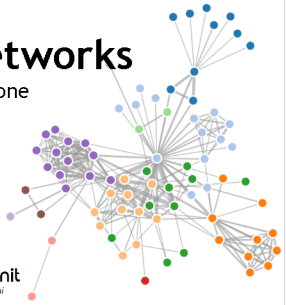
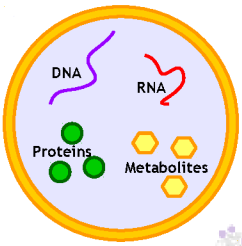
Biological Networks

Alberto Calderone



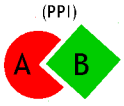
Simplified Cell



The goal is to try to understand how biological entities such as DNA, RNA, proteins and metabolites are physically and functionally related to each other and how they form networks.

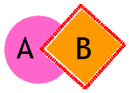
Biological Networks

Protein-Protein Interaction Networks (PPI)



A physically interacts with B

Signaling Networks (Proteins, genes, RNAs)



A activates or inactivates B

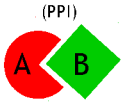
A up-regulates or down-regulates B

Reaction-Based Dynamical Models

A catalyst is needed for the reaction between A and B, where the amount of A is twice the about of B

Biological Networks

Protein-Protein Interaction Networks (PPI)



A physically interacts with B

Signaling Networks (Proteins, genes, RNAs)

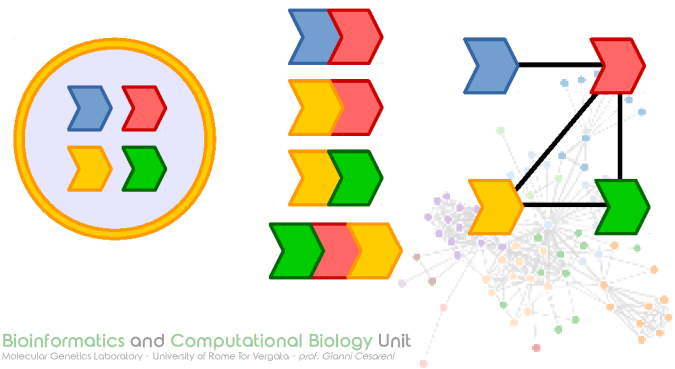
A activates or inactivates B

A up-regulates or down-regulates B

Reaction-Based Dynamical Models

A catalyst is needed for the reaction between A and B, where the amount of A is twice the about of B

Protein-Protein Interactions

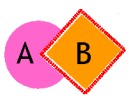


Biological Networks

Protein-Protein Interaction Networks (PPI)

A physically interacts with B

Signaling Networks (Proteins, genes, RNAs)



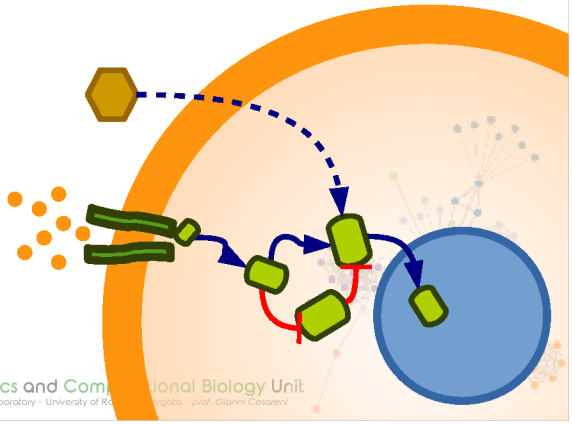
A activates or inactivates B

A up-regulates or down-regulates B

Reaction-Based Dynamical Models

A catalyst is needed for the reaction between A and B, where the amount of A is twice the about of B

Signaling



Biological Networks

Protein-Protein Interaction Networks (PPI)

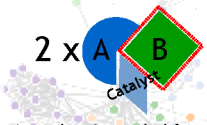
A physically interacts with B

Signaling Networks (Proteins, genes, RNAs)

A activates or inactivates B

A up-regulates or down-regulates B

Reaction-Based Dynamical Models



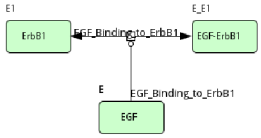
A catalyst is needed for the reaction between A and B, where the amount of A is twice the about of B

