

GENE@HOME

GEne Network Expansion

TN-Grid BOINC platform

Who we are



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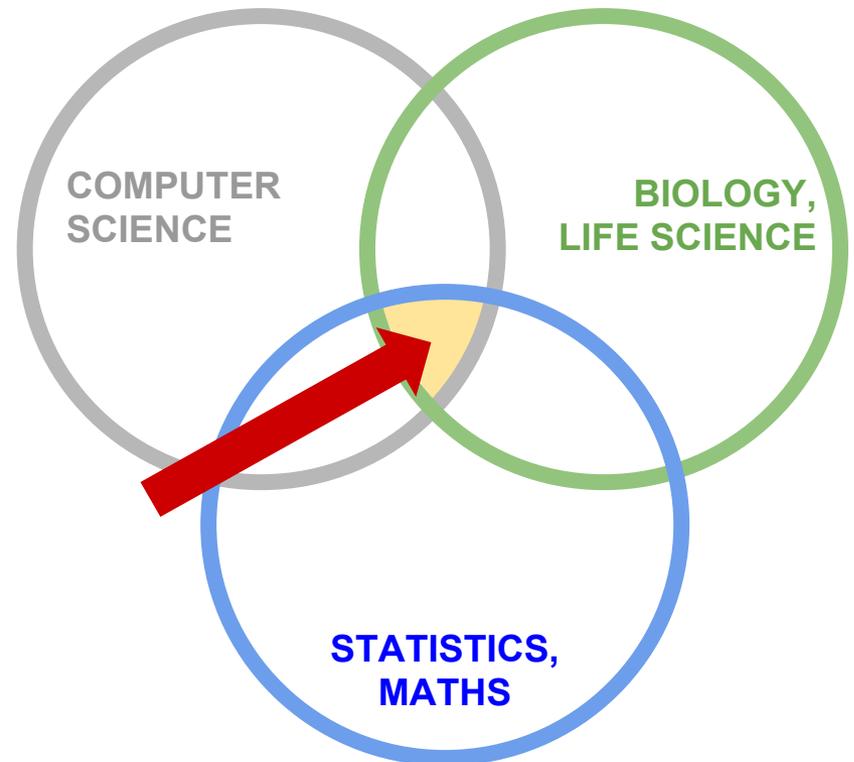


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Gene@home

A
**Computational
Biology**
project for
GEne Networks
Expansion
on a
**Distributed
Platform**

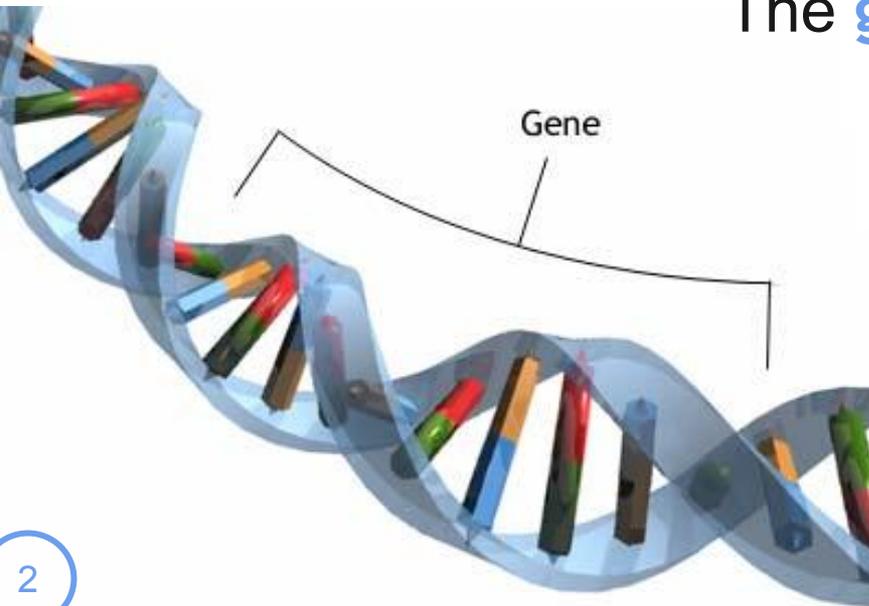


Biological background

A **gene** is a piece of DNA which contains the information to create a specific protein

