

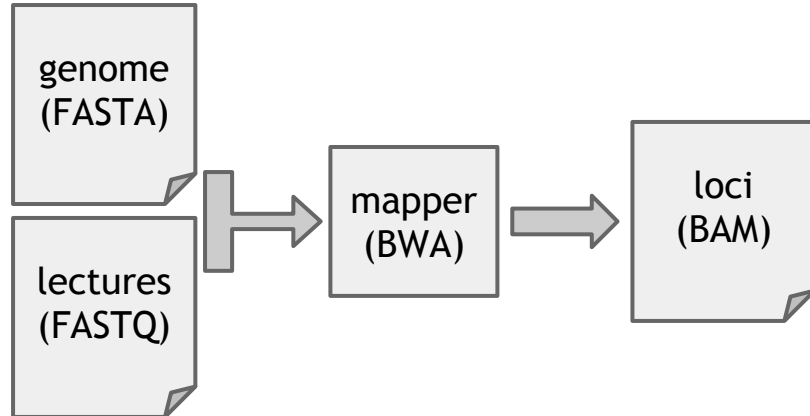
# Algorithmes de mapping

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# Qu'est-ce que le mapping ?

## Définition

*Prédiction du locus d'où vient une lecture.*



## Implémentation

Liste des régions comportant le moins de différences.

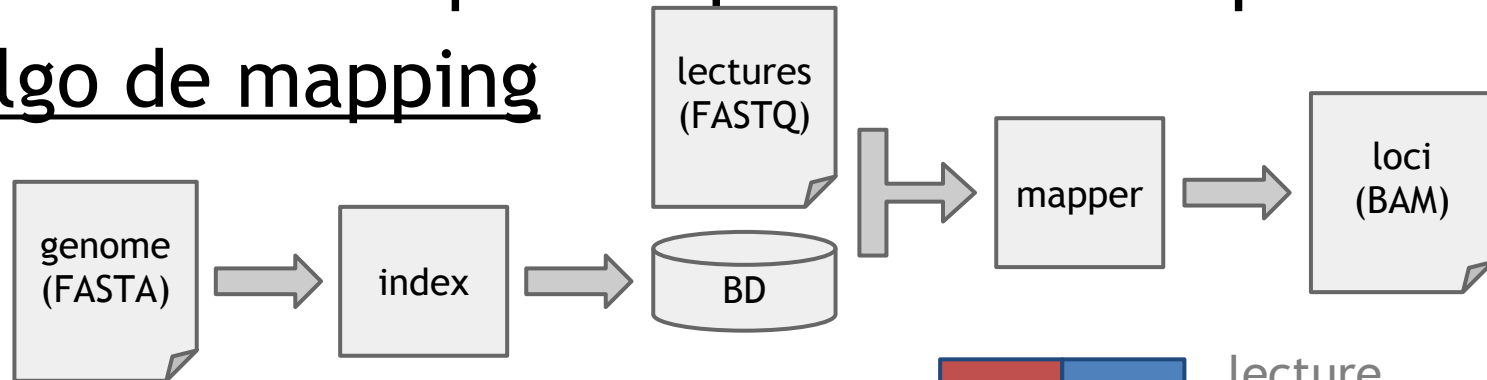
## Mapping $\neq$ alignement

ACGGGGTACGTACGT  
---ACGTACGTACGT

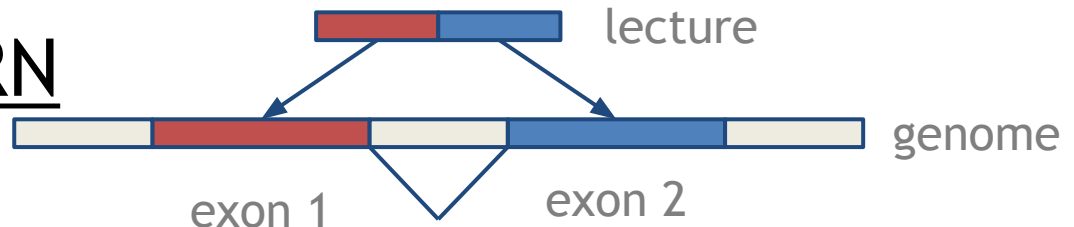
# Qu'est-ce qu'un algorithme ?

C'est une méthode implantée dans un ordinateur pour répondre à une question.

