

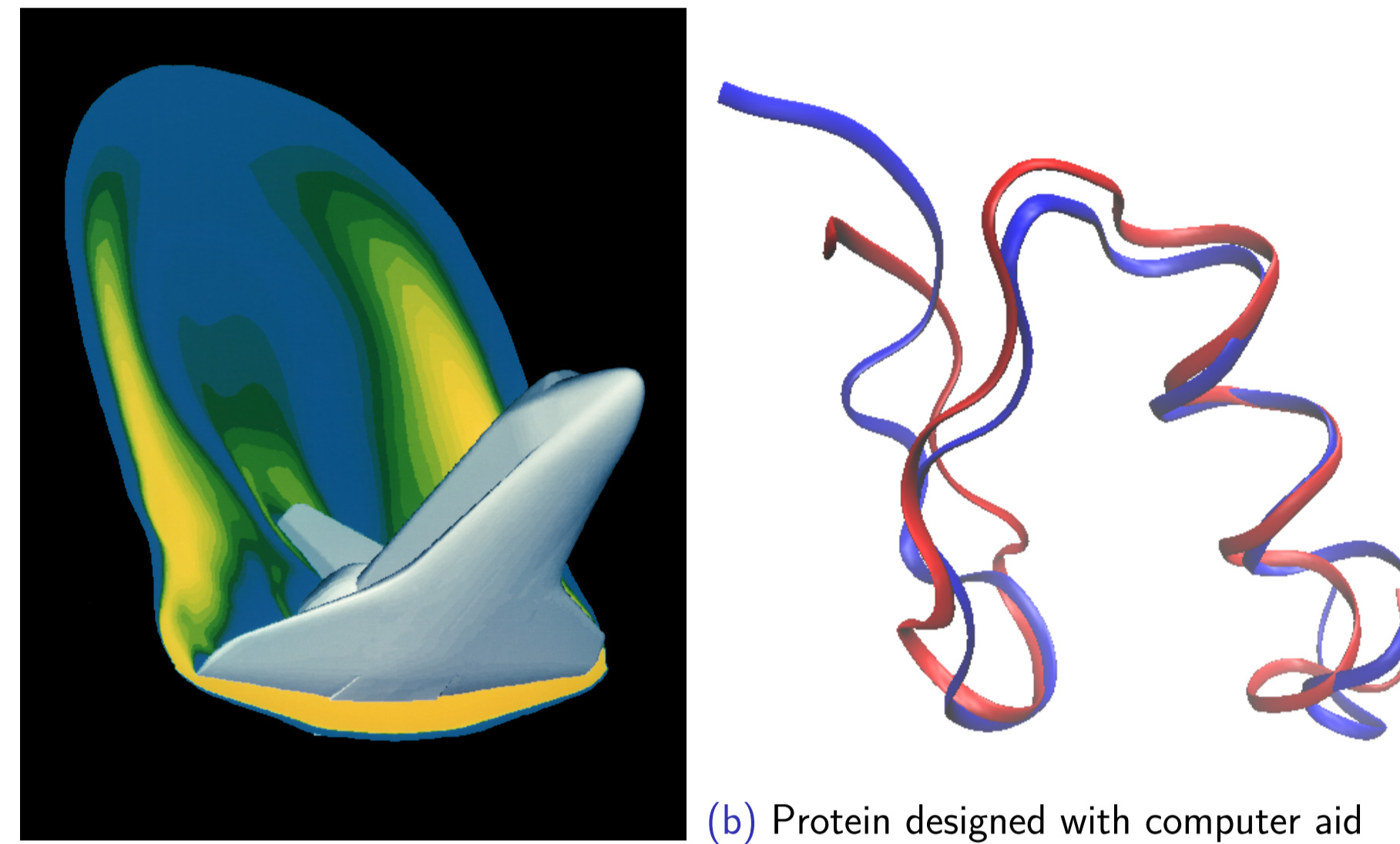
CATALYZE YOUR RESEARCH WITH ADVANCED COMPUTING

Luis Guillermo Cornejo Suárez

Colaboratorio Nacional de Computación Avanzada, Centro Nacional de Alta Tecnología
Escuela de Computación, Tecnológico de Costa Rica

