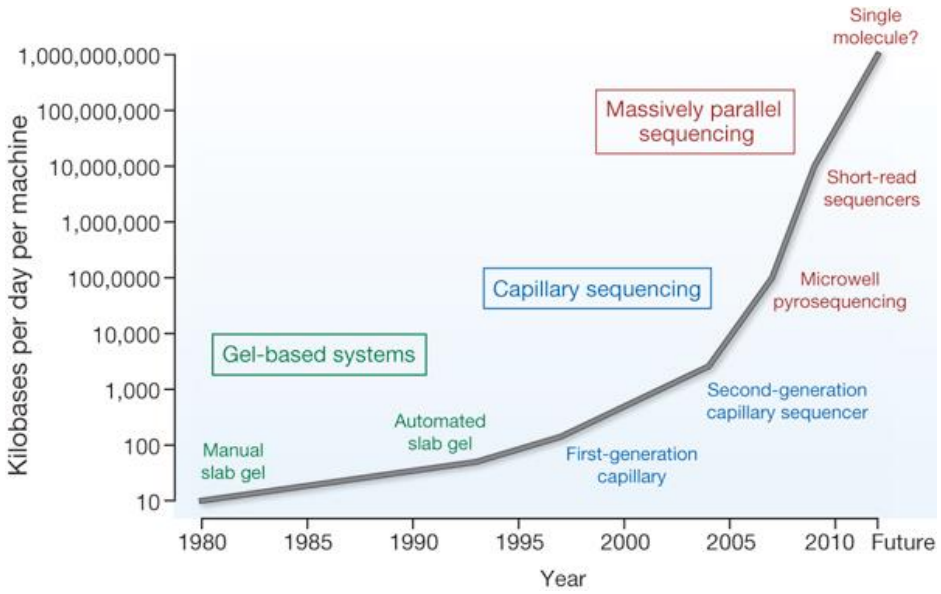
Chiara Romualdi

Introduzione alla bioinformatica

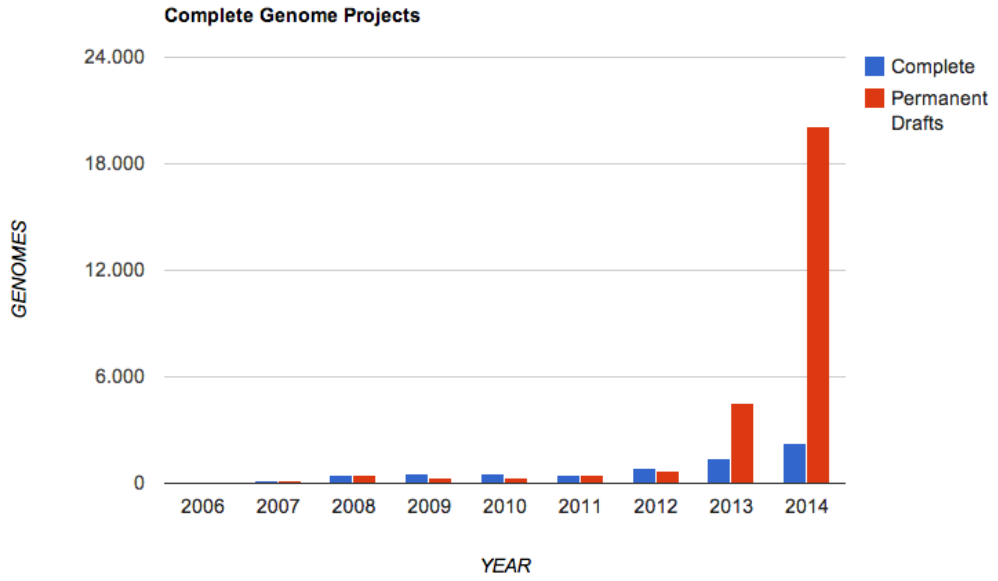
Come nasce la Bioinformatica?

