

Data structures

Key

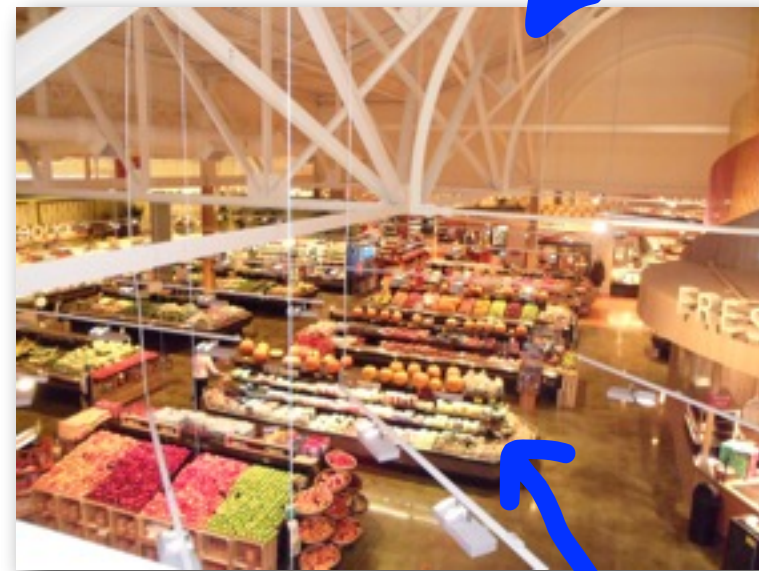
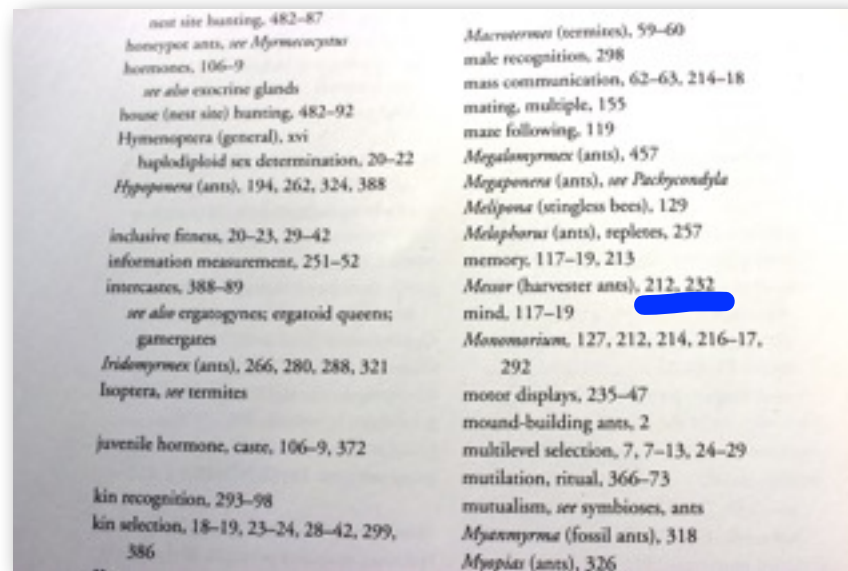
<i>Index of T</i>	
<u>CGTGC</u>	: 0, 4
GCGTG	: 3
GTGCC	: 1
GTGCT	: 5
TGCCCT	: 2
TGCTT	: 6