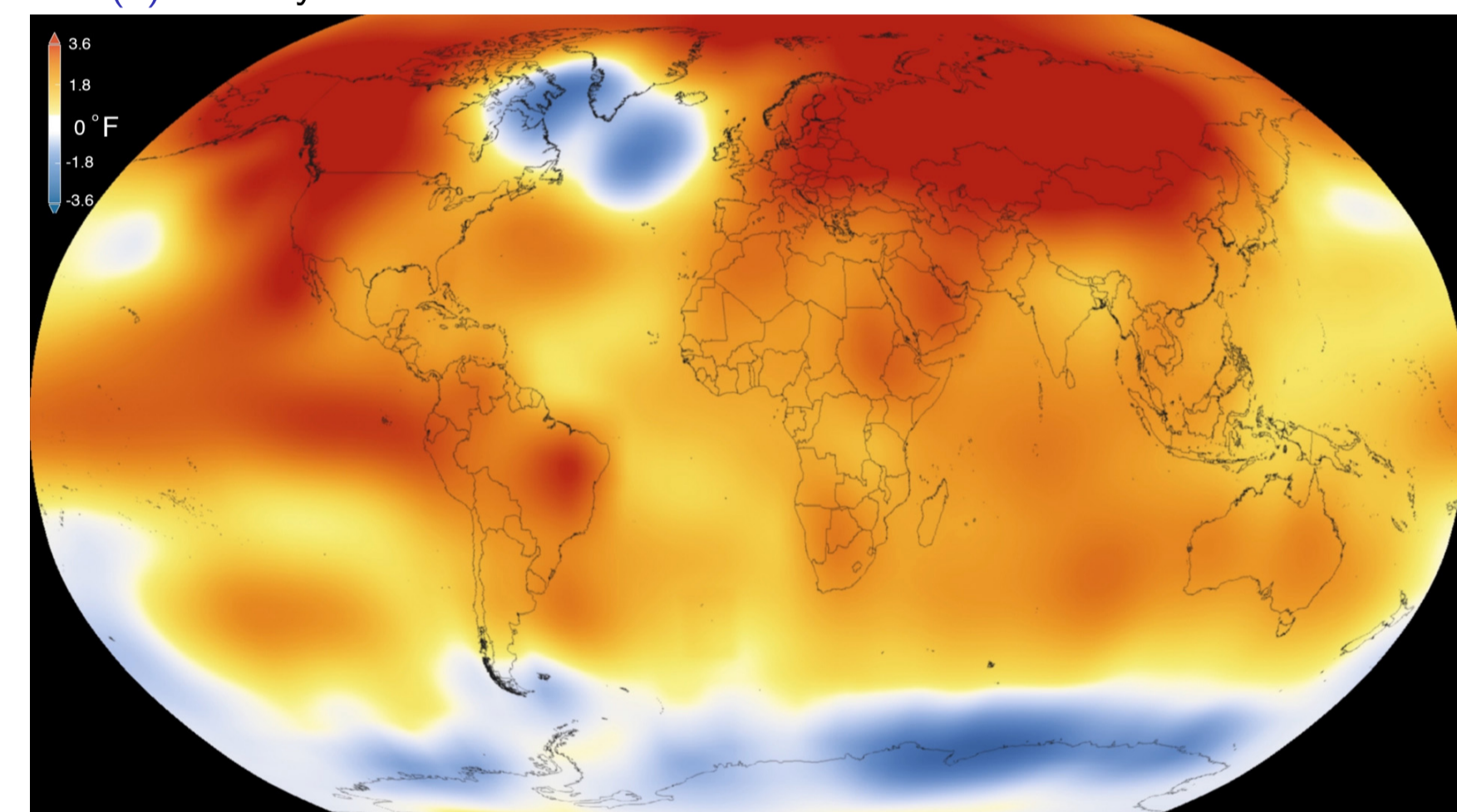
A NEW PILLAR OF SCIENCE

Computational science has established itself as the third pillar of modern science. Protein design, manufacturing process, civil infrastructure, power systems regulation, aerial vehicles, weather prediction, genetic engineering, the list goes on, everything exists as a computational model before coming to reality. But sometimes, the complexity of that model is so big it requires a special kind of computational science: Advanced Computing.



