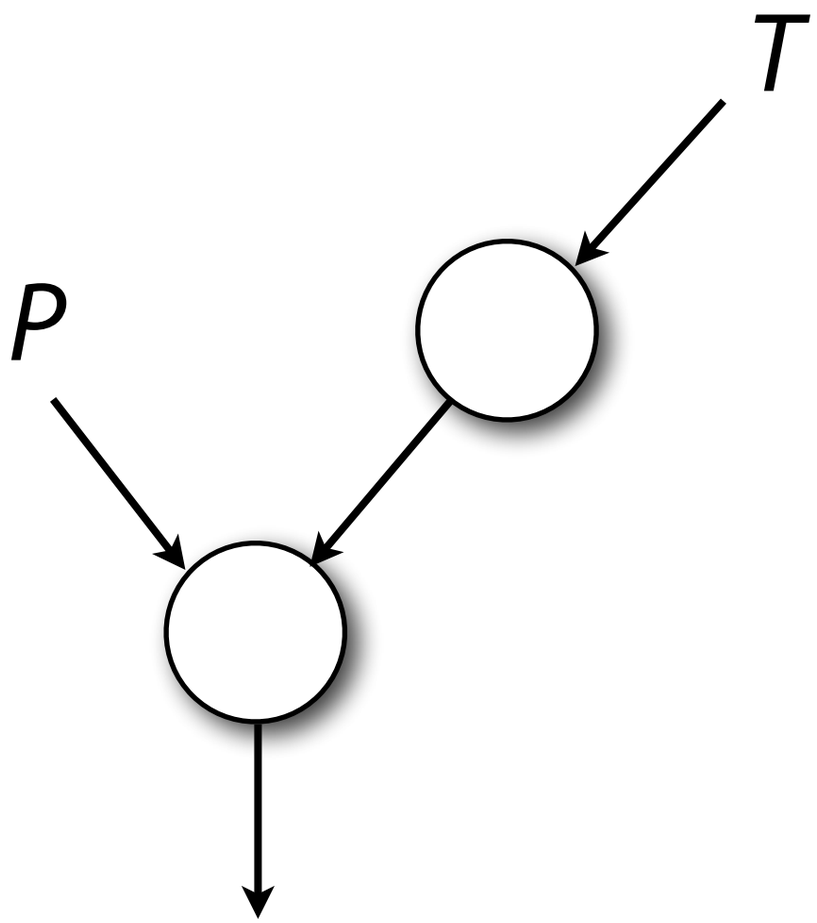
Preprocessing

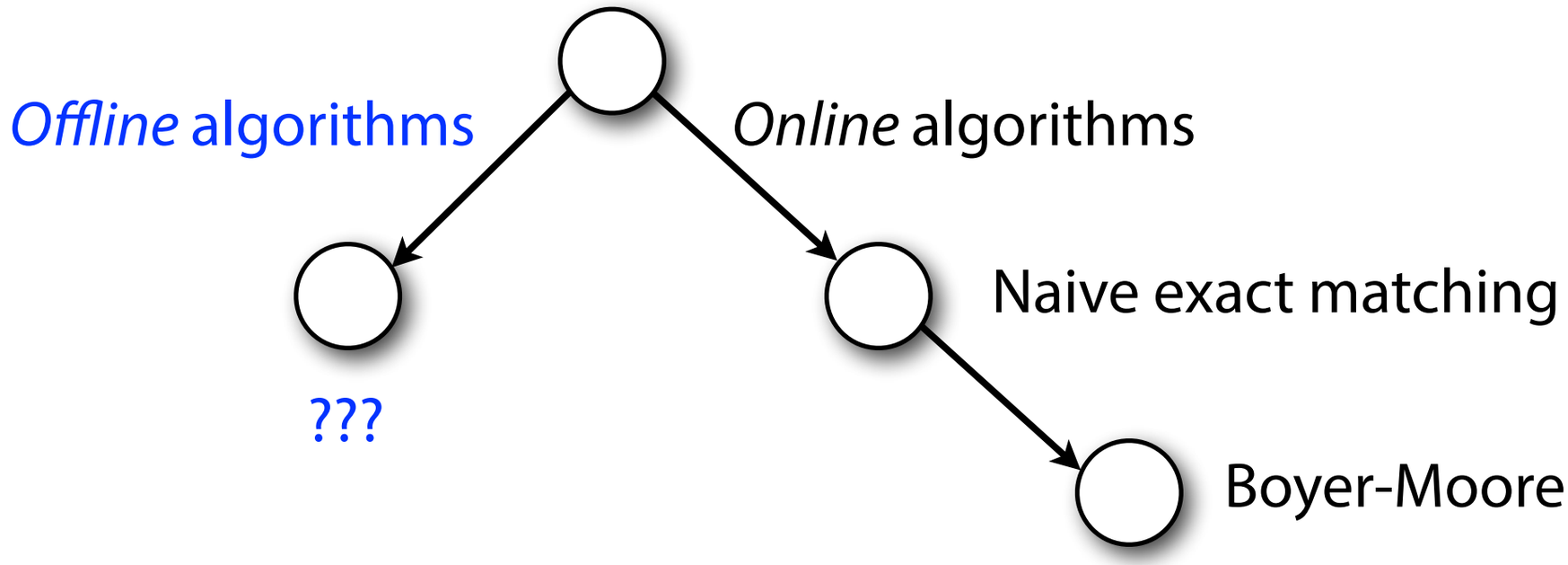
Algorithm that preprocesses *T* is *offline*.
Otherwise, algorithm is *online*.