- La Bioinformatica si può considerare come un **ponte tra due mondi**: le scienze della vita e l'informatica.
- Questa nuova disciplina nasce quando lo studio della biologia non si basa più su mere osservazioni della realtà (approccio *riduzionistico*) ma cerca di coprendere sistemi complessi nella loro globalità (approccio *olistico*).
- Lo svilluppo di **nuove tecnologie** ha portato ad un'esponenziale **produzione di dati** ed alla necessità di sistemi il loro immagazzinamento ed utilizzo

L'avvento delle Nuove Tecnologie







- Vengono prodotti **più dati di quanti siamo in grado di gestire efficacemente**
- L'analisi dei dati richiede lo sviluppo di **software dedicati e computer molto potenti**

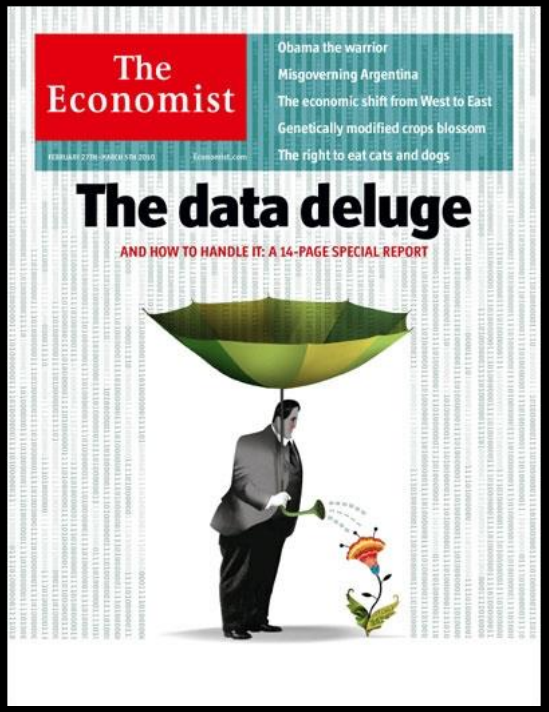
Sept 2008

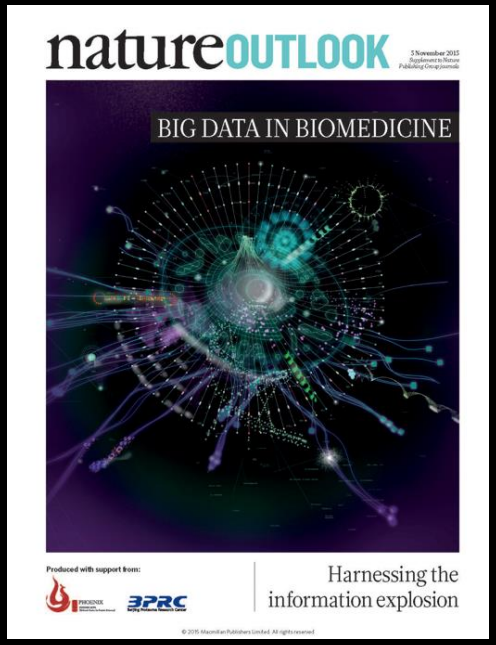


Feb 2011

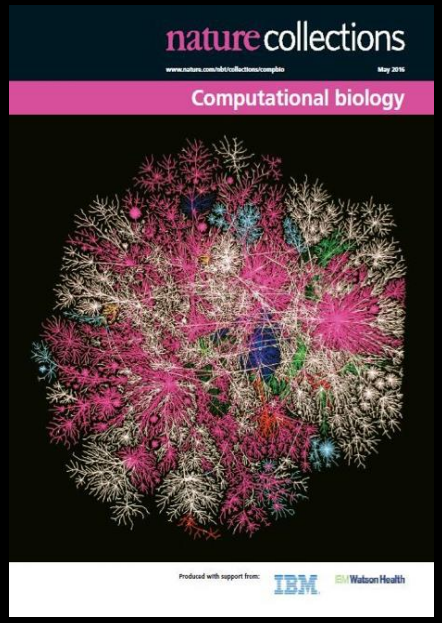


March 2010





Nov 2015



May 2016

«The power of individual targeting - the technology will be so good it will be very hard for people to watch or consume something that has not in some sense been tailored for them»

Eric Schmidt of Google (2010)

« I think the biggest innovations of the 21st century will be at the intersection of biology and technology. A new era is beginning.»