(a) Reentry simulation of STS

(b) Protein designed with computer aid

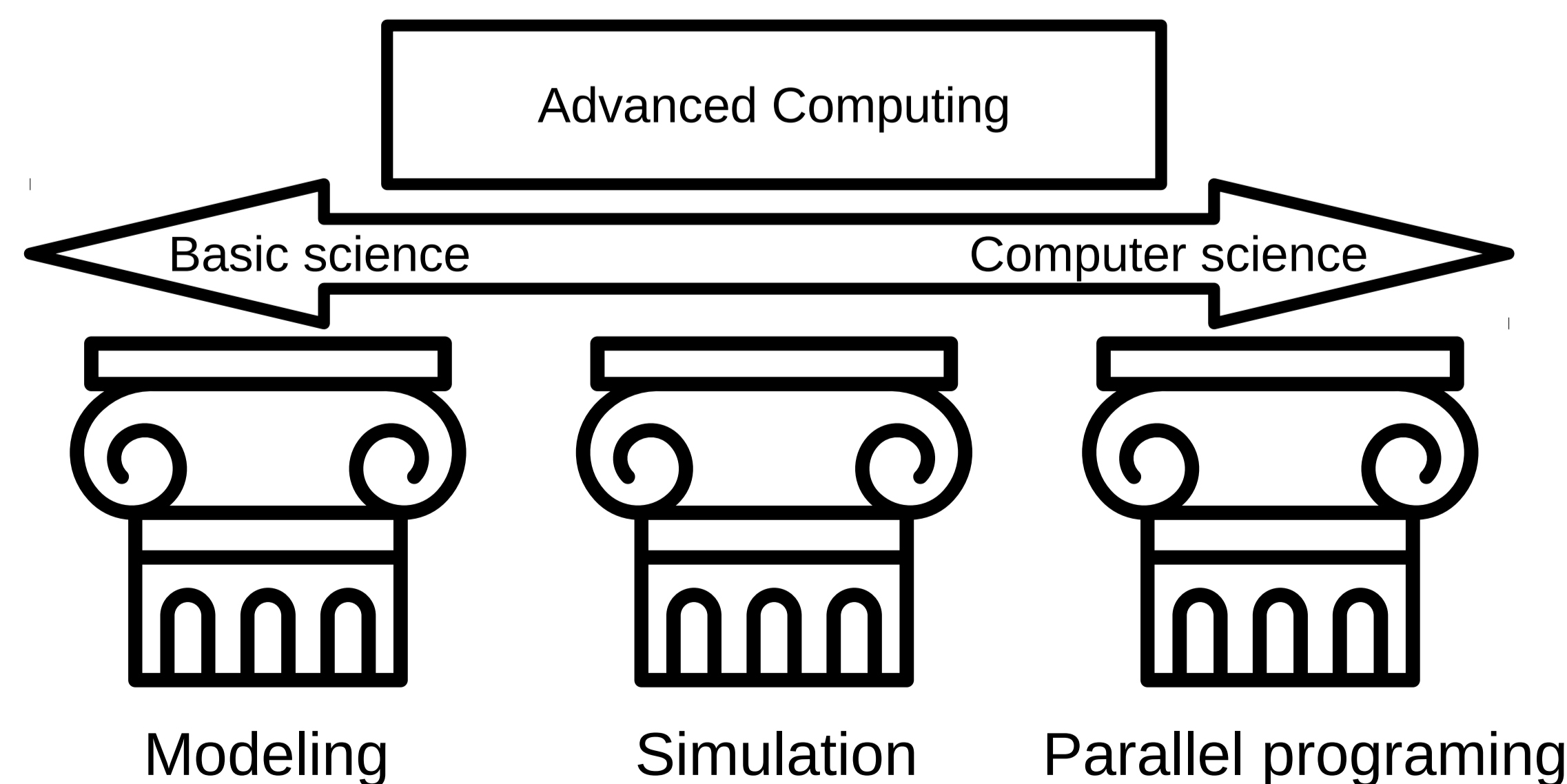


(c) Global temperature change visualization

WHAT IS ADVANCED COMPUTING?

It is the use of high-end computing resources to help solve highly complex problems. In general, a problem that uses Advanced Computing has one of these characteristics:

- ▶ It is computationally expensive: solving the computational model in a reasonable time demands thousands of computers working together.
- ▶ There are many possible solutions: like testing protein fitness for a particular purpose. Testing one is easy, but you have to test millions.
- ▶ There is Big Data: for example, analyzing the relationship between genetic expression and a complex illness, like cancer.