## Algo de mapping



## Algo ADN $\neq$ Algo ARN



# Algo ADN 1: *Seed and extend* (MAQ)

1. Recherche exacte de taille  $k$

ATAGCGA

CAGCTAGCTAGAATC

2. Extension approchée

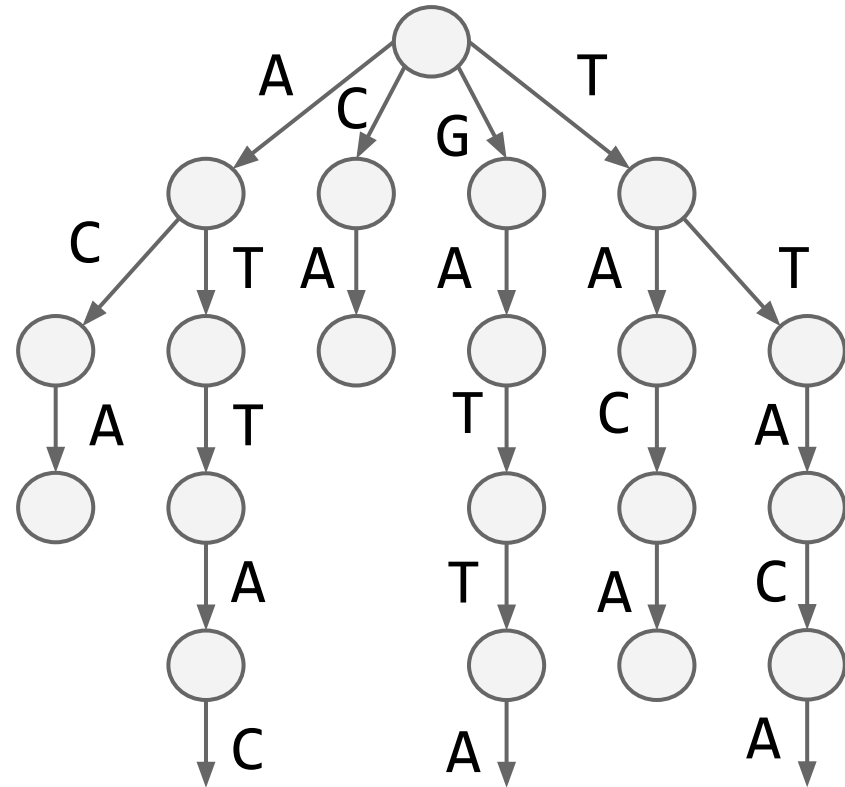
ATAGCGA

CAGCTAGCTAGAATC

## Remarques

- Étape 1: rapide
- Étape 2: lente
- $k$  grand: spécificité
- $k$  petit: sensibilité
- $k$ -mer très répété: non enregistré

# Algo ADN 2: Burrows-Wheeler (BWA, Bowtie)

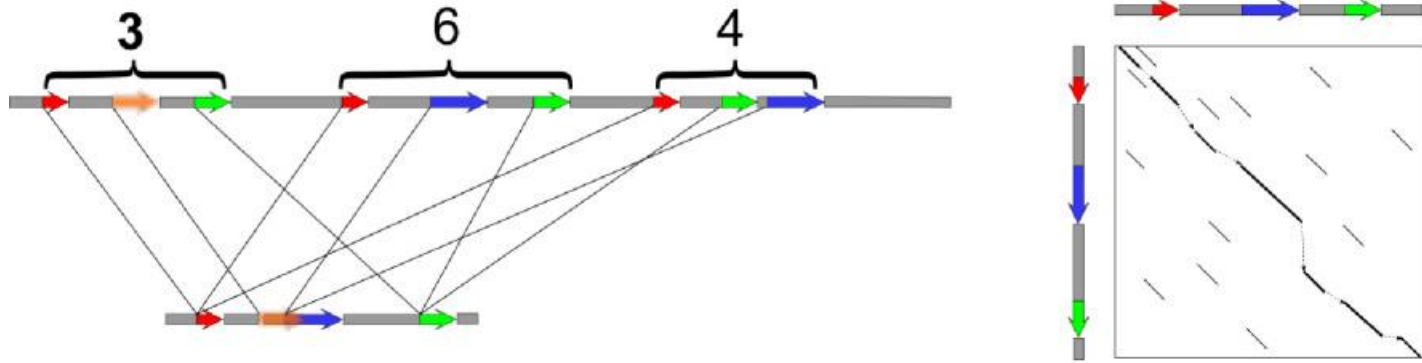


1. Transformer le génome en un “arbre”
2. Rechercher une lecture

## Remarques

- Recherche avec erreur complexe.