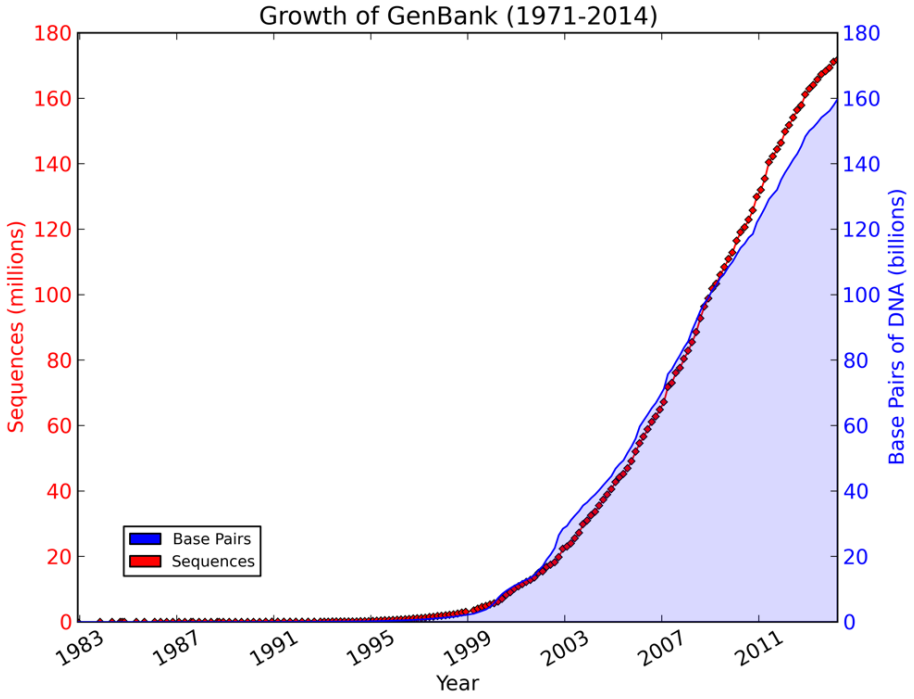
Steve Jobs Apple

L'era dei Big Data

Nature journal
4 September 2008

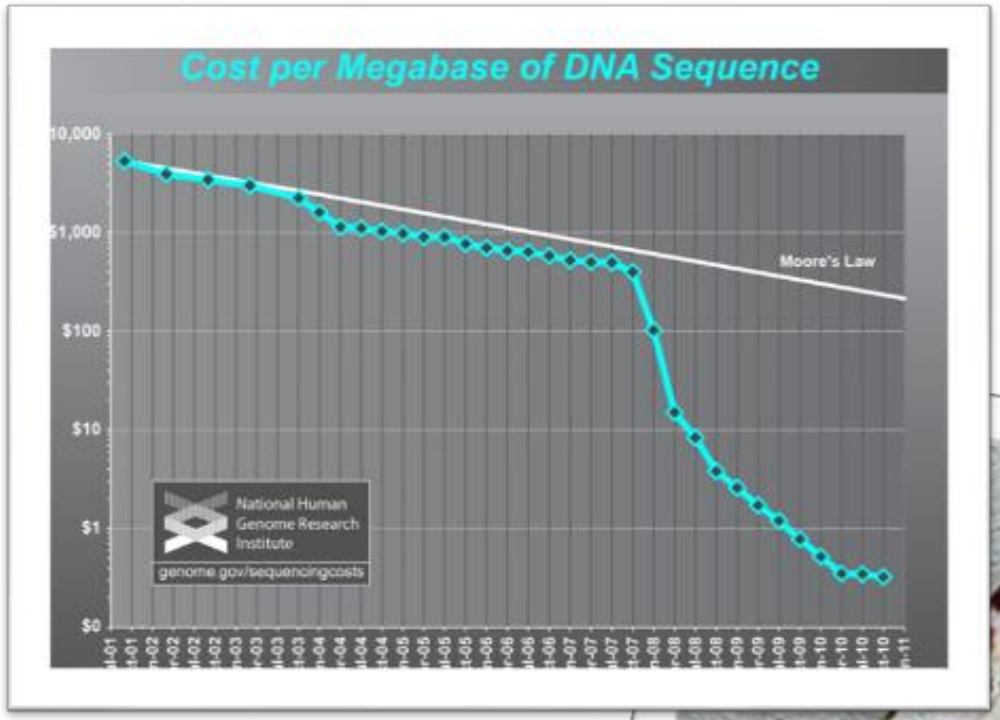
"Researchers need to be obliged to document and manage their data with as much professionalism as they devote to their experiments."