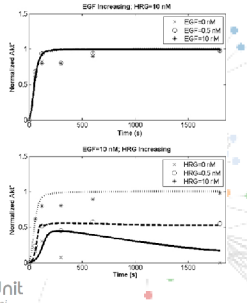
Reaction-Based Networks

Metabolic Networks

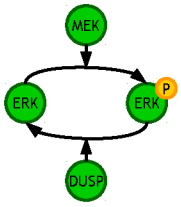
Ligand-dependent responses of the ErbB signaling network: experimental and modeling analyses

Marc R Birtwistle, Mariko Hatakeyama, Noriko Yumoto, Babatunde A Ogunnaike, Jan B Hoek, Boris N Kholodenko





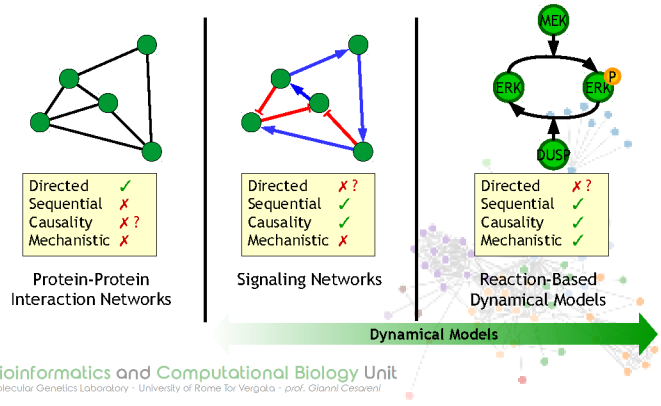
How to build a Reaction-Based Network



MEK catalyses the addition of a phosphate group to ERK. DUSP removes the phosphate

$$\frac{\Delta[pERK]}{\Delta t} = k_1 \cdot [MEK] \cdot [ERK] - k_2 \cdot [DUSP] \cdot [pERK]$$