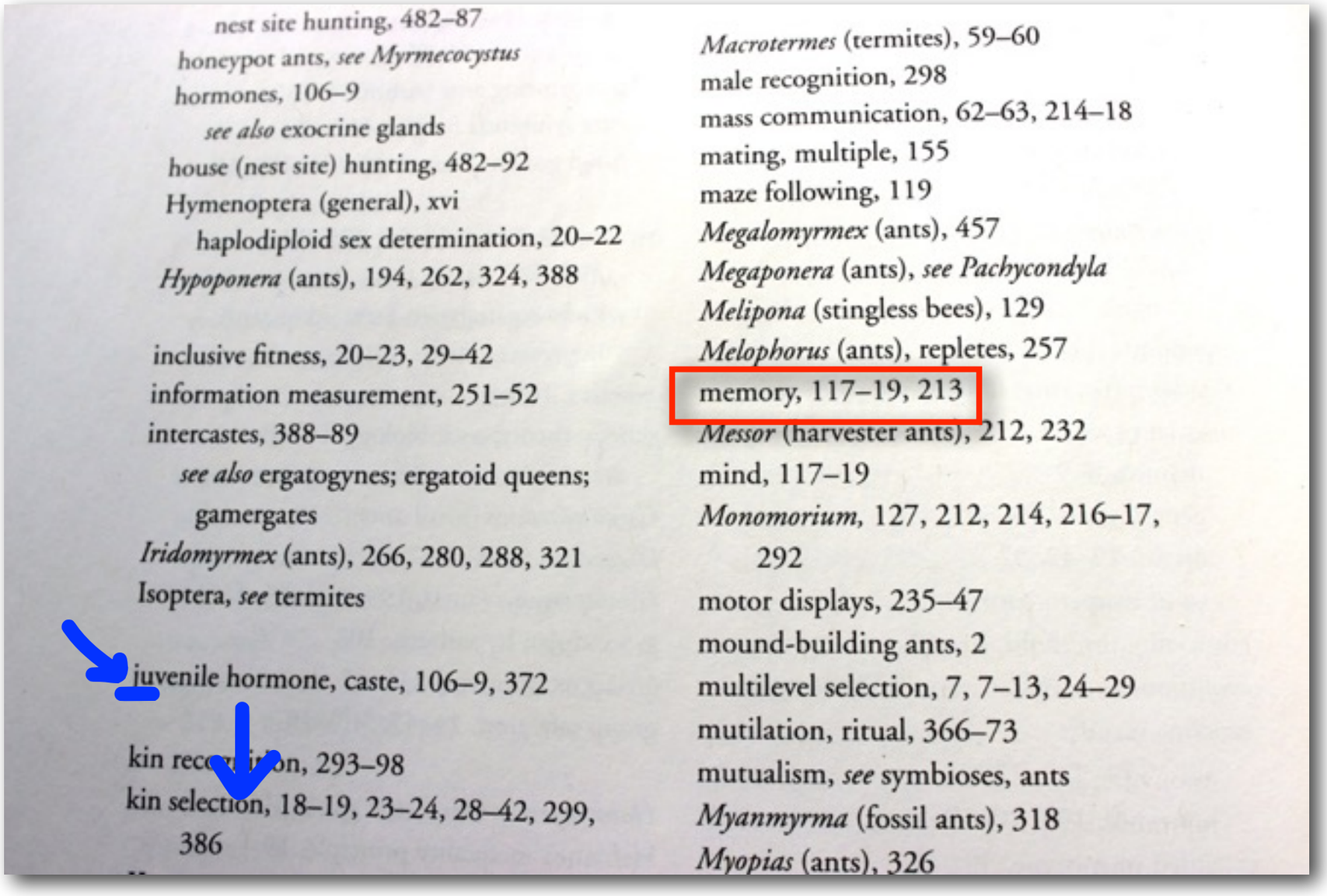
Online or offline?

