A Crash Course of Fundamental Numerical Methods

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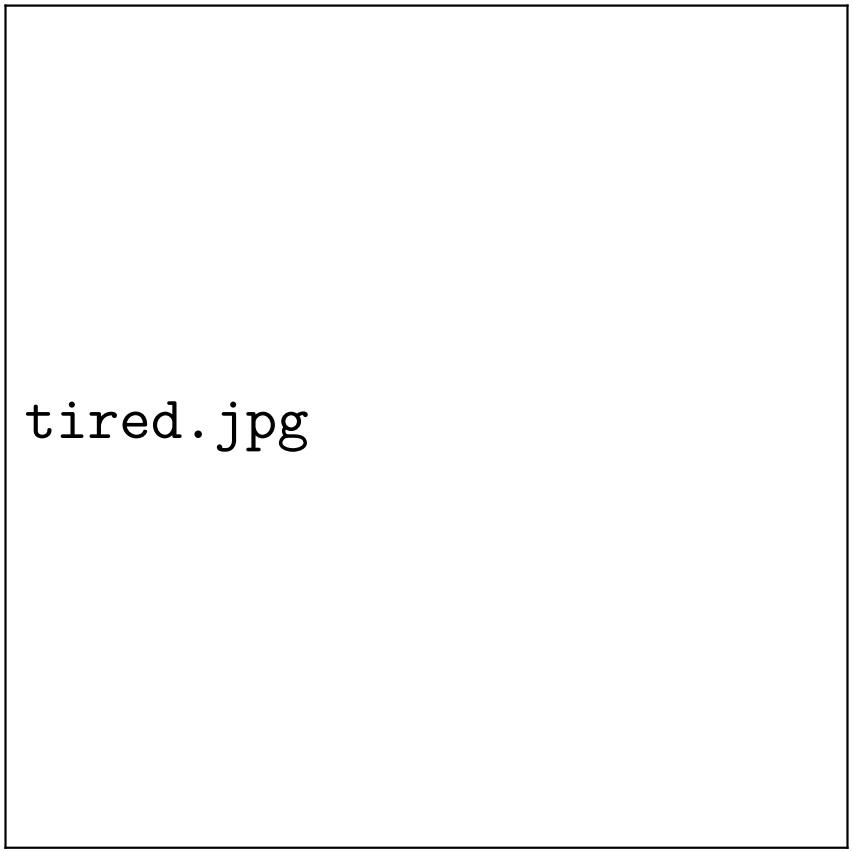
Challenges for Computational Scientists

In addition to addressing the **performance** and **scalability** issues, the developers for next generation HPC applications will also need a **sustainable development strategy** to enhance overall **programming productivity**.



Opportunities for Multidisciplinary Research

Whenever there is a challenge/difficulty, there is an opportunity. A lot of **multidisciplinary research and analytical work** is involved in

- designing and implementing the right algorithm (applied mathematics, computer science) for the right set of equations (all sciences) on right computing systems (computer science, electrical engineering);
- finding and categorizing the programming patterns (computer science);
- designing and implementing scientific applications (computational sciences);
- and much more...

Our Attempts to Address These Challenges - SCALE 2009

The prize-winning work at the **SCALE 2009 Challenge** at CCGrid09 is one of our attempts to demonstrate our **multidisciplinary and collaborative research efforts** and **framework-based solutions** to these challenges.

Our Attempts to Address These Challenges - Executable Paper

We responded to **the Executable Paper Grand Challenge** at ICCS 2011. We presented **the Prickly Pear Archive**, our **framework-based solution** to meet Executability, Validation, Reproducability, Provenance, Security, Programmability, and several other requirements for creating an executable paper.

Our Attempts to Address These Challenges - RoseACC Compiler

We contributed to **RoseACC**, an ROSE-based open source **OpenACC** compiler generating **OpenCL C** computation kernels from C or C++ codes parallelized using OpenACC directives.