



e-Learning in Bioinformatics

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European Molecular Biology Network

Red Iberoamericana de Bioinformática

Red Temática Nacional de Bioinformática

Asia-Pacific Bioinformatics Network

Medicine

- All science is either physics or stamp collecting
 - Rutherford, Ernest (1871-1937)
- We can only understand disease at the molecular level
 - Alberto Sols (1917-1989)

Molecular Medicine

- Biochemistry
- Biophysics
- **Genetic medicine**
- **Molecular basis of disease**
- **Cellular basis of disease**
- **Biological aspects of disease**
- **Pharmacogenomics**

Molecular Biology

- A young science that flourished in the last two decades
 - Genetics
 - Proteins
 - Molecular interactions
 - Cellular integration
 - Population dynamics
 - Evolution

Bioinformatics

- For the Biologist
 - Analysis of experimental data from Molecular Biology
 - Understanding Biological processes
- For the physician
 - Interpretation of test results
 - Diagnose and prognosis
- For the pharmaceutical
 - Drug selection and study

Bridging the gap

- Molecular Biology is increasingly being applied in Medicine
 - Just follow MB experimental methods
 - What about data interpretation?
 - Bioinformatics has grown for the Biologist
 - BI methods could be applied directly by the Physician
 - But **literature is Biologist-oriented**



An example

Evolution

- For the Biologist

- How did these species/genes originate?

- How did these species/genes evolve from a common ancestor to reach their current status?
 - *I want to know what is this!*

- For the Physician

- How does this disease/pathogen change?

- How does it spread?
 - How does it develop new pathologies?
 - How does it develop resistances?...
 - *I know what it is, I want to know what makes it special!*

Avian Flu

- From: Identification of human-to-human transmissibility factors in PB2 proteins of influenza A by large-scale mutual information analysis. *InCoB2007 Hong Kong, 28th August 2007. Olivo Motto.*



Can H5N1 viruses spread amongst humans?

Human Sequences (H2H)

H2H variants show remarkable historical stability

Location of characteristic sites in binding domains suggests complex interactions are involved in adaptation to H2H transmission

Both current lineages (H1N1, HxN2) have evolved from the same source (1918 Spanish Flu)

The Spanish Flu (La Gripe) H1N1

20-40 *million* dead in one year

50-100 million dead in total

20% world population infected

8 million deaths in May in

Spain

death within hours



Avian sequences (H5N1)

Avian strains rarely show any H2H mutation

Spanish Flu had 5 H2H mutations

H5N1 repeatedly exhibits H2H mutations, but they do not “stick”

H5N1 not becoming H2H

Reassortment is unlikely - and how pathogenic?

| | | | | | | | | | | | | | | | | |
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| DA | M | T | T | A | T | I | R | L | D | A | V | E | A | A | K | A2A |
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| DA | M | T | T | A | T | T | R | L | E | A | V | E | A | A | K | HSN1,2006,INDONESIA,A/Indonesia/CDC739/2006 |
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| NS | T | M | V | S | A | T | K | H | N | I | T | K | T | R | | H2H |

Fighting Avian Flu

- New Grid technologies are finding its way into Bioinformatics and Health informatics
- Drug screening initiatives are speeding up the path to discovery of new therapies.



The screenshot displays the WISDOM website, an initiative for grid-enabled drug discovery against neglected and emergent diseases. The page features a search bar with a 'Submit' button and a link to 'Advanced search'. Below the search bar, there are links for 'Description', 'Results', 'Partners', and 'Press release'. A section for 'INTRANET' and 'NEWS' is also visible, with a message stating 'no news in this list.' The main content area highlights a project titled 'High throughput virtual screening against avian influenza', which discusses the H5N1 virus transmission and the goal of screening compounds against the influenza A neuraminidase. A URL is provided: <http://wisdom.eu-egee.fr/avianflu>. The footer includes logos for the Information Society and Media, the European Union, and a design credit to HealthGrid © 2006.

WISDOM
Initiative for grid-enabled drug discovery
against neglected and emergent diseases

HOME ABOUT WISDOM PROJECTS LINKS

PROJECTS >> Wide virtual screening against avian flu >> Description >>

Submit >> Advanced search

- Description
- Results
- Partners
- Press release

INTRANET >>

NEWS >>

no news in this list.

High throughput virtual screening against avian influenza

The H5N1 virus transmission to human has been observed since 1997, but there has been experience of the subtype N1 at least since 1918. However, scientists showed that the N1 and N2 subtypes could evolve into variants under drug stress. Therefore, our initiative is going to study the impact of point mutation on drug resistance. The goal is to screen a large set of compounds against the same target, the influenza A neuraminidase, with various structures predicted from homology methods thanks to grid infrastructure.