- Naïve algorithm
- Boyer-Moore
- Web search engine
- Read alignment

Offline


Offline algorithms
Online algorithms
???
Naive exact matching
Boyer-Moore

Index



nest site hunting, 482–87
honeypot ants, *see Myrmecocystus*
hormones, 106–9
see also exocrine glands
house (nest site) hunting, 482–92
Hymenoptera (general), xvi
haplodiploid sex determination, 20–22
Hypoponera (ants), 194, 262, 324, 388

inclusive fitness, 20–23, 29–42
information measurement, 251–52
intercastes, 388–89
see also ergatogynes; ergatoid queens; gamergates
Iridomyrmex (ants), 266, 280, 288, 321
Isoptera, *see* termites

juvenile hormone, caste, 106–9, 372

kin recognition, 293–98
kin selection, 18–19, 23–24, 28–42, 299, 386

Macrotermes (termites), 59–60
male recognition, 298
mass communication, 62–63, 214–18
mating, multiple, 155
maze following, 119
Megalomyrmex (ants), 457
Megaponera (ants), *see Pachycondyla*
Melipona (stingless bees), 129
Melophorus (ants), repletes, 257
memory, 117–19, 213
Messor (harvester ants), 212, 232
mind, 117–19
Monomorium, 127, 212, 214, 216–17, 292
motor displays, 235–47
mound-building ants, 2
multilevel selection, 7, 7–13, 24–29
mutilation, ritual, 366–73
mutualism, *see* symbioses, ants
Myanmyrma (fossil ants), 318
Myopias (ants), 326