Value

Multimap

T: C G T G C G T G C T T

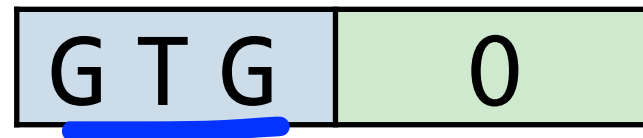
Data structures



Multimap

T: C G T G C G T G C T T

✓ Data structures



T: GTG C G T G T G G G G

Data structures

G T G	0
T G C	1

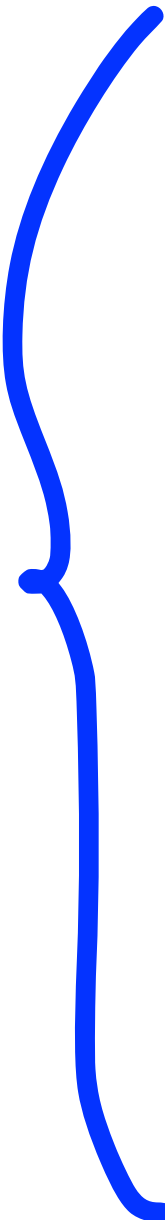
T: G T G C G T G T G G G G

Data structures

G T G	0
T G C	1
G C G	2

T: G T G C G T G T G G G G