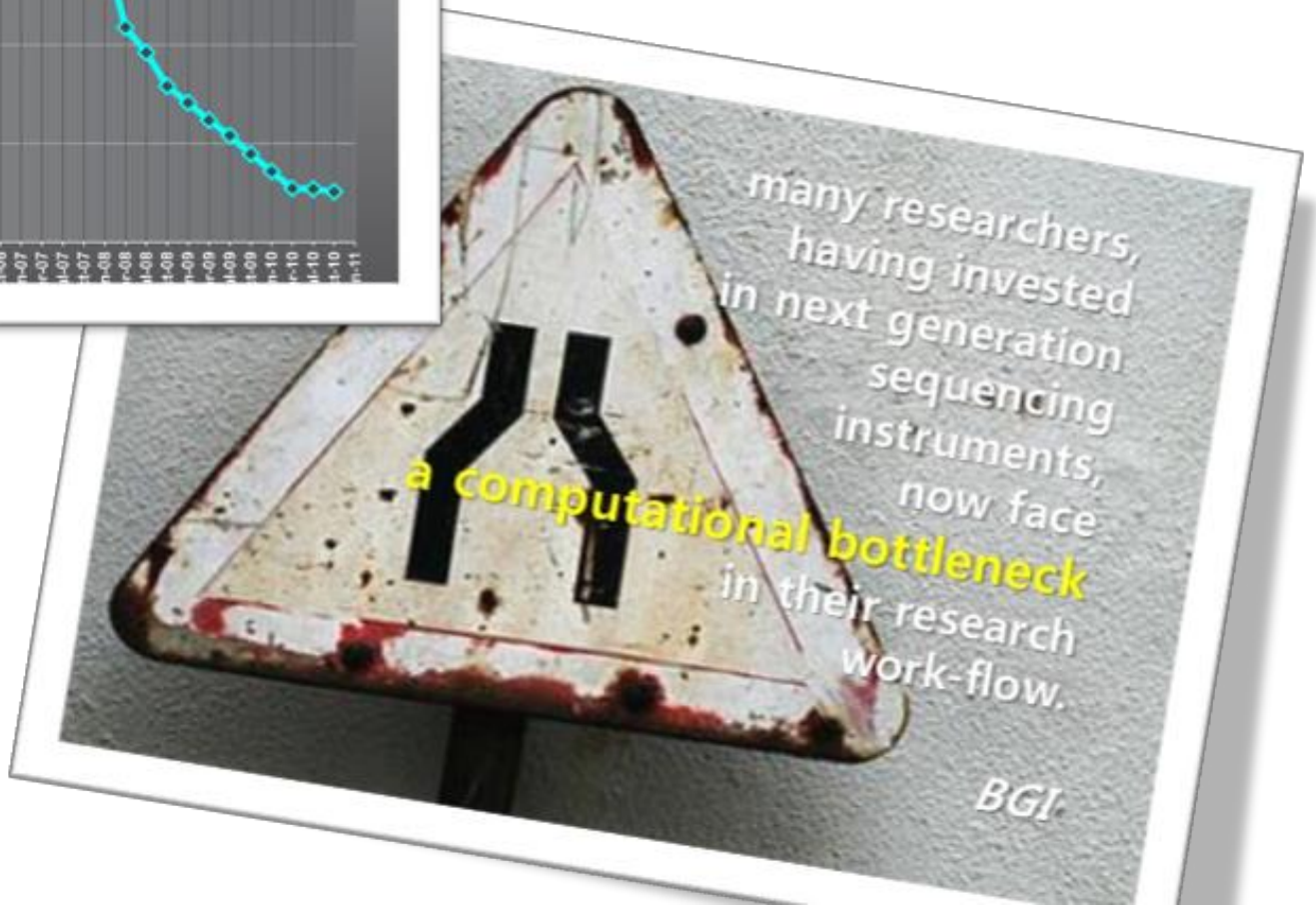


- Recupero
- Archiviazione
- Utilizzo
- Analisi
- Integrazione

Costi - Benefici



- Il costo finanziario per generare dati è diminuito drasticamente negli anni
- La difficoltà ora è la gestione e la modellazione dei dati.



Cos'è la Bioinformatica



Bioinformatics

From Wikipedia, the free encyclopedia

For the journal, see Bioinformatics (journal).

Bioinformatics /ˌbaɪ.oʊˌɪnfərˈmætɪks/ is an interdisciplinary field that develops methods and software tools for understanding biological data. As an interdisciplinary field of science, bioinformatics combines computer science, statistics, mathematics and engineering to study and process biological data.

Bioinformatics is both an umbrella term for the body of biological studies that use computer programming as part of their methodology, as well as a reference to specific analysis "pipelines" that are repeatedly used, particularly in the fields of genetics and genomics. Common uses of bioinformatics include the identification of candidate genes and nucleotides (SNPs). Often, such identification is made with the aim of better understanding the genetic basis of disease, unique adaptations, desirable properties (esp. in agricultural species), or differences between populations. In a less formal way, bioinformatics also tries to understand the organisational principles within nucleic acid and protein sequences.

Scopo ultimo della Bioinformatica

Scoprire la maggior quantità possibile di informazioni nascoste nella massa di dati prodotti per approfondire e comprendere le funzioni biologiche degli organismi viventi.

Le nuove conoscenze possono avere un profondo impatto negli studi evolutivi, nella scienza medica, in agricoltura, biotecnologie, ecc.

Cos’è la Bioinformatica

Bioinformatics

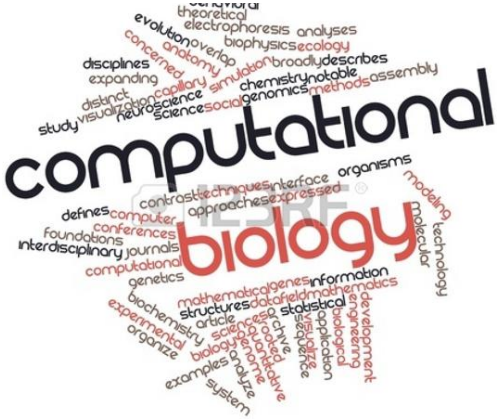
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DATABASE
Memorizzazione accurata, organizzazione, indicizzazione e mantenimento di informazioni biologiche (GenBank, EMBL, DDBJ)

ALGORITMI
Allineamenti, ricerca di motivi funzionali analisi dei genomi, analisi di trascrittomi Integrazioni dati…

