

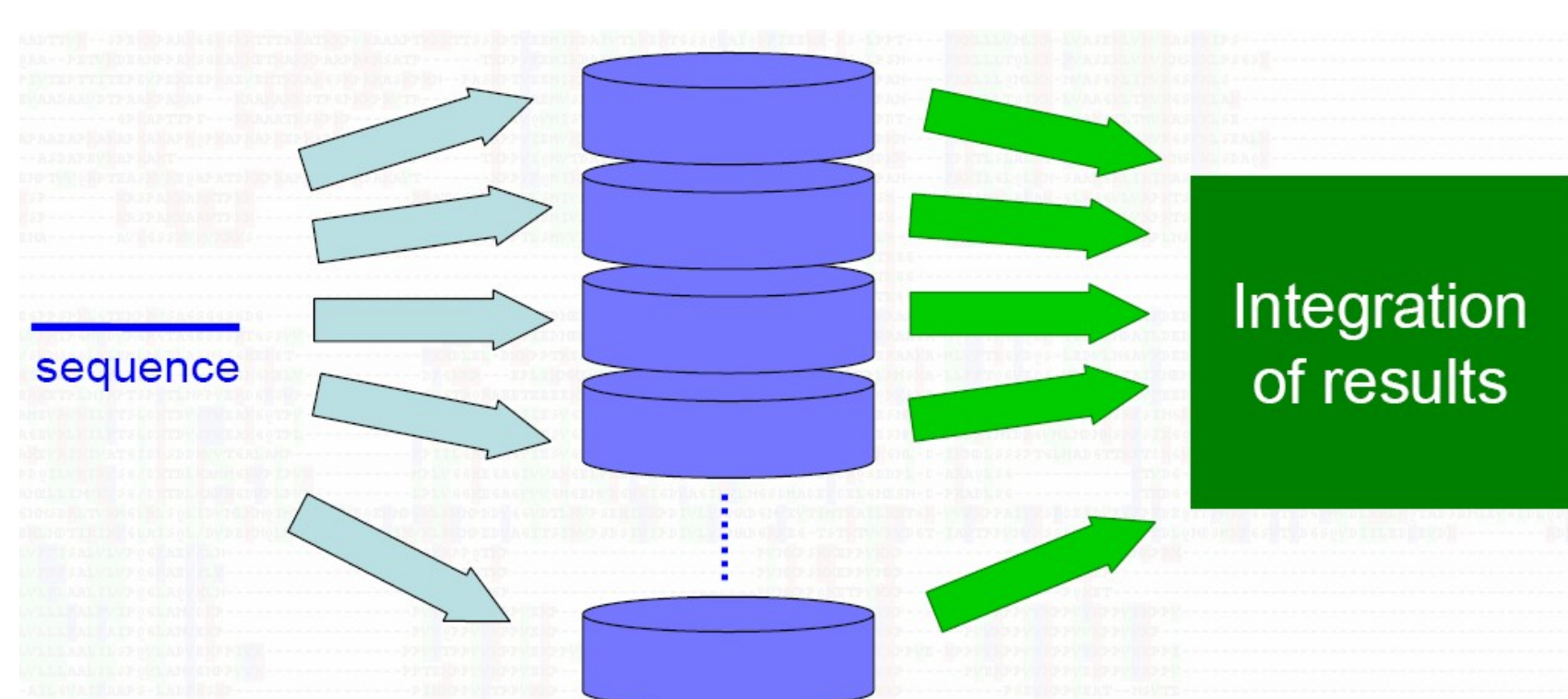
**Project Title:**

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**FIU/FAU Advisor:** Dr. Abhijit S. Pandya, FAU  
**PIRE International Partner Advisor:** Dr. Gustavo Rossi, UNLP