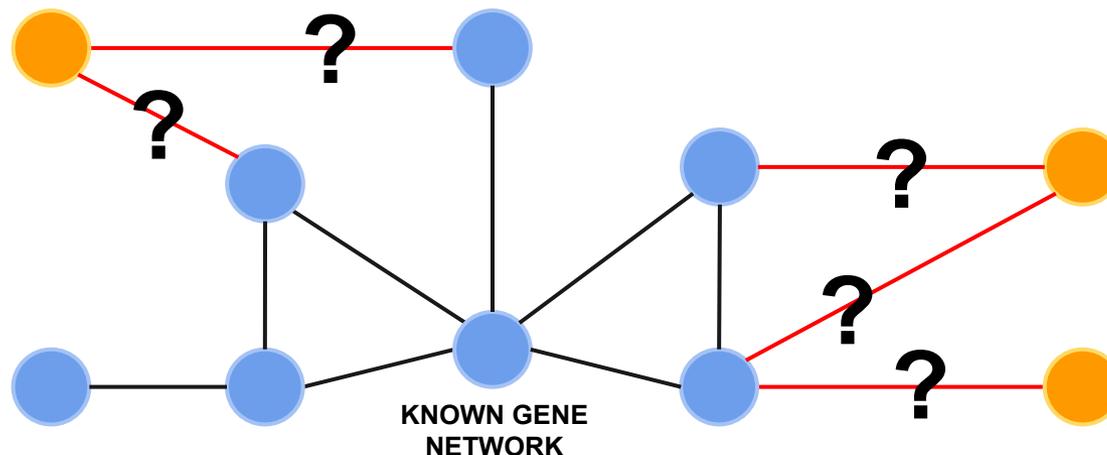
The **genome** is the whole set of genes of a specific organism