Key terms ordered alphabetically, with associated page #s

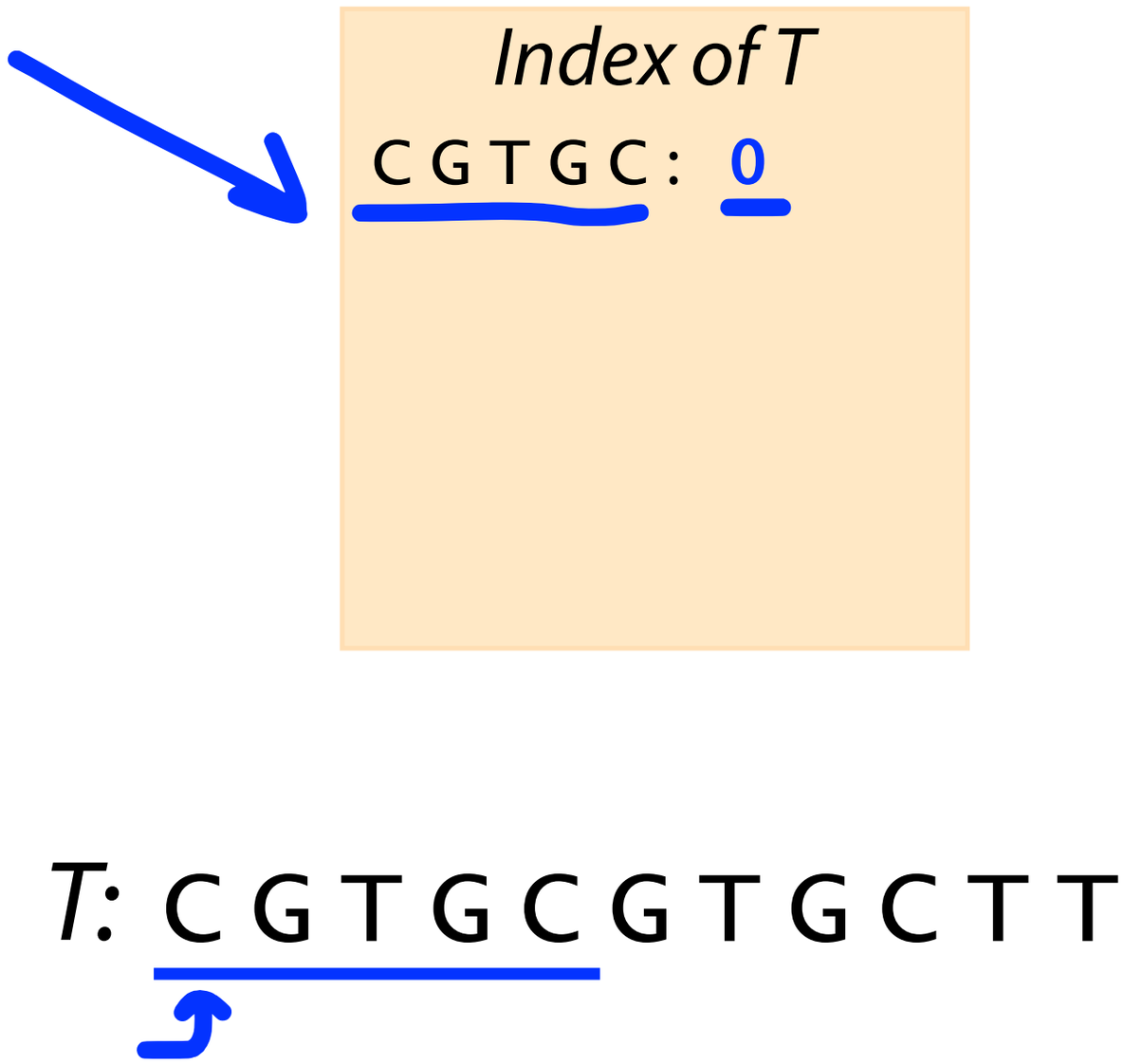
Index

Grocery store items grouped into aisles

Indexing DNA

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

Indexing DNA



Indexing DNA

Index of T

C G T G C : **0**

G T G C G : **1**

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

Indexing DNA

Index of T

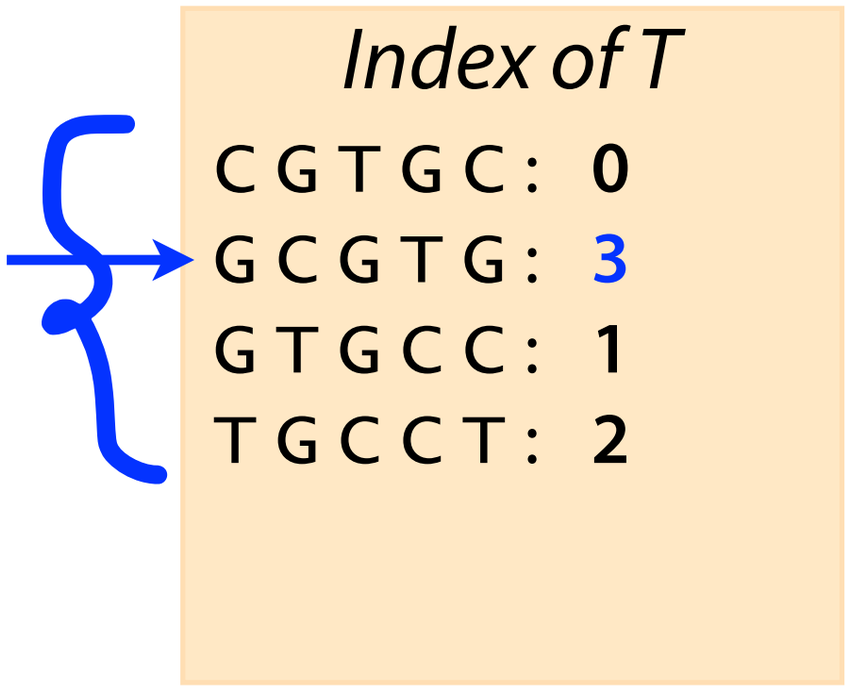
C G T G C : **0**

G T G C G : **1**

T G C G T : **2**

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

Indexing DNA



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