Data structures

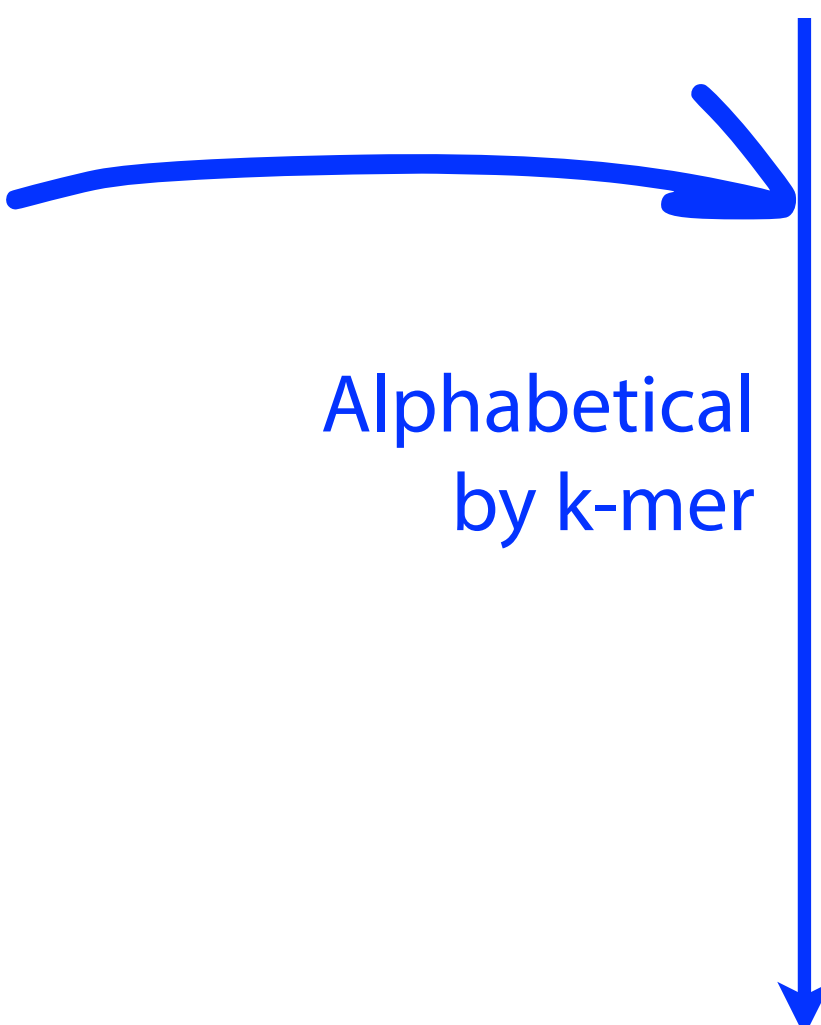


G T G	0
T G C	1
G C G	2
C G T	3
G T G	4
T G T	5
G T G	6
T G G	7
G G G	8
G G G	9
G G G	10

T: G T G C G T G T G G G G

Data structures

Alphabetical
by k-mer



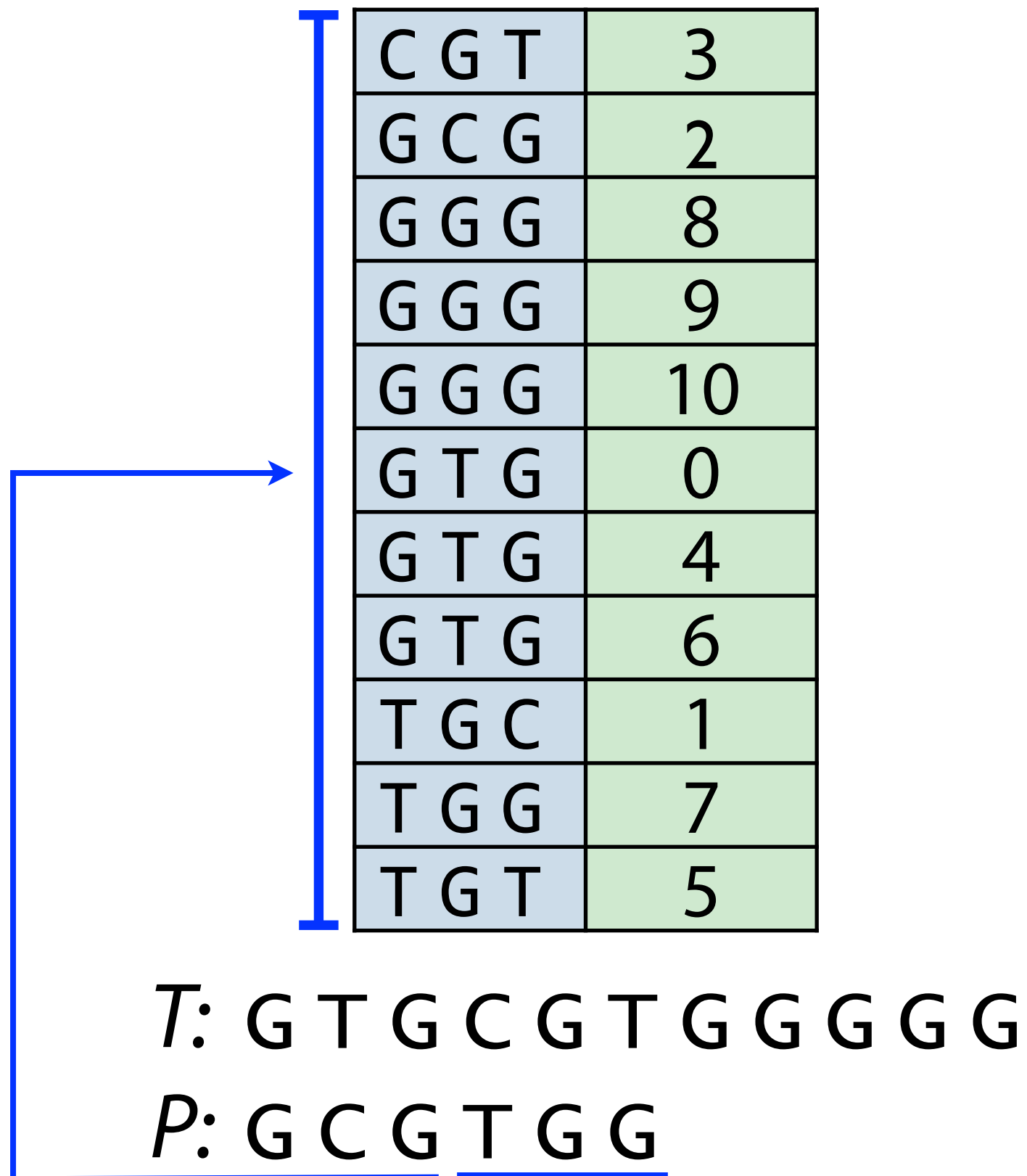
C G T	3
G C G	2
G G G	8
G G G	9
G G G	10
G T G	0
G T G	4
G T G	6
T G C	1
T G G	7
T G T	5