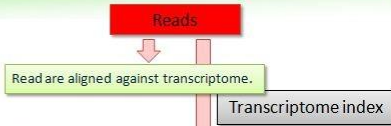
# Algo ADN 3: MEM (BWA-MEM, Blasr)



M. Chaisson & G. Tessler, *BMC Bioinformatics*, 2012

# Algo ARN 1: TopHat2

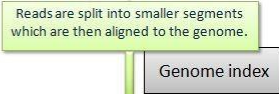
## (1) Transcriptome alignment (optional)



## (2) Genome alignment



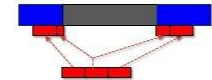
## (3) Spliced alignment



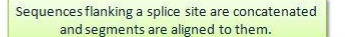
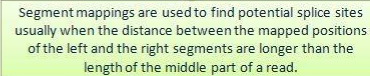
### (3-1) Segment alignment to genome



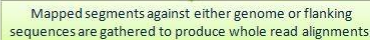
### (3-2) Identification of splice sites (including indels and fusion break points)



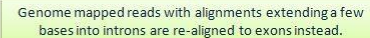
### (3-3) Segments aligned to junction flanking sequences



### (3-4) Segment alignments stitched together to form whole read alignments

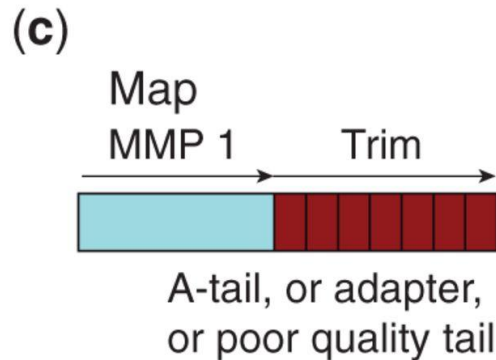
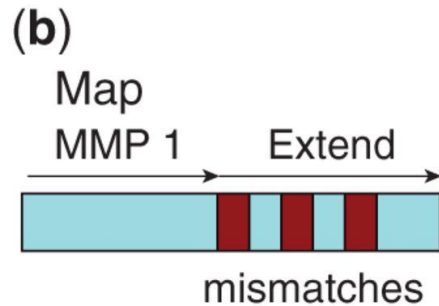
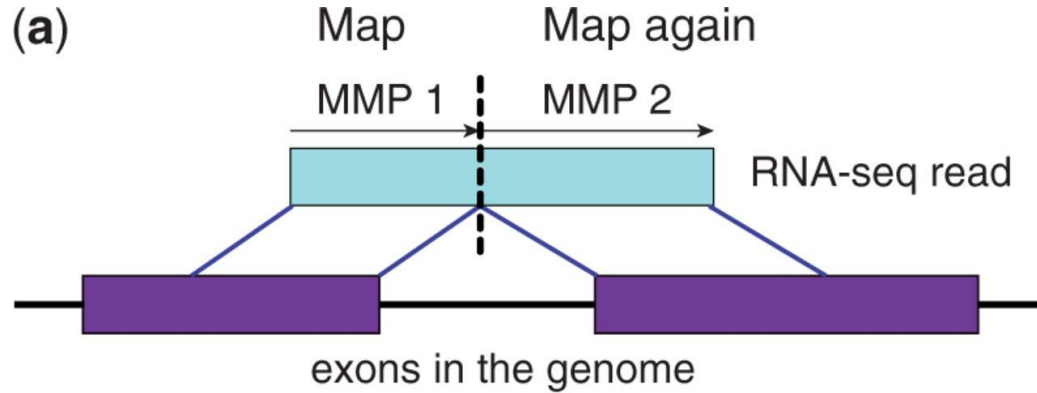


