

Executive Summary

Assisting Bioinformatics Efforts at Minority Schools

The primary aim of this project is to build on our highly successful program of assisting selected minority institutions in building a multidisciplinary bioinformatics training programs by providing a wide range of aid and support with all aspects of implementing bioinformatics programs. The core of this aid and support will continue to be the elements of our initial program three-part program. This begins during the summer with an intensive two-week workshop in sequence-based bioinformatics at the Pittsburgh Supercomputing Center (PSC) for a multidisciplinary faculty from the minority school. This workshop encompasses more than enough bioinformatics material for a one semester introductory course in bioinformatics. Next, PSC staff members travel to the selected minority school campuses during the following academic year to assist the faculty team that participated in the workshop in teaching an introductory bioinformatics course based on the workshop material. The initial core program continued through the next summer with a bioinformatics internship at the PSC for students selected from the on-campus course.

This core program has been carried out successfully at Howard University and the Medical Sciences campus at the University of Puerto Rico. It is currently underway and on schedule for successful implementation at North Carolina Central University and Morgan State University.

Our experience with this successful core program revealed a strong need and demand for assistance in extending the bioinformatics programs on these minority school campuses beyond the single, basic course included in the initial program. Faculty from biological sciences departments indicated a need for assistance in implementing courses covering more advanced techniques. Faculty from mathematical sciences and computational sciences departments indicated a need for assistance in providing training in bioinformatics to students in mathematical and computational sciences. We are proposing here to provide this assistance by working with a team of faculty members from minority schools to design and help implement courses to help provide this much sought training.

We will work with faculty from mathematics and computer sciences departments to develop model courses designed to introduce bioinformatics to students in the computational and mathematical sciences as well as the biological sciences. Additionally, the program will develop advanced courses for students who desire additional training in bioinformatics. Advanced courses will be developed for students in the biological sciences, the mathematical sciences, and the computational sciences. The goal is to assist minority institutions in providing their students complete set of courses. This program has two major components, first to create on each campus a core of faculty from multiple departments with expertise in the sequence analysis aspects of bioinformatics and to introduce this knowledge into the teaching curriculum and research repertoire of the faculty on that campus. The second major component is a curriculum development effort that will support the expansion of the initial bioinformatics course

offering into a certificate program in bioinformatics involving multiple departments, typically biological sciences, computer science, and mathematics or statistics.

The program will create new bioinformatics programs at two minority institutions each year and provide significant bioinformatics training at a number of other minority institutions. The first major component of the proposed program focuses around training in bioinformatics and sequence analysis techniques that allow scientists to make effective use of the vast amount of information being produced by various genome sequencing, gene expression, and macromolecular molecular sequence determination projects around the world. The training will also include an introduction to molecular mechanics and dynamics which will allow the trained scientists to make effective use of homology modeling in order to exploit the structural information available from the protein data bank and the structural genomics initiative and to effectively use these powerful techniques for investigating the interplay of sequence, structure, and function of biological macromolecules

This first major component of the technology transfer program involves three components designed to provide both immediate and long-term increases in the research opportunities available to scientists at minority institutions. The aims for each of the three components are to: create a multidisciplinary core group of faculty at each institution with knowledge and interest in bioinformatics; establish bioinformatics as part of the curriculum at selected institutions; and integrate bioinformatics procedures into the repertoire of research tools used in the laboratories of specific faculty at the selected institutions. The components for accomplishing these goals are: 1) A two week summer workshop in bioinformatics for a faculty teams from minority institutions; 2) Introducing bioinformatics as a permanent part of the curriculum at two minority campuses every year by cooperative team teaching of an bioinformatics course with members of the above faculty teams; and 3) A five week research internship for graduate students from the minority institutions who have completed the bioinformatics course on their campus in a project involving at least one of the faculty team members from the minority institution and Pittsburgh Supercomputing Center (PSC) staff members.

The second major component in developing bioinformatics certificate programs at minority institutions is a curriculum development effort to support the full range of courses needed in multiple departments to create an effective certificate program. We will develop three courses for each of the three tracks. Our conception of a broadly based certificate program in bioinformatics envisions students entering from one of three backgrounds and specializing in courses that will enhance their expertise in that area. The three backgrounds and specialization tracks are: a biological sciences or experimental track, a computer sciences or computational track, and a mathematical sciences or modeling track. We expect that students entering from each track will retain that background as their primary area of expertise and professional competence but will develop a strong ability to apply bioinformatics within their area of expertise (biological sciences) or to apply their area of expertise to developing solutions for problems in bioinformatics (computer and mathematical sciences).

We will develop curricula for a total of six courses, two for each track. The initial course for each track will be designed to serve as both an introduction to bioinformatics for students who are specializing in that track and an introduction to material from the area of expertise of that track to students from the other tracks. The second course in each track will be advanced, specialized material designed for students who are specializing in that track. Students in the certificate program will be expected to complete all three introductory courses as well as the advanced course in their area of specialization. Each course module will include a complete description of the course suitable for formal registration of the course at each minority institution that wants to adopt the certificate program. In addition suitable reading materials will be identified and PowerPoint presentations for each of the anticipated lectures in the course will be developed.

As the curricula are developed we will incorporate presentation of the course design along with representative material into the summer workshop in Pittsburgh. The course designers will be present at the workshop to present the materials developed for the course and discuss their experience in presenting such material with those participants who want to implement the certificate program on their campuses.