Interactions between genes form a **gene network**



Challenge

We want to discover **new relations** between genes

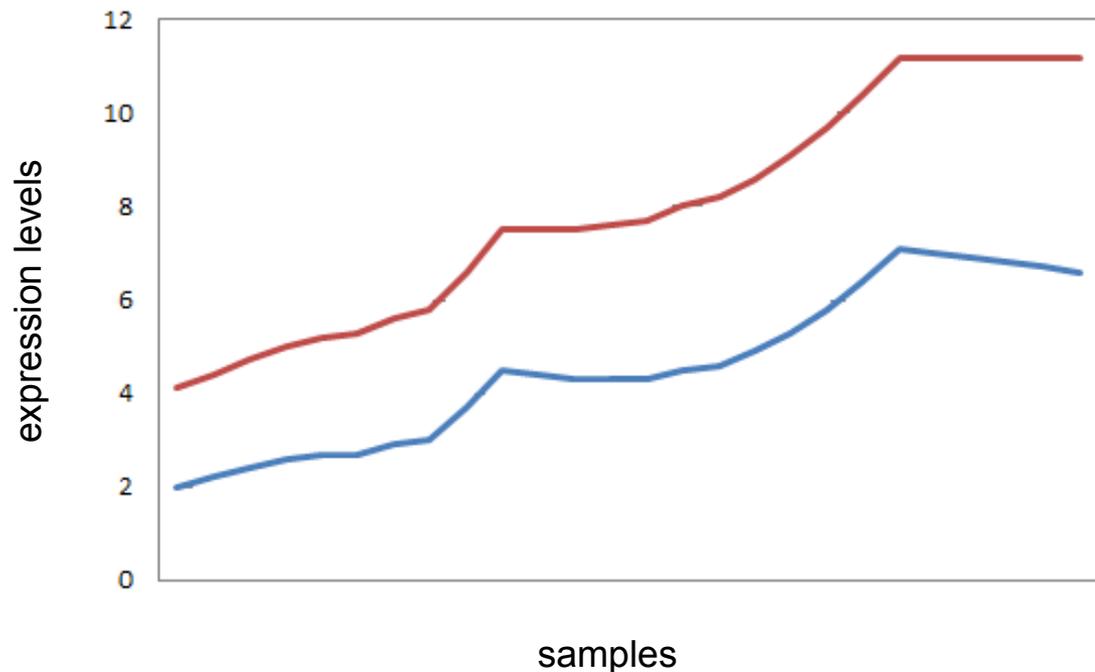


Genes on the same gene network are **correlated**

Method

We compare the **expression levels** of two different genes

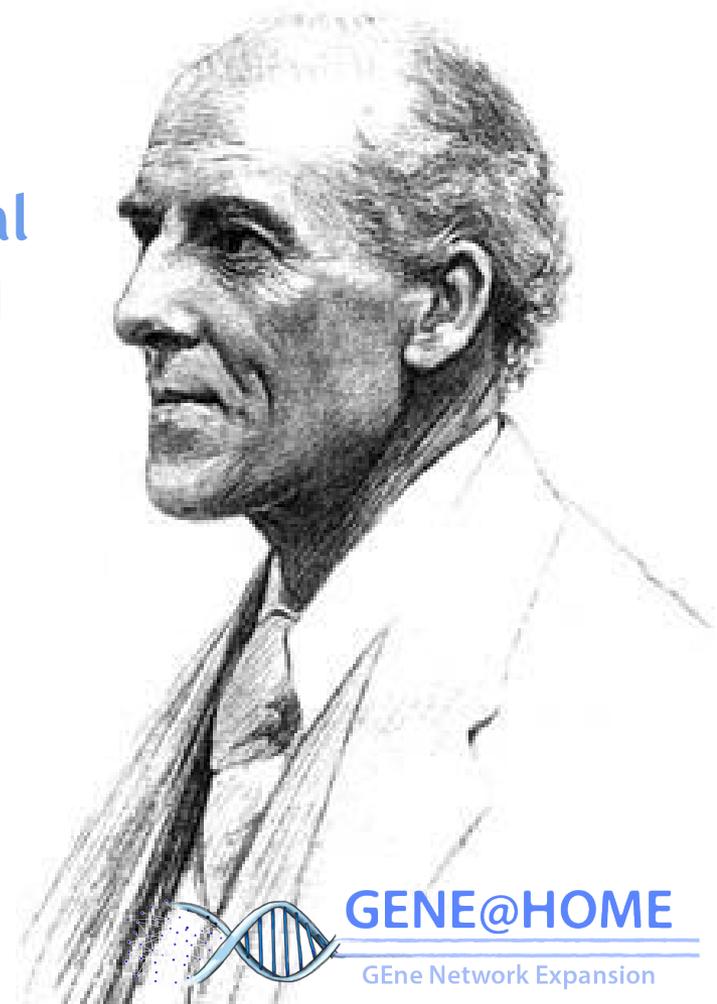
Relations between genes become **correlations** when their expression levels have a similar trend



Method

We use the **PC-algorithm** to find **causal relationships** among genes, exploiting their expression levels in different samples