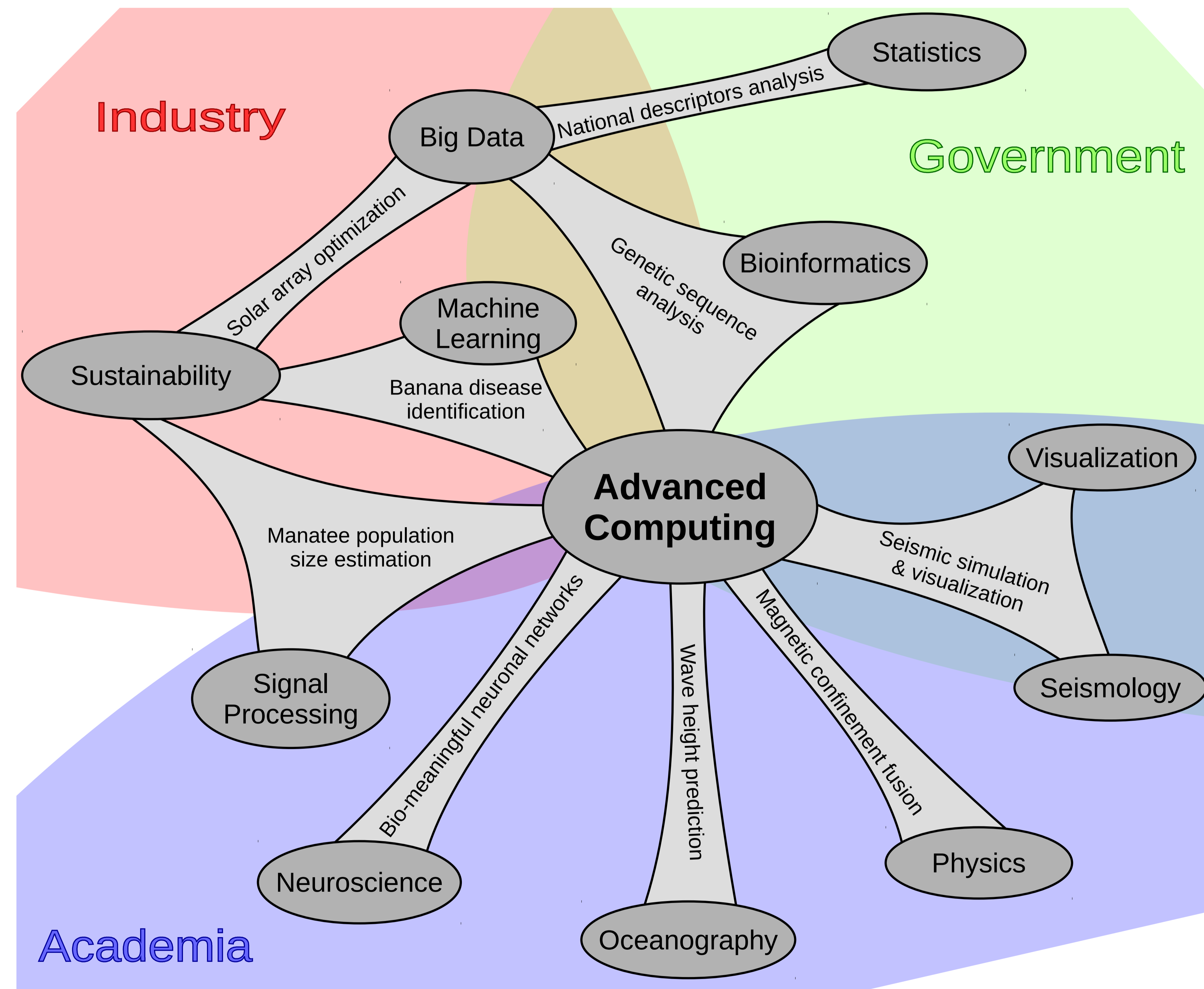


ADVANCED COMPUTING @ CNCA-CENAT

The National Advanced Computing Collaboratory (CNCA), a laboratory of National High Technology Center (CeNAT), offers a high-end computational infrastructure, scientific collaboration and technical support to research groups that require Advanced Computing.

WE ARE CATALYZERS OF SCIENTIFIC DISCOVERY

By transforming a field-specific research problem into a computational one, and then exploiting a massive parallel infrastructure, we enable scientist from many disciplines to accelerate discovery, reduce time to results and cut-off experimental costs.



OUR HYPERGRAPH OF SYNERGY

Through collaborative interaction with our scientific colleagues, we aim to produce a combined effect greater than the sum of individual efforts. As the HyperGraph shows, many research areas interact in a synergistic fashion, creating solutions whose value, by definition, is bigger than the value of individual solutions.

The ground-hue of each solution depends on the ratio of three principal components:

- ▶ Academia as motor of scientific discovery
- ▶ Government as promoter of education and social wellness
- ▶ Industry as source of innovation and economic development

COLLABORATION MODELS

- ▶ Outsourcing: external partners delegate research and development of specific modules