Indexing DNA

Index of T

C G T G C : 0 , 4
G C G T G : 3
G T G C C : 1
T G C C T : 2

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

Indexing DNA

Index of T

```
CGTGC: 0,4
GCGTG: 3
GTGCC: 1
GTGCT: 5
TGCCT: 2
```

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

Indexing DNA

Index of T

```
CGTGC: 0,4
GCGTG: 3
GTGCC: 1
GTGCT: 5
TGCCT: 2
TGCTT: 6
```

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

Indexing DNA

k-mer: substring of length k

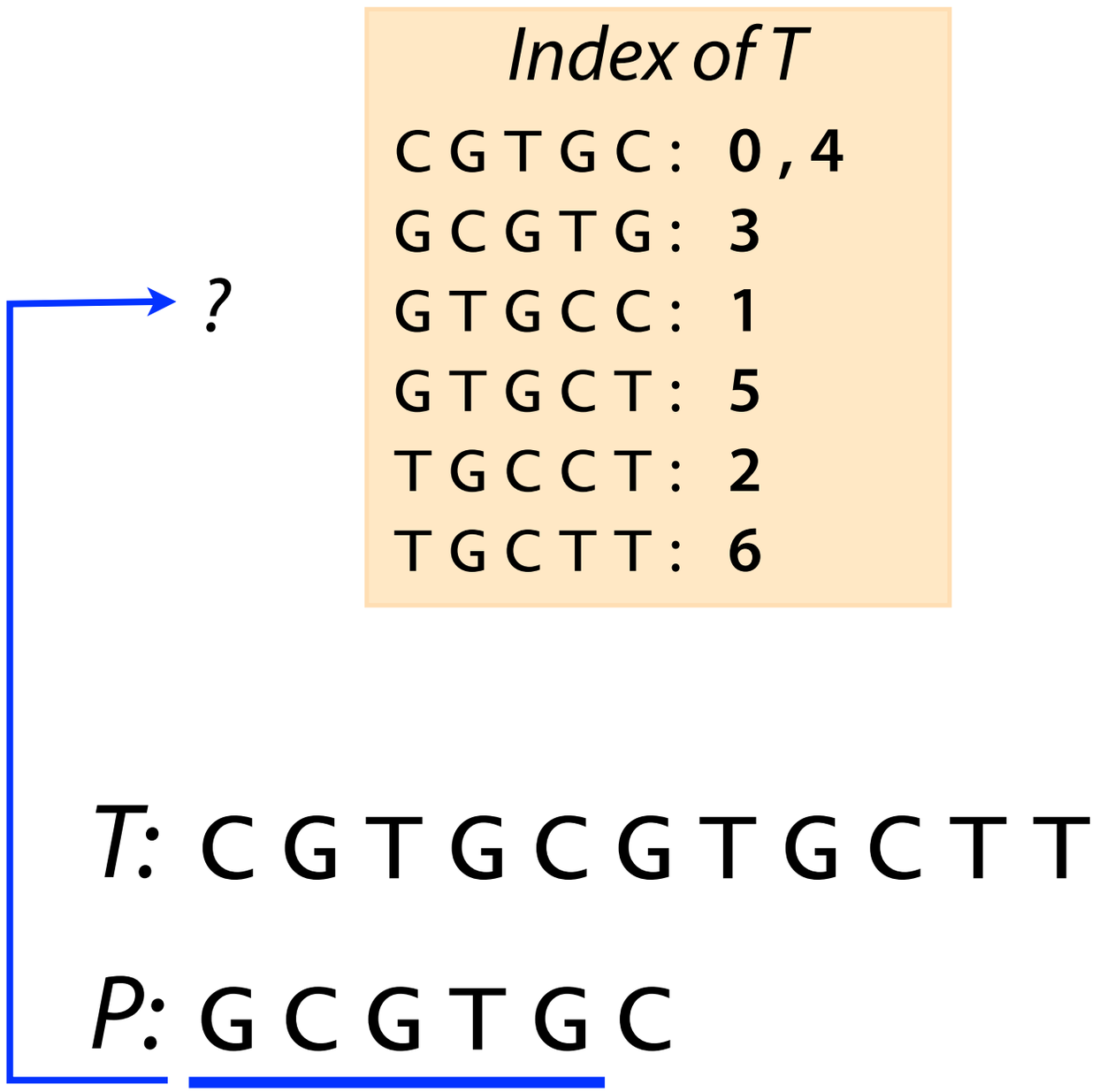
Index of T

```
CGTGC: 0,4
GCGTG: 3
GTGCC: 1
GTGCT: 5
TGCCT: 2
TGCTT: 6
```