<http://wisdom.eu-egee.fr/avianflu>

HOME SITE MAP DISCLAIMER CONTACT

Information Society and Media European Union Design >> HealthGrid © 2006

Other applications

- Identification of mutant genes
 - Diagnosis of genetic diseases
 - Prognosis of propensity to disease
 - Genetic/molecular counsel
 - Personalized drug therapy
 - etc...
-
- Note that all of them have a wider economic and social impact (travel, insurance, politics, commerce, discrimination...)



So, where is the problem?

Getting closer

- Bioinformatics has grown hand-by-hand with Molecular Biology
 - Most tools and documentation are oriented to the Biological problem
 - Indeed, most of them are oriented to the Bioinformatician (Theoretical Life Scientist?)
- Medical Doctors need to get acquainted with a well-established methodology
 - Using a *foreign* language



Solving the problem

Adapt to MD needs

- Translate tools and docs to *medicalese*
- MDs need meaningful data to guide decisions
 - Develop/adapt tools to MD needs
 - Subject of a submitted COST proposal
- Train MDs in the *interpretation* of analytical results

Training in Bioinformatics

- Still immature:
 - Lack of professionals
 - Wide range of subdisciplines
- Bioinformatics is still a young discipline
 - Comprehensive training is difficult to deliver
- Either
 - Experts *at* different institutions cooperate
 - Or only specialized training is delivered

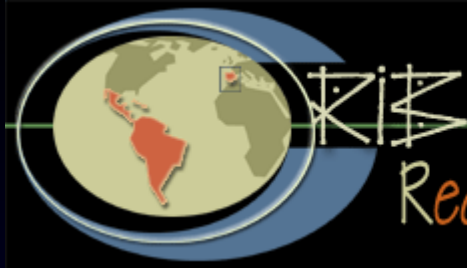
e-Learning

- e-Learning allows pooling of training resources at different locations
- EMBnet has started a public portal for
 - Sharing (CC) training materials
 - Cooperative training
 - Delivering remote education
- <http://edu.embnet.org/>

- EMBnet is a group of **~40 collaborating nodes** providing support to Life Scientists
 - National nodes provide bioinformatics support to local scientists
 - Specialist nodes provide expertise in highly specialized areas
 - Other nodes collaborate on special areas
- There are european as well as non-european nodes (Africa, America, Asia, Australasia)

Growing collaboration

- Despite its size, EMBnet alone can not cover all the needs for e-Learning in Bioinformatics
- To be truly useful such a resource must cover the needs of
 - Most training institutions
 - At different countries, cultures, etc...
 - Most Bioinformatics fields
 - Sequence Analysis, Evolution, Structural Biology, *omics...
 - Most users
 - Biologists, Medical Doctors, Pharmacologists, etc...



Red Iberoamericana de Bioinformática

- An international network of cooperating nodes oriented to **Iberian** (Spain and Portugal) and related **American** (Central and South American) countries.
- Goal is to **promote development of Bioinformatics** in the region.
- Many **common members** with EMBnet
- Joined the initiative in June-2007



The Asia Pacific Bioinformatics Network

Endorsed By    

- More than 20 organizational and 300 individual members from over 12 countries in the region
- A non-profit, non-governmental, international organization.
- It focuses on the promotion of bioinformatics in the Asia Pacific Region
- Joined the initiative in August 2007





Red Temática Nacional de

BIOINFORMÁTICA

- The national network for bioinformatics is the communication and community-building tool for our bioinformaticians and computational biologists. It has an open scope, as
 - it represents the different trends in bioinformatics and computational biology,
 - it includes people from different professional and academic origin, and
 - it participates in the organization of scientific activities, dissemination and training
- Joined initiative in February 2008

http://edu.embnet.org



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English (en)


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
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You are welcome to visit courses and download a backup of their contents for use at your own site under their stated terms of license.

For an introduction to Bioinformatics for Life Scientists, you may also visit our sister **EMBER portal** (new users should 'create an EMBER account' to set their own login ID).


[You are welcome to use and contribute to this site](#)

Site news

**New materials on Biostatistics**
by [Admin User](#) - Monday, 25 February 2008, 01:17 PM

The course on Introductory Biostatistics has been updated and expanded for its use at the Spanish EMBnet node this week.

In addition we have added to the exchange repository new materials on statistics from Universidad de Cádiz in Spain released under GNU licenses.



Welcome to EMBnet eLearning
Best Bioinformatics training in the Galaxy!

Calendar
April 2008

| Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|-----|-----|-----|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
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| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | | | | |

<http://elearning.embnet.org>

- A sharing point for training materials
 - With advice to authors
- An e-learning place to support courses
 - Open to guest and registered users
 - Multilingual (EN, ES, CN...)
 - Wide range of courses available
 - Used in real-world training
 - All materials available for download/replication/use
- Creative Commons licensing

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Topic outline

Welcome to the Bioinformatics Exchange

This is a place where you can exchange materials with other people. If you don't have a full course to share, but have instead spare materials covering or demonstrating a given topic (presentations, movies, notes, etc..) and want to share them with the community, then this is your place.