T: G T G C G T G T G G G G

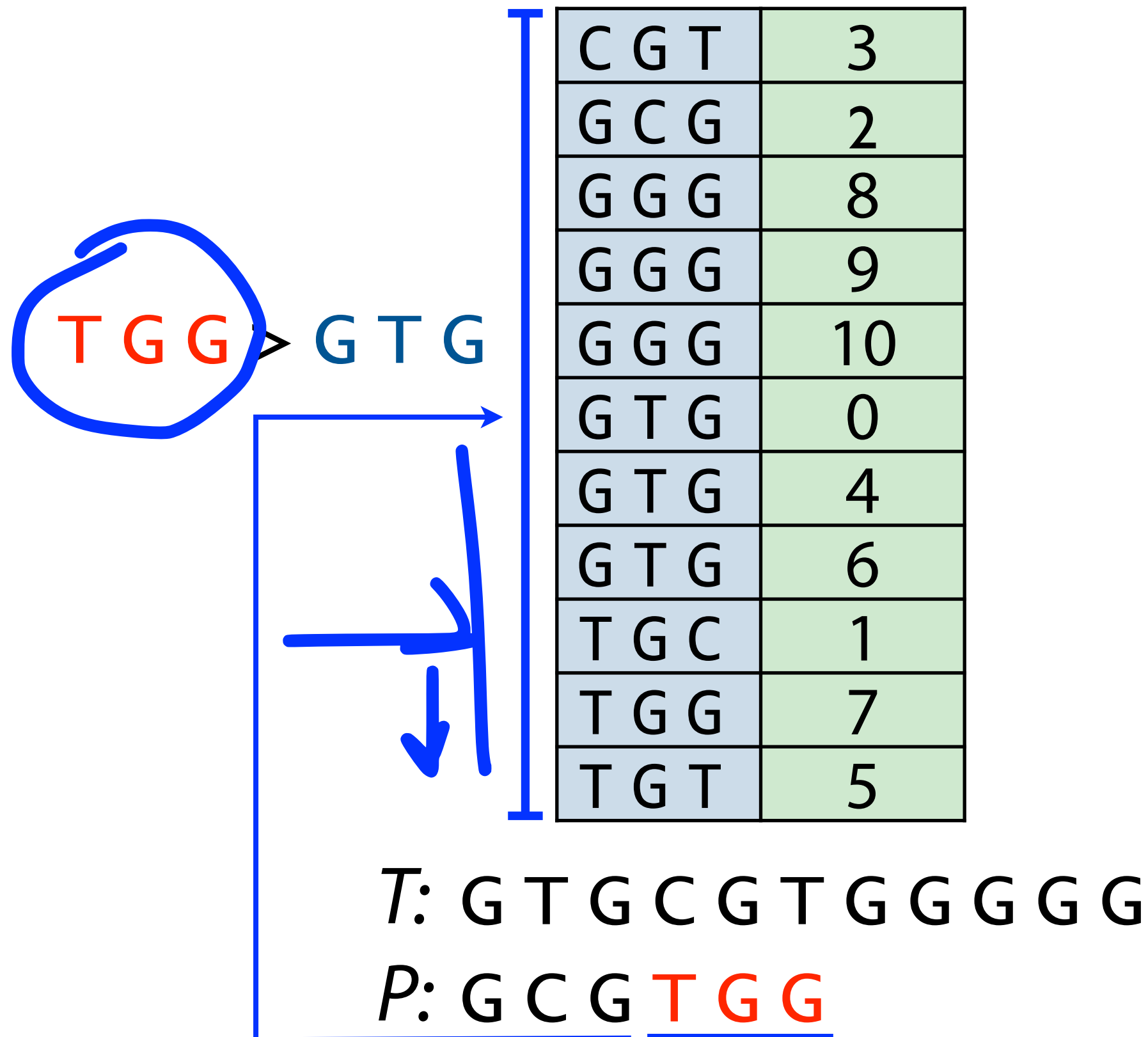
Data structures

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Binary search



Binary search



Binary search

After 1st
bisection

T G G > T G C

C G T	3
G C G	2
G G G	8
G G G	9
G G G	10
G T G	0
G T G	4
G T G	6
T G C	1
T G G	7
T G T	5

T: G T G C G T G G G G G

P: G C G T G G

Binary search

After 2nd
bisection

C G T	3
G C G	2
G G G	8
G G G	9
G G G	10
G T G	0
G T G	4
G T G	6
T G C	1
T G G	7
T G T	5

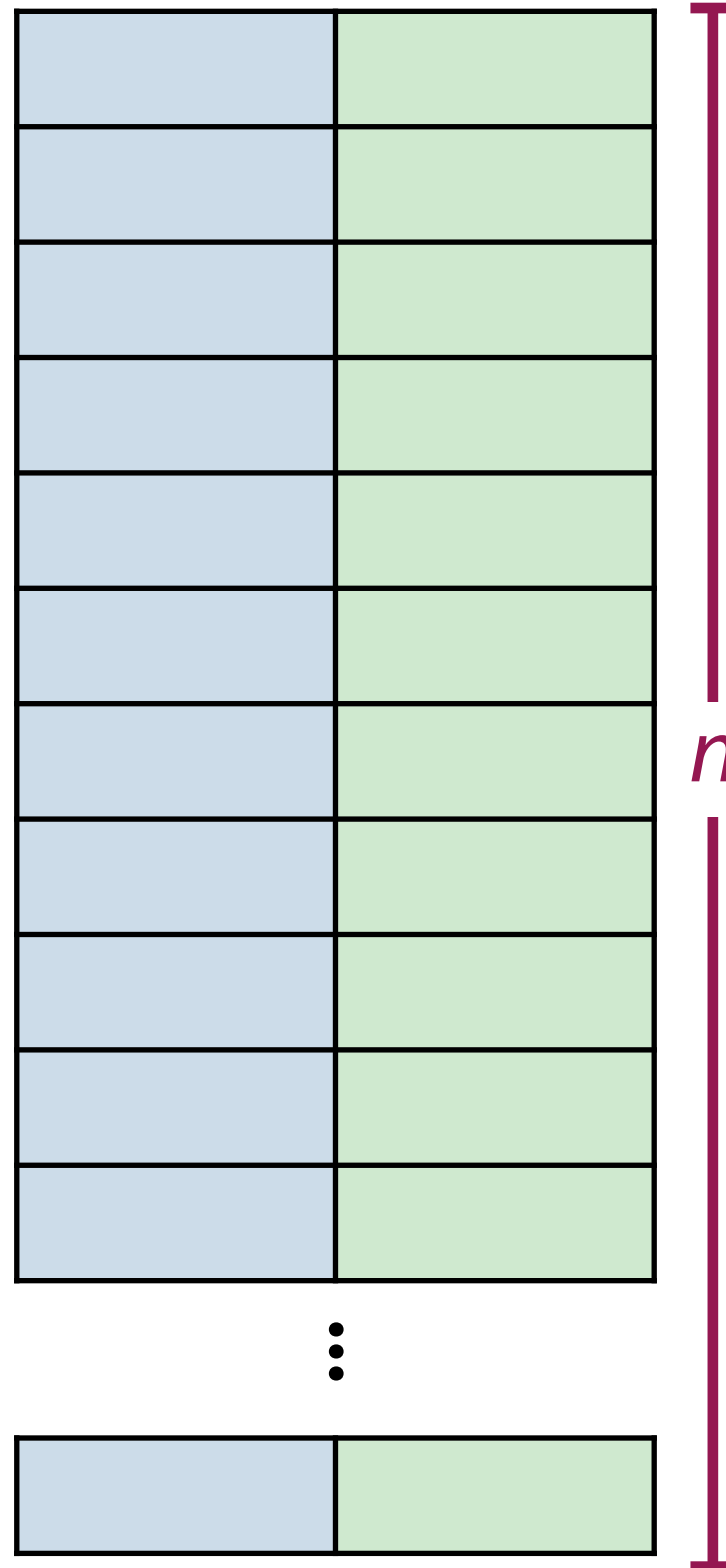
T G G = T G G



T: G T G C G T G G G G G


P: G C G T G G

Binary search



$\sim \underline{\log_2(n)}$ bisections
per query

bisect.bisect_left(a, x): Leftmost offset where **x** can be inserted into **a** to maintain order



```
>>> a = [1, 3, 3, 6, 8, 8, 9, 10]
>>> import bisect
>>> bisect.bisect_left(a, 2)
1
>>> bisect.bisect_left(a, 4)
3
>>> bisect.bisect_left(a, 8)
4
```

bisect_left(index, 'GTG')

C G T	3
G C G	2
G G G	8
G G G	9
G G G	10
G T G	0
G T G	4
G T G	6
T G C	1
T G G	7
T G T	5

T: G T G C G T G G G G G

P: G C G T G G