the various higher-level and lower-level programming languages used in large-scale simulations is considered helpful for this position. As part of a new initiative undertaken by the Department of Energy's EES2 (Energy Efficiency Scaling every two years for two decades)[1], this effort will complete a systematic analysis of multiple large-scale algorithms and software, assess their energy estimates for computations of applications, and compare that with the existing benchmarks. Successful candidates are expected to conduct systematic literature and report reviews, propose and implement methodologies for estimating energies used for simulations in applications across different areas. Postdoctoral researchers are responsible for authoring reports, presenting findings, and supporting proposal writing efforts for building larger efforts. Specific responsibilities include but are not limited to: Expand and build upon the existing analysis for the different applications; Understanding of advanced Machine Learning and AI algorithms and their implementations including in newer applications such as driverless cars; Understanding of sensing algorithms used in devices at the extreme edge; Understand and scope the basic operations in different algorithms; Ability to bridge the different algorithms with different architectures; Develop, test and document large scale models, simulations, and implementations in different system architectures; Maintain and update documentation as needed; Work with the current and potential with the Department of Energy's AMMTO collaborators and industrial community to discuss and develop systematic benchmarks and analysis for the different applications.

Minimum Qualifications:
- Ph.D. in computer, or computational sciences, or advanced numerical methods, especially in assessing algorithmic complexity/scaling;
- Experience using machine learning, statistical analysis, and optimization.

- Experience in modeling and simulating large-scale scientific simulations
- Demonstrated ability not only to learn, but master, new techniques quickly
- Proficient programming skills
- Ability to work independently and in a team environment; and communicate effectively with a diverse population in both face-to-face and remote / virtual settings.
- Effective written and verbal communications skills.

Preferred Qualifications:
- Experience with higher level programming languages such as Python or Julia
- Interest in environmental impact of computing and sustainability

What we offer you:

A constant stream of new things to learn. This is a new and exciting thrust in SLAC and Stanford and trying to address sustainability in computing. We're always expanding into new areas, bringing in new projects and developing new technologies in the areas of computing.

Growth and mentorship from exceptionally talented engineers and scientists from SLAC and Stanford University, plus an opportunity for you to mentor new students and staff. A mission-driven, stable, collaborative, highly interdisciplinary, and supportive work environment.

Interested candidates should submit a cover letter with CV to Stephanie Carlson (steph@slac.stanford.edu).