### (3-5) Re-alignment of reads minimally overlapping introns



M. Kim & al., *Genome Biology*, 2013

# Algo ARN 2: Star



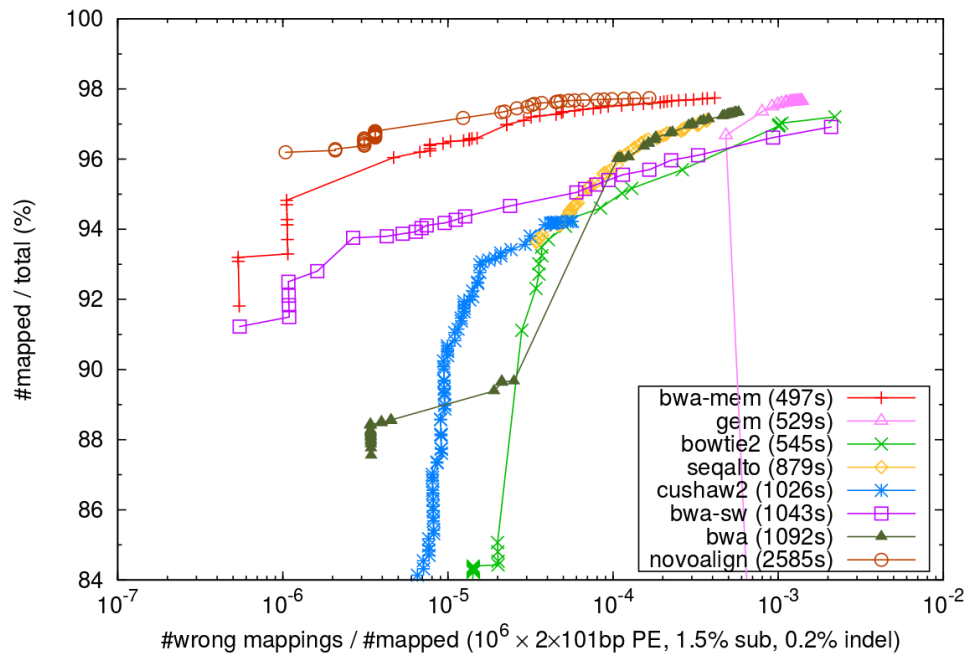
A. Dobin & *al.*,  
*Bioinformatics*, 2013



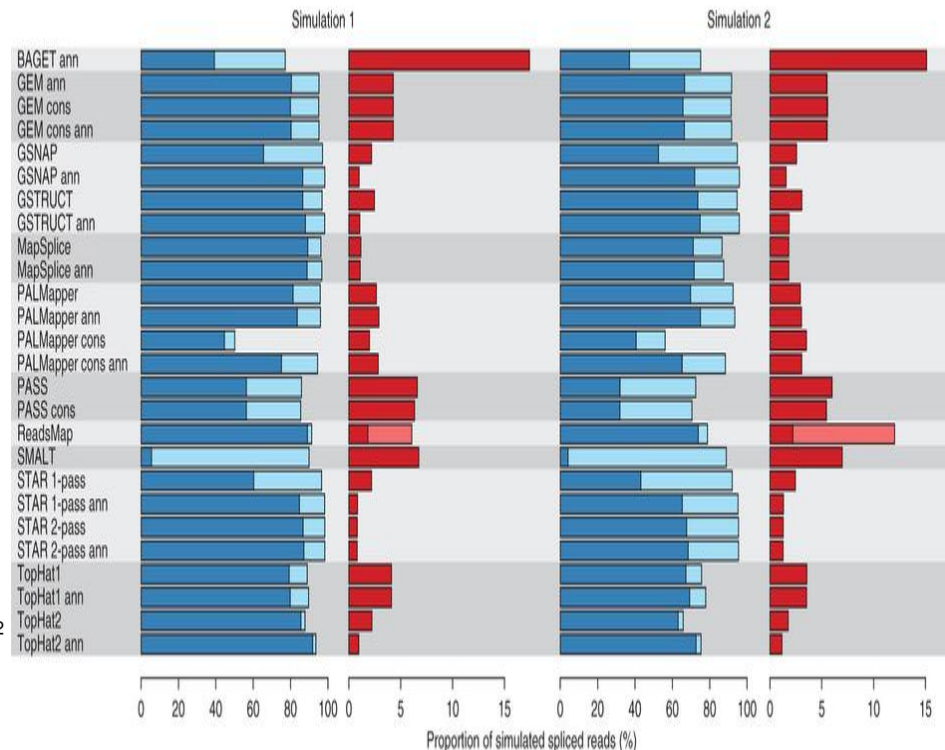
# Commentaires

- Qualité du mapping: 0-40
- Lectures pairées: plus sensible/spécifique
- Encodage binaire: A=00, C=01, G=10, T=11
- À chaque séquençage son outil

# Quel outil utiliser ?



■ Perfectly mapped  
 ■ Part correctly mapped  
 ■ Mapped, no base correct  
 ■ No base correctly mapped but intersecting correct location



H. Li, *ArXiv*, 2013

P. Engström & *al.*, *Nat. Meth.*, 2013