Biological Networks Models



Protein Interaction Resources

IMEx
The International Molecular Exchange Consortium

MINT
http://mint.bio.uniroma2.it/mint/Welcome.do

MatrixDB
http://matrixdb.ibcp.fr/

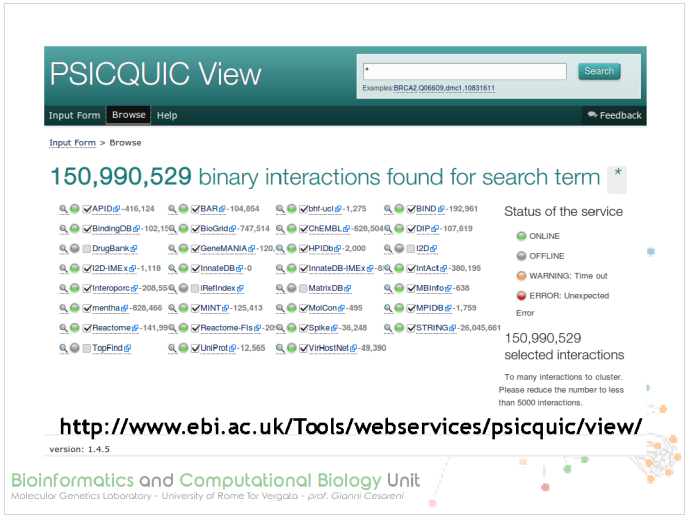
IntAct
http://www.ebi.ac.uk/intact/

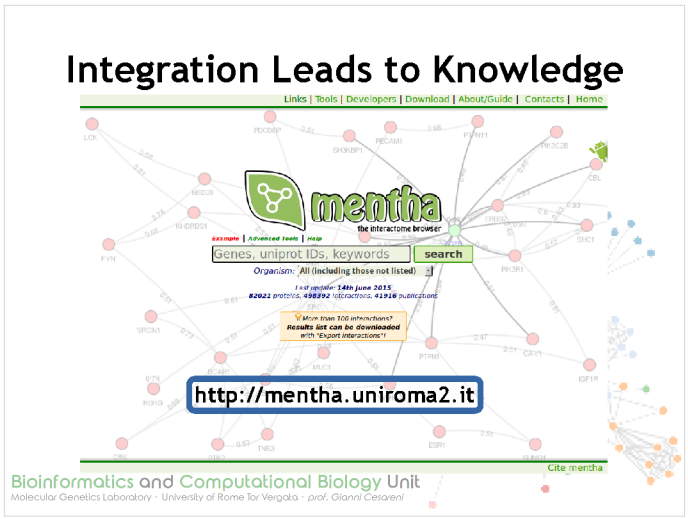
BioGRID
http://thebiogrid.org/

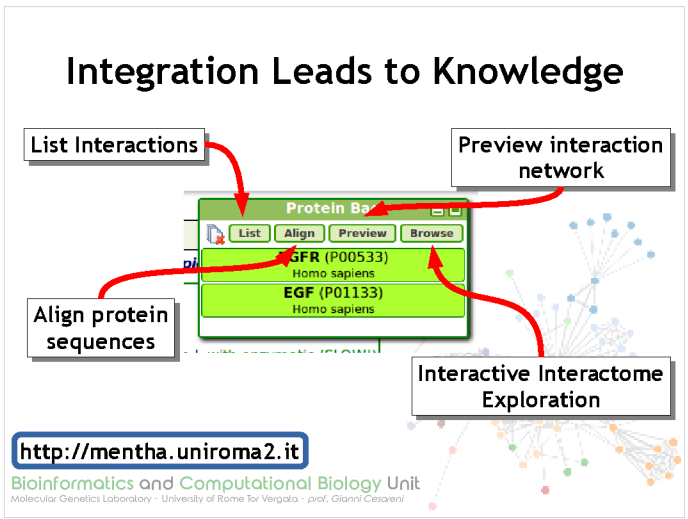
Database of Interacting Proteins
http://dip.doe-mbi.ucla.edu/dip/Main.cgi

Note

- Different resources may contain different and complementary evidence
- Some evidence can be redundant


PSICQUIC View
Search
Input Form
Browse
Help
Feedback
Input Form > Browse
150,990,529 binary interactions found for search term *
Status of the service
ONLINE
OFFLINE
WARNING: Time out
ERROR: Unexpected Error
150,990,529 selected interactions
To many interactions to cluster. Please reduce the number to less than 5000 interactions.
http://www.ebi.ac.uk/Tools/webservices/psicquic/view/
version: 1.4.5
Bioinformatics and Computational Biology Unit
Molecular Genetics Laboratory - University of Rome Tor Vergata - prof. Gianni Cesareni


Integration Leads to Knowledge
Links | Tools | Developers | Download | About/Guide | Contacts | Home
mentha
the interactome browser
Genes, uniprot IDs, keywords
search
Organism: All (including those not listed)
http://mentha.uniroma2.it
Cite mentha
Bioinformatics and Computational Biology Unit
Molecular Genetics Laboratory - University of Rome Tor Vergata - prof. Gianni Cesareni


Integration Leads to Knowledge
List Interactions
Preview interaction network
List
Align
Preview
Browse
EGFR (P00533)
Homo sapiens
EGF (P01133)
Homo sapiens
Align protein sequences
Interactive Interactome Exploration
http://mentha.uniroma2.it
Bioinformatics and Computational Biology Unit
Molecular Genetics Laboratory - University of Rome Tor Vergata - prof. Gianni Cesareni

Causal Interaction Resources

Signalling Interactions

Signor

SIGnaling Network Open Resource

http://signor.uniroma2.it

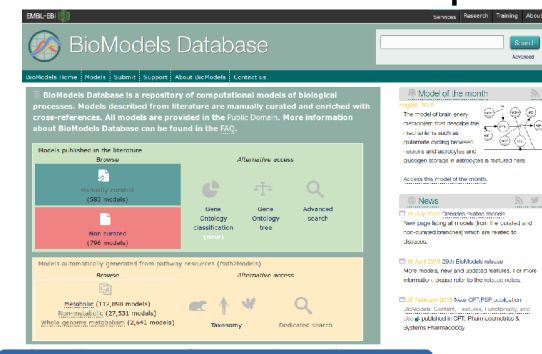
Aim of the project

A resource to store binary logic relationships among different types of biological entities to support high-throughput experimental approaches

Reaction-Based Models Repository

http://www.reactome.org

Reaction-Based Models Repository



https://www.ebi.ac.uk/biomodels-main/