**I. Research Overview and Outcome**

**Developing Bioinformatics Applications on the Grid**

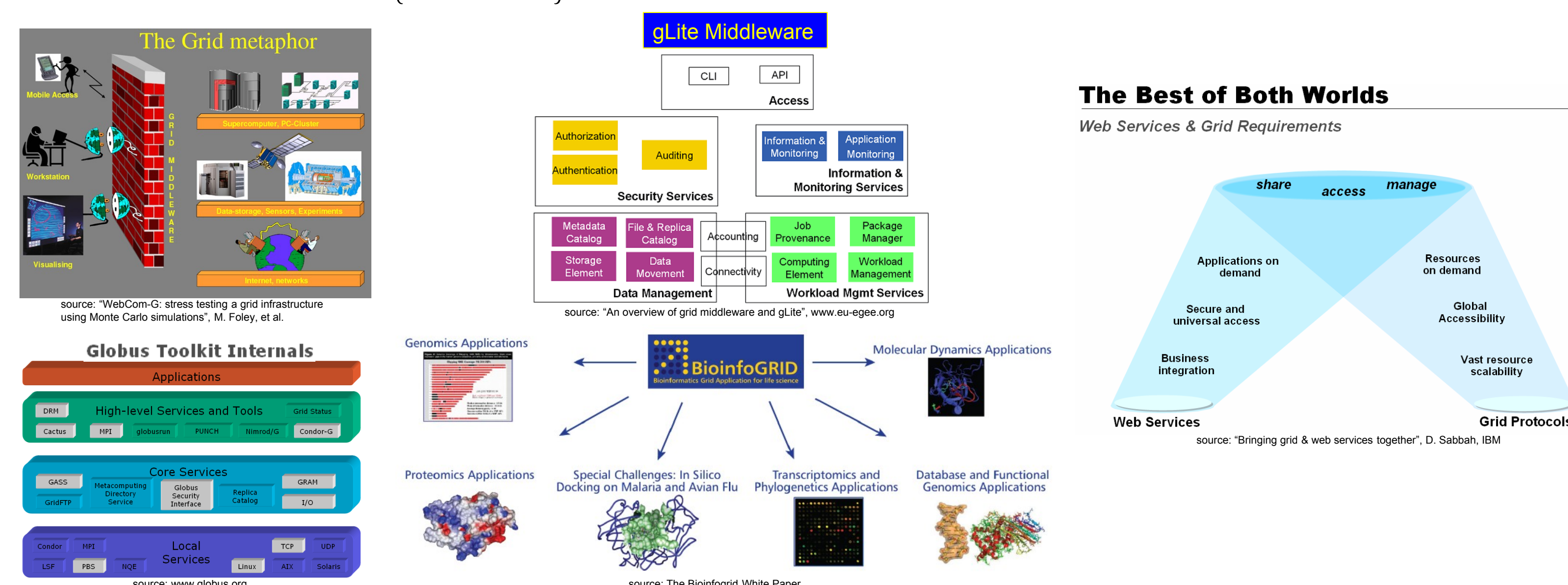
**Overview:** Today, a vast amount of genetic sequence information is available in bioinformatics databases. By performing preliminary analysis of this information, biologists can streamline their efforts before resorting to wet labs experiments involving living organisms. However, the execution time for many bioinformatics applications is currently not practical and the size of biological databases continues to expand rapidly. Many of the algorithms, such as those used for sequence comparison and protein folding, can be coded to make use of parallel execution, possibly leading to an improvement in execution speed of several fold:



This project targets how grid computing can be applied to take advantage of parallel execution and resource management to solve these problems. The benefits of this research are increased interconnection of researchers and faster application execution. This leads to a reduction in time to market for disease treatments due to quicker results, enhanced collaboration among researchers and the ability to store massive amounts of data. Another goal was to share bioinformatics research activities at our respective universities.

**Methodology:** Since UNLP is a member of both LAGrid and EELA (E-infrastructure between Europe and Latin America), I tried to access both grids and compare both platforms for development of bioinformatics applications. I investigated the components of grid software, development tools for grid applications, and existing bioinformatics grid applications.