Correlations between genes are computed using **Pearson coefficient**

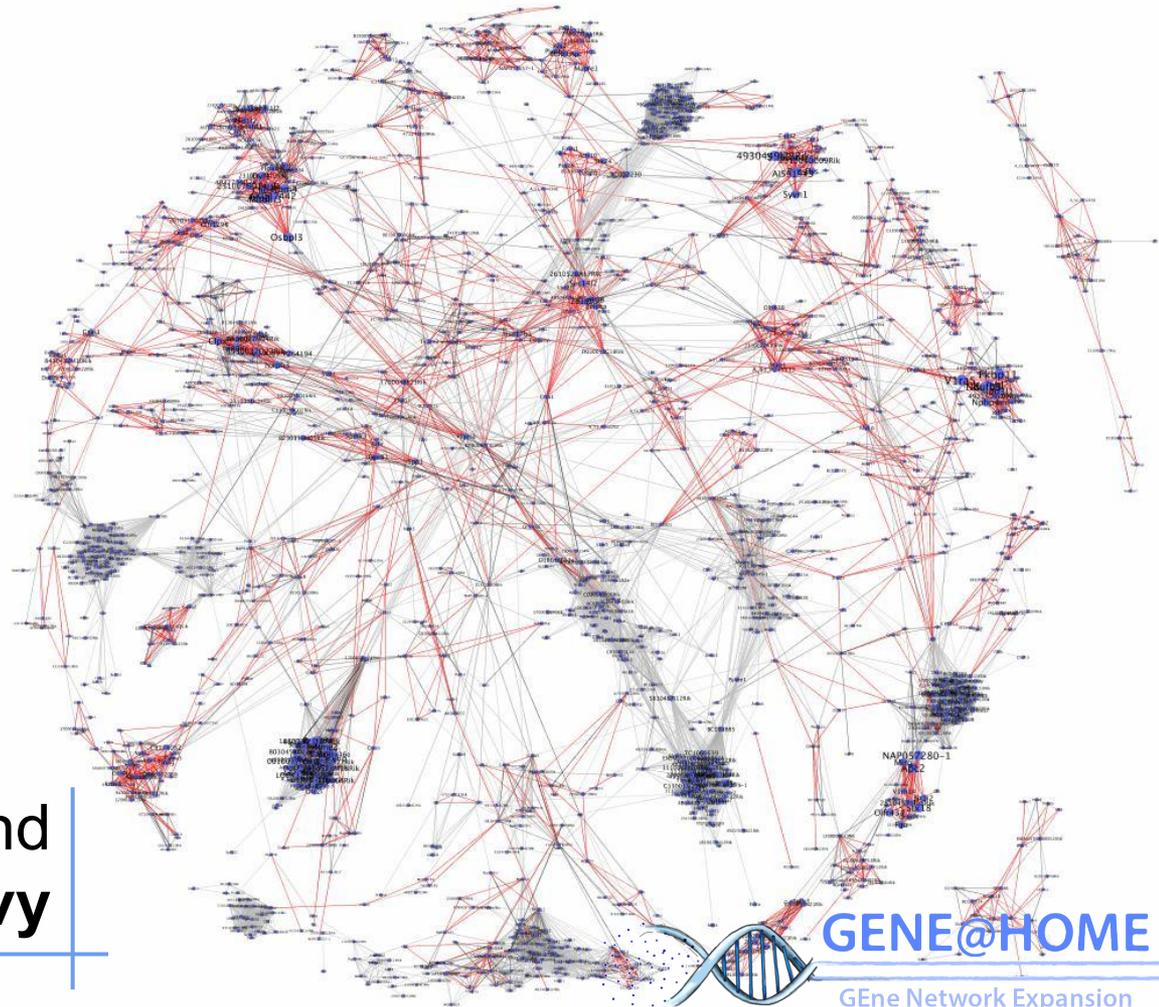


Problem

Genomes and gene networks are **huge**

We want expand **many gene networks** of **several organisms**

This work is **hard** and **computationally heavy**



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GEne Network Expansion

Study case



Arabidopsis thaliana

the model plant

~23.000 genes

~264.500.000 possible relations

Implementation

1

Run PC-algorithm on the whole genome is not convenient. So we use **PC-IM** to iteratively run PC-algorithm on genome portions

We implemented an efficient version of the PC-algorithm, named **PC++**

2

Implementation

So we have a lot of computation to do!

- 3 We use **BOINC**, an open source framework for Volunteer Grid Computing.



Thanks to the help of volunteers, we reach the computational power of a supercomputer!

Like one of the 100 most powerful!

Gene@home

By joining the [Gene@home](#) project, a BOINC user can help the improvement of:

- health
- agriculture
- biotechnologies

... just making available their personal computers for computation



Future

- *Escherichia coli* (bacteria)
- *Saccharomyces cerevisiae* (yeast)
- *Vitis vinifera* (grapevine)
- *Malus domestica* (apple)
- *Homo sapiens* (human)
- *Drosophila suzuki* (fruitfly)



What we need

RESEARCH FIELD

- ❑ Scholarships
- ❑ Hardware
- ❑ BOINC users
- ❑ Sponsorship

BUSINESS OPPORTUNITY

- ❑ Service for gene network expansion
- ❑ PC++ open source release
- ❑ PC-IM patent filed





Questions are welcome

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