- ▶ Technical support: partners already count with a mature computational model, but lack the computational infrastructure to carry out simulations
- ▶ Scientific collaborations: partners require collaboration to develop a new computational model

To promote application of Advanced Computing in scientific research, CNCA offers training in parallel and scientific programming.

DO YOU THINK WE CAN COLLABORATE?

Contact us at cnca@cenat.ac.cr

For more specific questions, contact one of our members:

- ▶ Mariano Sánchez: Advanced Networking and Big Data
- ▶ Jorge Castro: Pattern Recognition
- ▶ Daniel Alvarado: Computational Physics
- ▶ Diego Jiménez: High Performance Computing
- ▶ Carlos Gamboa: Bioinformatics
- ▶ Guillermo Cornejo: Earth Sciences
- ▶ Willy Villalobos: Advanced Computing Infrastructure

Email: {First name initial}{lastname}@cenat.ac.cr



JOIN THE RICC

Research Network on Scientific Computing wraps together all kinds of researchers that develop or use Advanced Computing in their work. The spectrum of disciplines represented in the RICC includes computational physics, bioinformatics, earth sciences, engineering, computing, among others. By joining the RICC you get access to resources, training, consulting, and new collaboration opportunities. For more information, contact Jorge Castro, RICC Lead at jcastro@cenat.ac.cr