

Project Resource Allocation Request

Researchers

Principal Investigator Name: Eugene Fluder
Email address: eugene.fluder@mssm.edu
Department: Scientific Computing

Project researcher:

Researcher name: Eugene Fluder
Email address: eugene.fluder@mssm.edu

Researcher name: Hyung Min Cho
Email address: hyungmin.cho@mssm.edu

Project:

Title: Role of latent metabolic pathways in the evolution of Multivac-AC

Description of Proposed Scientific Activity:

Please explain what you plan to research for this project (100-300 words).

The Multivac-AC is an advanced design computer in which sentient beings are completely integrated into the construction and operation. (The Last Question, I. Asimov, 1954). Earlier ancestors were described by D. Adams (The Hitchhikers Guide to the Galaxy, 1979). The ability of organisms to adapt to evolutionary pressures is not well understood but is thought to involve latent metabolic pathways ([J Biol Chem.](#) 2006 Mar 24;281(12):8024-33). Using genetic data obtained from humans, dolphins and mice, we will use Bayesian network techniques developed both at Mt. Sinai and elsewhere to search for common dispensable pathways and then model the impact of those pathways if they were to be activated. Because the answer is already known, that fact can be used to guide the experiments and significantly reduce the amount of combinatorial space that needs to be searched.

Potential Scientific Impact:

Please explain why this science is important including the effects it will have if successful (50-300 words).

Understanding how it is that humans are evolving to merge with computational machines and make the interface seamless would accelerate the development of the Multivac-AC significantly. It is clear that deep thought is not enough to accomplish this and that probabilistic models will be needed. Once these models are developed, direct manipulation of the evolution of the computational matrix will be within

reach. This will allow us to direct the evolution toward solving issues that are of immediate interest and value such as curing cancer or determining how the Cubs could win another World Series. While much work needs to be done in this area, this study will shed some light on the issues.

Computational Approach:

Please explain how you plan to use the computational facilities to meet your scientific goals. Please include the viability of your approach. (25-100 words)

At this time, the construction of each putative network is serial in nature. Efficient use of Minerva will be achieved by running the experiment as an SPMD exercise where each individual run will have a distinct seed for the random number generator. We will throttle the jobs so that the number of results will keep pace with our ability to analyze them.

This is a new resource request

Resource	Units	Request	Justification	Expected Request for next year	Justification
CPU time	Wallclock hours	500,000	Estimate that only 1% of computed values will pass screens and need to be examined. Each potential candidate takes 1 hr to generate and approximately 100 candidates per week can be examined by the team. (100/0.01)*50	2,500,000	Anticipate increasing our capacity in the next year to being able to examine 500 putative candidates per week
Scratch Storage	Gigabytes	400,000	Initial databases are 200TB and will grow at 10%/month	700,000	Anticipate an additional 300TB next year
Archival Storage	Gigabytes	400,500	Need to preserve original data plus results	710,000	Growth of databases plus additional results
Assistance	Person-hours	40	Optimization of code.	40	

Special Requests:

Addition of Intel Phi co-processors will greatly enhance the efficiency of this project

Past publications related to this research:

None

Funding Sources:

Funding identifier: Neo Institute for Matrix Research

Value: \$50,000