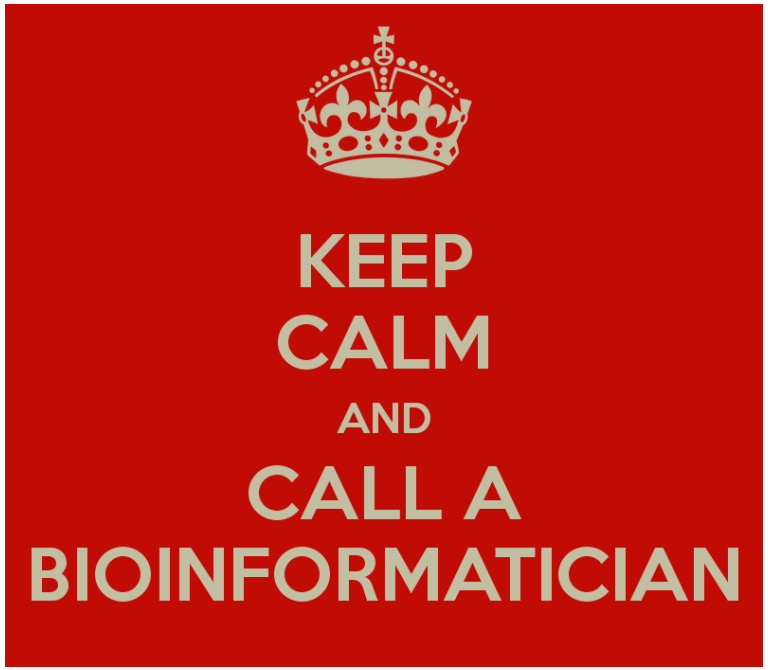
Le due anime della Bioinformatica

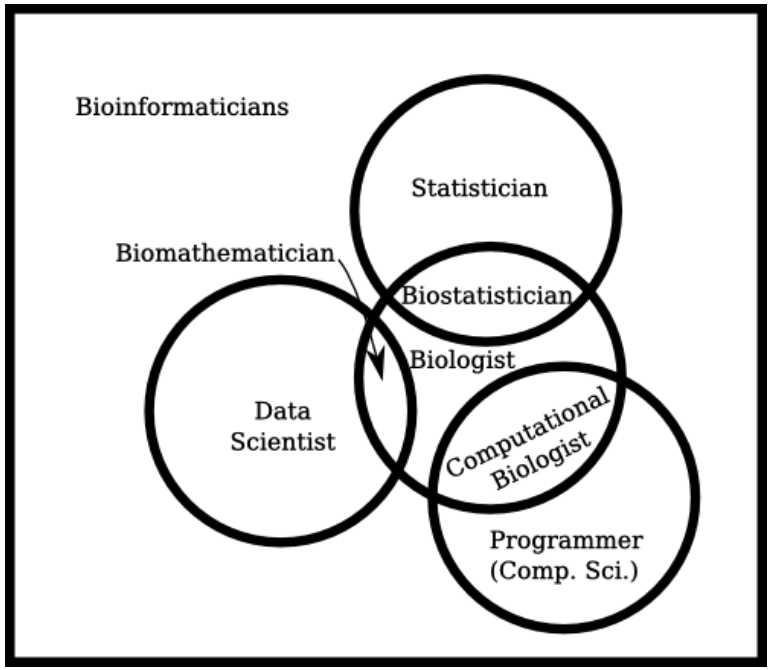
1. **GESTIONE DEI DATI DATABASE**
2. **ANALISI DEI DATI COMPUTATIONAL BIOLOGY**

Nello studiare la bioinformatica sarà necessario:

- Avere conoscenze biologiche di base
- Sapere cosa sono, come sono strutturati e dove sono i database biologici
- Saper effettuare ricerche (anche complesse) in database
- Essere in grado di utilizzare una serie di *tools* disponibili in internet per le analisi dati

Il Bioinformatico





La figura professionale del bioinfomatico deve avere competenze di base in biologia molecolare, genetica e biochimica integrate con conoscenze informatiche e matematico-statistiche...

… deve fare da **collegamento con altre professionalità** specifiche in campi diversi, tra cui quello biomolecolare e informatico, indispensabili per raggiungere livelli di eccellenza nella ricerca in bioinformatica

PLOS | BIOLOGY

RESEARCH MATTERS

All biology is computational biology

Florian Markowetz*

University of Cambridge, Cancer Research UK Cambridge Institute, Cambridge, United Kingdom

* florian.markowetz@cruk.cam.ac.uk

Abstract

Here, I argue that computational thinking and techniques are so central to the quest of understanding life that today all biology is computational biology. Computational biology brings order into our understanding of life, it makes biological concepts rigorous and testable, and it provides a reference map that holds together individual insights. The next modern synthesis in biology will be driven by mathematical, statistical, and computational methods being absorbed into mainstream biological training, turning biology into a quantitative science.