Simply select the kind of material you want to share and post an entry in the appropriate glossary, or browse the glossaries and download materials of interest.

Please, note that you can also visit most courses hosted on this site and grab a backup copy of them as well.

Note: to add new entries you may need to "enrol" yourself in this *Bioinformatics Exchange*.


 [Social forum](#)

Recent Activity








Activity since Saturday, 9 February 2008, 12:29 PM
[Full report of recent activity...](#)

Nothing new since your last login

Upcoming Events

 [Introductory Biostatistics \(CNB/CSIC\)](#)
Monday, 25 February (03:30 PM)
» *Friday, 29 February* (05:30 PM)

[Go to calendar ...](#)
[New Event...](#)

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Course categories

- Active courses
 - Athens Practicals 2007
 - Basic Bioinformatics
 - Introduction to Bioinformatics - ch.embnet.org
 - Introductory Biostatistics (ES-2008)
 - Advanced Bioinformatics
 - Computer Science
 - RTNBI Grid tutorial (EMBnet/ES 2008)
- Archived courses
 - Basic Bioinformatics
 - Introductory Biostatistics (ES-2007)
 - Molecular Dynamics Simulations (CHARMM), CH 1999
 - Introduction to Bioinformatics, ES, 2005
 - Introduction to Bioinformatics, CH, 2006
 - Advanced Bioinformatics
 - Statistical Methods in Bioinformatics, CH, 2006
 - Unix & Perl for biomedical researchers, CH 2006
 - DNA Microarrays data analysis, CH 2006

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Computer Science

- InCoB07 Grid tutorial (EMBnet/ES 2007)
- GNU C Tutorial 2007
- EMBRACE - ES - 2007
- UNIX Fundamentals (OSU 1996)
- Networking
- Welcome to Java
- Unix System Administration - A Survival Course (WU, 1998)
- Unix System Administration (OSU, 1996)
- GNU C Programming Tutorial 2002

Spanish / Español

- Bioinformática**
 - Biocomputación, (ES-2006)
- Computación**
 - Aprendiendo SQL con PostGreSQL (ES-2005)
 - Introducción al Lenguaje PERL (ES-2005)
 - Tutorial de C++ (ES-2006)
 - Curso de Fortran (ES-2005)
 - Programación de Pascal (ES-2005)

Chinese / 中文

- Applied Bioinformatics Course (PKU, CN, 2006)

Miscellaneous

- Bioinformatics exchange

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Topic outline

Statistical Methods in Bioinformatics 2006



Course objectives

The purpose of this course is to introduce students to methods from probability theory, statistics, and the theory of stochastic processes in the context of bioinformatics applications (e.g. DNA and protein sequence analysis, microarray data analysis, phylogeny). Major topics will include a general introduction into Bayesian statistical inference, clustering and classification, regression methods, stochastic processes and Markov chains, and evolutionary models.

Attendees will work through short tutorial on the topics discussed in the class.

Audience

Familiarity with basic concepts from statistics and knowledge of calculus and linear algebra are prerequisites to fully benefit from this course.

A basic knowledge of Unix is required for the practical sessions of the course.

News forum

Latest News

Add a new topic...
(No news has been posted yet)

Upcoming Events

Introductory Biostatistics (CNB/CSIC)

Monday, 25 February (03:30 PM)

» Friday, 29 February (05:30 PM)

Go to calendar...
New Event...

Recent Activity

Activity since Saturday, 9 February 2008, 12:37 PM

Full report of recent activity...

Nothing new since your last login

Done Tor Disabled

A long way to go...

- A new initiative in its early phases
- Need to increase coverage for
 - More topics
 - More languages
 - More disciplines
 - More communities
 - Physicans (MD)
 - Chemists (Pharma)
 - Biology (other than MB)
 - etc...



In one word

It's all about people

We need your help

- To develop new materials
 - Oriented to medical doctors
- To develop new tools
 - Oriented to medical practice
- To benefit from our work
 - Use
 - Contribute
 - Spread
 - Support

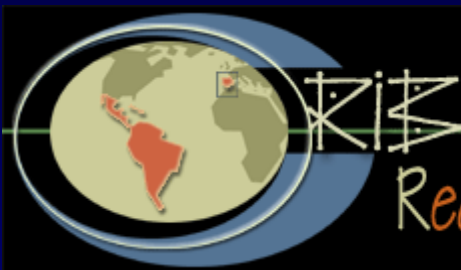
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