

What is bioinformatics? Biology somehow combined with informatics?
But why do we need computation in biology anyway?



If you have no clue, don't worry;
we will show you what we can do in bioinformatics!

Let's start with a small example
Can you guess what is in the following picture?



To solve this puzzle, you need to go step by step to connect all the parts!



Try to imagine the whole picture; put pieces together in a logical way, so you can reach to the correct solution!!



If you can recognize the patterns and put the pictures in the correct order
.... the whole picture is yours!



Arabidopsis Thaliana

Similarly, bioinformatics is trying to organize data to see the "whole picture"

Cancer informatics Gene regulation
Personalized medicine Protein modeling
Computational biology Gene expression analysis
Image analysis Genomics and proteomics
Comparative genomics Gene expression databases
Epidemic models Computational drug discovery
Bioinformatics
Sequence analysis Bio-ontologies and semantics
Evolution and phylogenetics Structure prediction
Cheminformatics Next generation sequencing
Computational intelligence Transcriptomics
Biomedical engineering Amino acid sequencing
Structural bioinformatics Medical informatics
Microarrays
Visualization





So, how do we apply this idea to biology?

Let's look at another example

Suppose you have a genome,
and it has red flags and blue flags as shown in the figure below

...and you are interested in regions where you have both red and blue flags



In a biological context, the region you are looking for could be a region regulating gene expression such as enhancers and insulators

The flags may be epigenetic marks and physical interactions with other parts of the genome

You know two experimental methods to investigate this region

With method B, you discover where the blue flags are:



With method R, you discover where the red flags are:



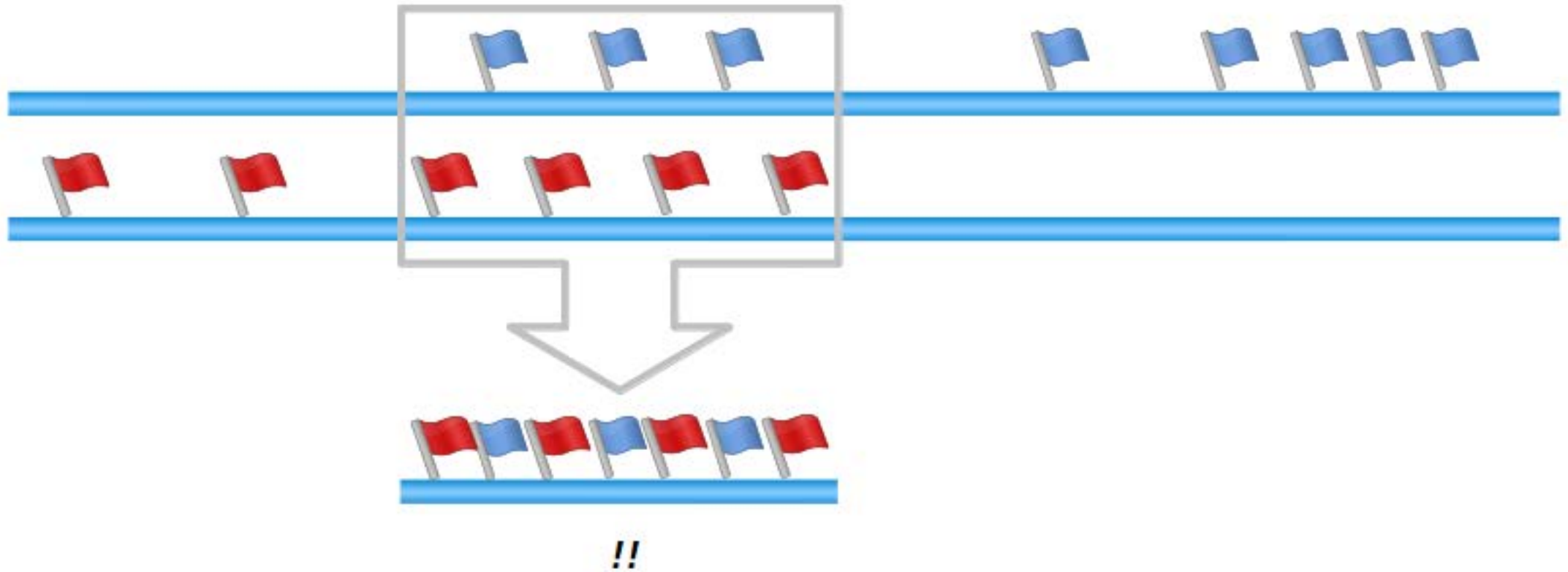
But, unfortunately you cannot fish out just the region with both red and blue flags, in other words, the region that you are interested in

What do you do, then?

Bioinformatics can help you solve the problem!



Bioinformatics combines the data from method B and method R computationally, and then provides you the exact region you are looking for!



So, bioinformatics tries to organize biological data in a way
you see the whole biological picture;
just like you solved the puzzle to see the picture of a plant!





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