Student/Faculty Research Models in Computational Biology

Proposal to the Collaborative Workshop Subcommittee of the Mellon 23
organized by:
Reed College*, Pomona College±, Wellesley College!
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We propose a workshop to explore different models for student/faculty research collaborations in computational biology at liberal arts colleges. The proposed 3-day workshop will foster the exchange of ideas among ~ 12 faculty members from Mellon colleges, a few from non-Mellon colleges and 2-3 University researchers. It is our goal to increase undergraduate student engagement in computational biology at the research level.

Rationale and Audience:

We propose a 3-day workshop focused on the exploration of models for student/faculty research collaborations in computational biology at liberal arts colleges. We will identify specific college assets that define relative strengths among alternate models for a given faculty. Two recent workshops have focused on curriculum development for Bioinformatics at liberal arts colleges. Both, the one-time workshop at Hope College[(1)] and the three-part collaborative program between Bates College and Mount Holyoke College[(2)] had as their goal, the creation of interdisciplinary curriculum modules to make standard bioinformatics resources accessible. While the proposed participant lists may overlap with these past events, the current proposal is unique in its emphasis on student/professor collaborative research, and its broader scope of computational biology.

While its growing visibility has been largely driven by the proliferation of genome sequences, the comprehensive field of computational biology includes, network analysis, modeling of biological systems, phylogenetic reconstruction etc. As was recently recognized by the National Research Council report[3], continued advancement requires computationally-savvy biologists, biologically-savvy computer scientists, with the ability to communicate.

The Mellon Colleges embrace a distinctive educational philosophy that treats students as junior collaborators in academic pursuits. Students are fully engaged in the research paradigm having experiences that are meaningful, vibrant and contemporary to build the foundation for a career that will contribute to the field. This productive interaction depends upon innovative programs integrating student and faculty research that equip the students with essential skills to meet intellectual challenges. Though our schools have used this model successfully for years, new challenges arise as we apply it in the emerging, complex discipline of computational biology. There is probably no single model that will work for all colleges; rather, the best practice will depend upon the strengths, resources, and culture of each institution and its faculty.

A cross-fertilization of these ideas is in order. We propose to invite one or two faculty from each college, representing a balance of mathematics, computer science and biology (encompassing ecology as well as molecular biology). Each participant will represent a distinct faculty/student research model, for example single faculty models stemming from either math of biology or a collaborative effort across departments, across colleges or including research university faculty. Two or three research faculty will be invited from diverse research models at graduate institutions in order provide a forward-looking perspective on research and graduate program expectations.

Impact:

The proposed workshop will foster the exchange of these innovative models that increase student engagement in computational biology at the research level.

Prior to the meeting, participants will summarize their student/faculty research model in a standard report that will address the college strengths that augment the particular model. These reports will be used to structure the final workshop program at which we will explore options (e.g. math students exploring biology, biology students incorporating math, rigorous integration of both research areas, and tight collaborations between specialists). During the final workshop session these reports will be revisited in order to evaluate current programs, identify unrealized college assets and direct future development. As several of the participating schools are currently restructuring programs to increase bioinformatics and computational biology curriculum, this timely workshop will ensure that faculty/student research interest are incorporated in the ongoing programmatic changes in a manner compatible with the college's strengths.

(1) 2004 http://www.hope.edu/pr/pressreleases/content/view/full/2095 funded by the Midwest Instructional Technology Center
(2) 2004 - 2006 http://www.collegenews.org/x5486.xml funded by the National Institute for Technology and Liberal Education
(3) BIO2010: Transforming Undergraduate Education for Future Research Biologists
http://www.nap.edu/openbook.php?isbn=0309085357

Workshop Organizers: The following faculty members initiated the workshop proposal and are committed to continued organizational effort toward the workshop.

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Origin and Evolution of the Genetic Code
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Computational and experimental methods to investigate non-coding RNA genes
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Workshop Planners: The following faculty members support the current proposal, will provide continued input and intend to attend the workshop if funded.

Brett Pellock - Hughes Postdoctoral Fellow-Dept. Biological Sciences
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Lisette G. de Pillis - Professor of Mathematics
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Workshop Participants: Additional openings will be filled through advertisement to the remaining Mellon colleges (the following faculty are representative of the diversity we intend to include).

Mellon Schools

Brian Morton Associate Professor and Chair of Biology
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Steven Williams - Professor of Biology Smith College
Genomics, proteomics and bioinformatics to elucidate the biology of disease parasites
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Daniel Aalberts - Associate Professor of Physics Williams College
Physics of biological polymers, studied with statistical and computational techniques.
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Non-Mellon Schools: The following faculty members have expressed interest in attending such a workshop.

Wei-Jen Chang - Assistant Professor of Biology Hamilton College
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Alistair Campbell, Ph.D., - Associate Professor of Computer Science Hamilton College
acampbel@hamilton.edu

Research University Participants (2-3 Faculty will be invited)

Pavel Pevsner
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Schedule and Format: Hosted at Reed College Campus

Peter Steinberger, Reed College Dean of the Faculty has indicated his support of this proposal.

The workshop will be scheduled for the summer of 2008 according to the availability of dormitory space, program organizers and program planners as well as attendees.

The precise program will be set according to logical arrangement of participants according to their self-reported student/faculty research model summary.

Day 1

5:00 arrive and check in
6:00 pm dinner on campus
7:30 Welcome
8:00 Examples of current research projects - short informal talks by participants
9:00 dessert social

Day 2

8:30 breakfast
9:00 Three 15 minute research talks
10:00 coffee
10:30 Research University seminar
11:00 Discussion
12:00 lunch
1:00 Three 15 minute research talks
2:00 Break
2:30 Research University Seminar
3:00 Examples of current research projects - specifically involving undergraduate students - 5-10 minute presentations.
4:00 Discussion
6:00 Dinner Downtown

Day 3

8:30 breakfast
9:00 Research University seminar
9:30 Three 15 minute research talks
10:30 coffee
11:00 Examples of current research projects - specifically involving undergraduate students - 5-10 minute presentations.
12:30 Lunch
1:30 -4:00 Discussion, Revisit self reported summaries of current faculty/student research models and evaluate respective college strengths that may be capitalized upon to improve future faculty/student research.
5:30 Dinner