**Outcome:** Access to both LAGrid and EELA, which involves obtaining a certificate and joining a virtual organization, was unexpectedly difficult. Therefore, hands-on testing of both systems was not possible in the time I was at UNLP. However, I learned about the major factors involved in successful grid computing: 1) access to networks with the capacity to maintain the level of service required for operations; 2) a grid services system (middleware – e.g. Globus or gLite) and other supporting software that perform according to expectations; 3) sufficient capacity in computing resources (e.g. CPU cycles or storage); 4) an inter-organizational management process that is satisfactory to all participants. It appears that we are seeing a convergence of grid and web standards. The Global Grid Forum, which is developing OpenGrid Services Architecture (OGSA) and the OGSI grid for applications, is working to include open source web standards, such as: XML; Universal Description, Discovery, and Information (UDDI); Web Services Description Language (WSDL); and Simple Object Access Protocol (SOAP). There are also grid-enabled versions of the Message Passing Interface (MPI) software and the Weka machine learning toolkit. I was able to locate several existing bioinformatics grids, such as BioinfoGRID (Europe), Biomedical Informatic Research Network (BIRN, National Institutes of Health), and North Carolina Bioinformatics Grid (BioGrid).



**II. International Experience**

Everyone at UNLP was very friendly and tried to be as helpful as they could, especially my international advisor, Dr. Gustavo Rossi. Unfortunately, there was very limited knowledge about grid computing and bioinformatics at UNLP. This gave me an opportunity to give them a bioinformatics presentation, which I did. I was also able to correspond with researchers at other universities in Argentina about bioinformatics grid solutions. The PIRE program has facilitated these international contacts which may enhance my professional and academic future.

It was a great opportunity to live in another culture for an extended period. Things I liked: the people, everything within walking distance, and meeting my relatives. Things I didn't like: the diet (too much red meat and sugar), trying to break large bills (nobody has change!), and the government bureaucracy.

**UNLP**

- Me, on the way to the office
- Dr. Gustavo Rossi, int'l advisor (and wife)
- The LIFIA collaborators



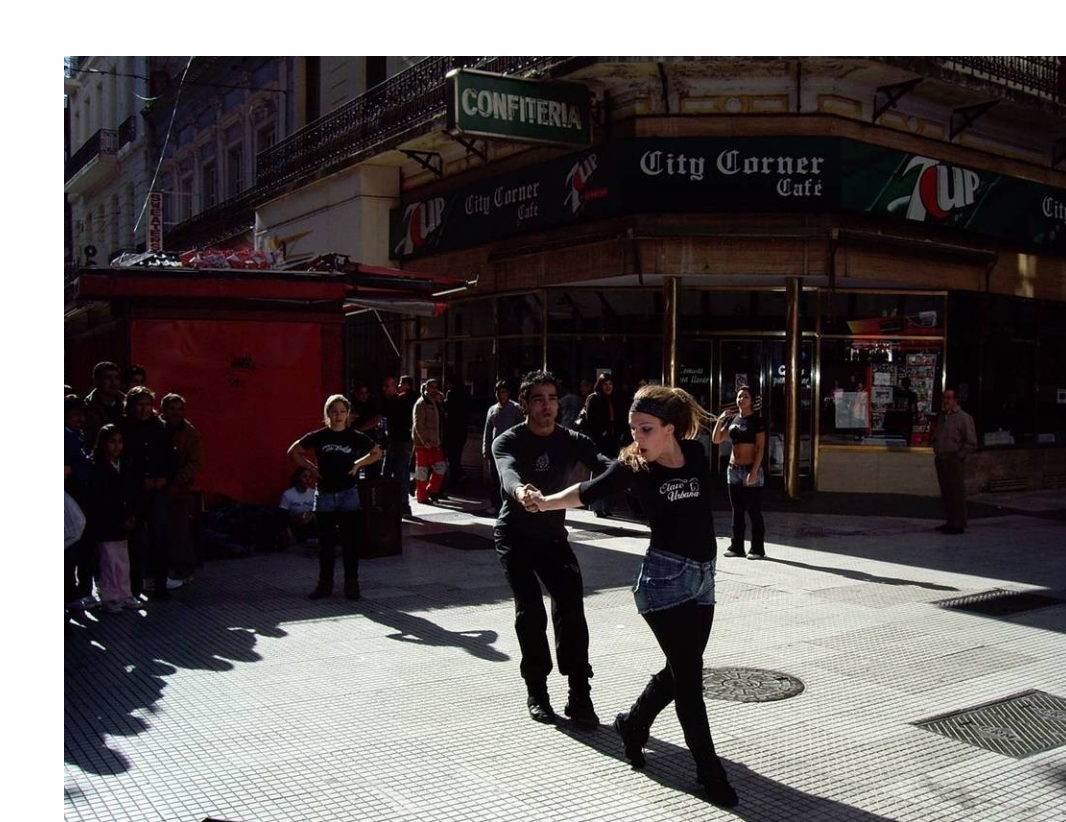
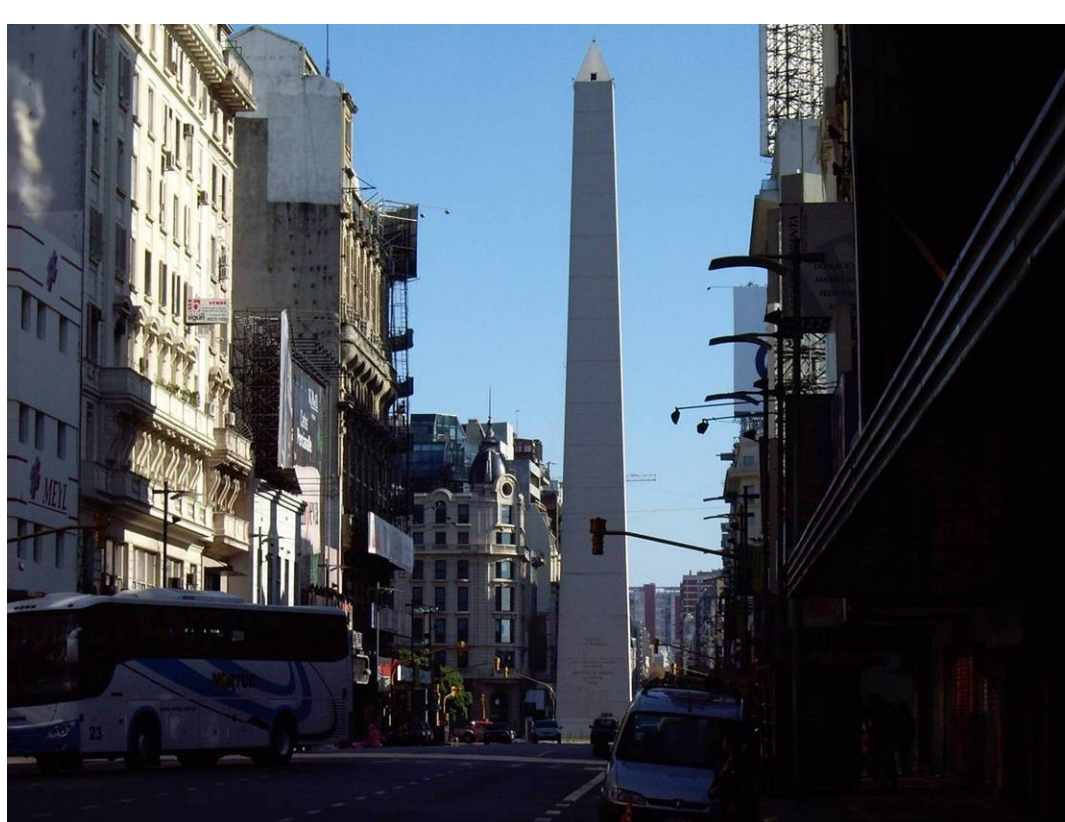
**La Plata**

- The Cathedral, the largest church in Argentina. Go to the top and view the city!
- Making empanadas: One of the LIFIA group invited us to her home to try our hand at making empanadas. I probably ate enough of them in Argentina to last a lifetime.
- El Barba: this was my favorite neighborhood restaurant. Of course it had an asado.



**Buenos Aires**

- The obelisk: one of the icons of the city. Looks like a miniature Washington monument.
- Recoleta necropolis: walk through this maze of tombs. To find Evita's look for DUARTE, not PERON (like I did).
- Salsa demo in the street: why not?



**III. Acknowledgement**

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