5-mer index

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

Querying the index



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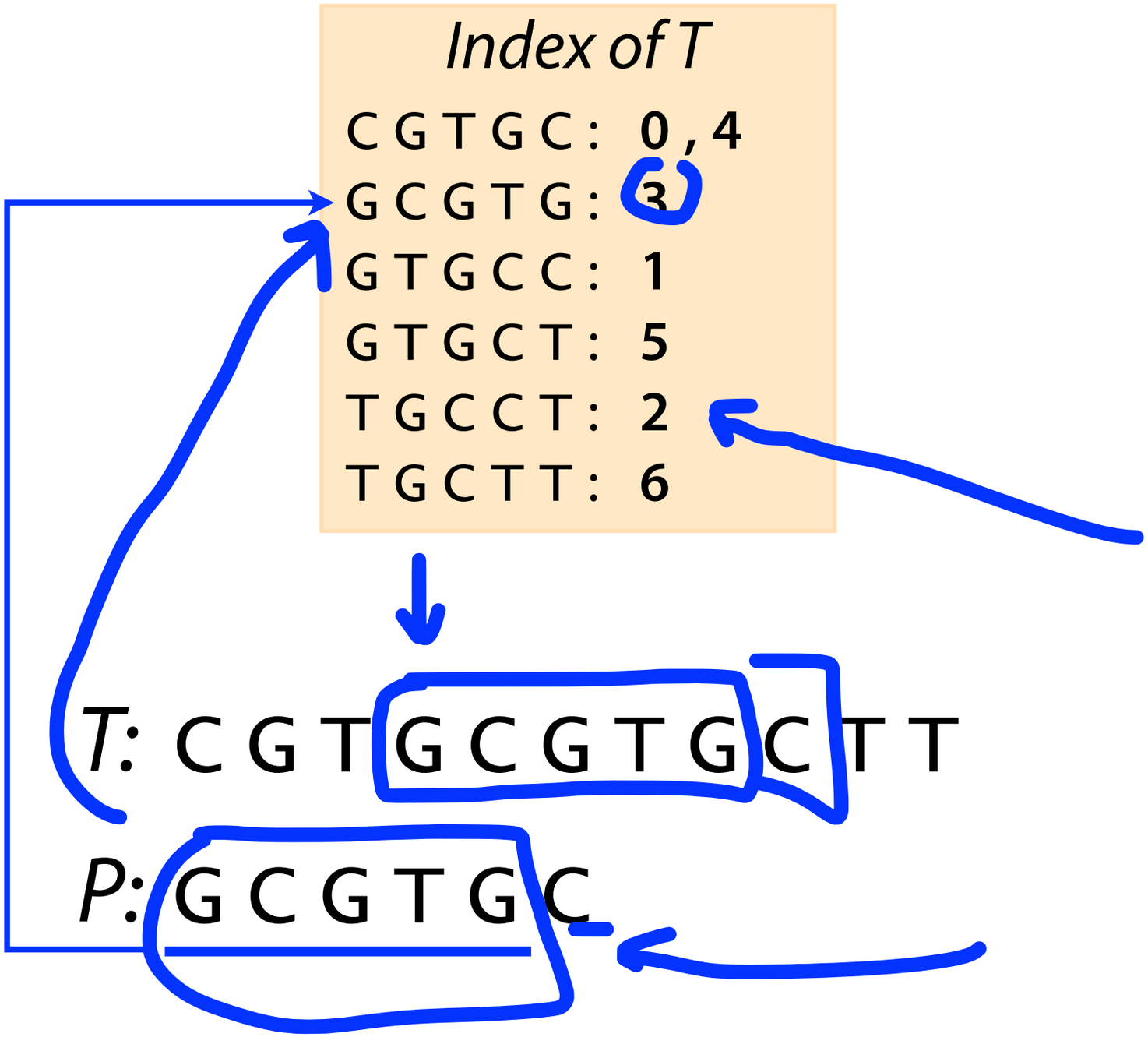

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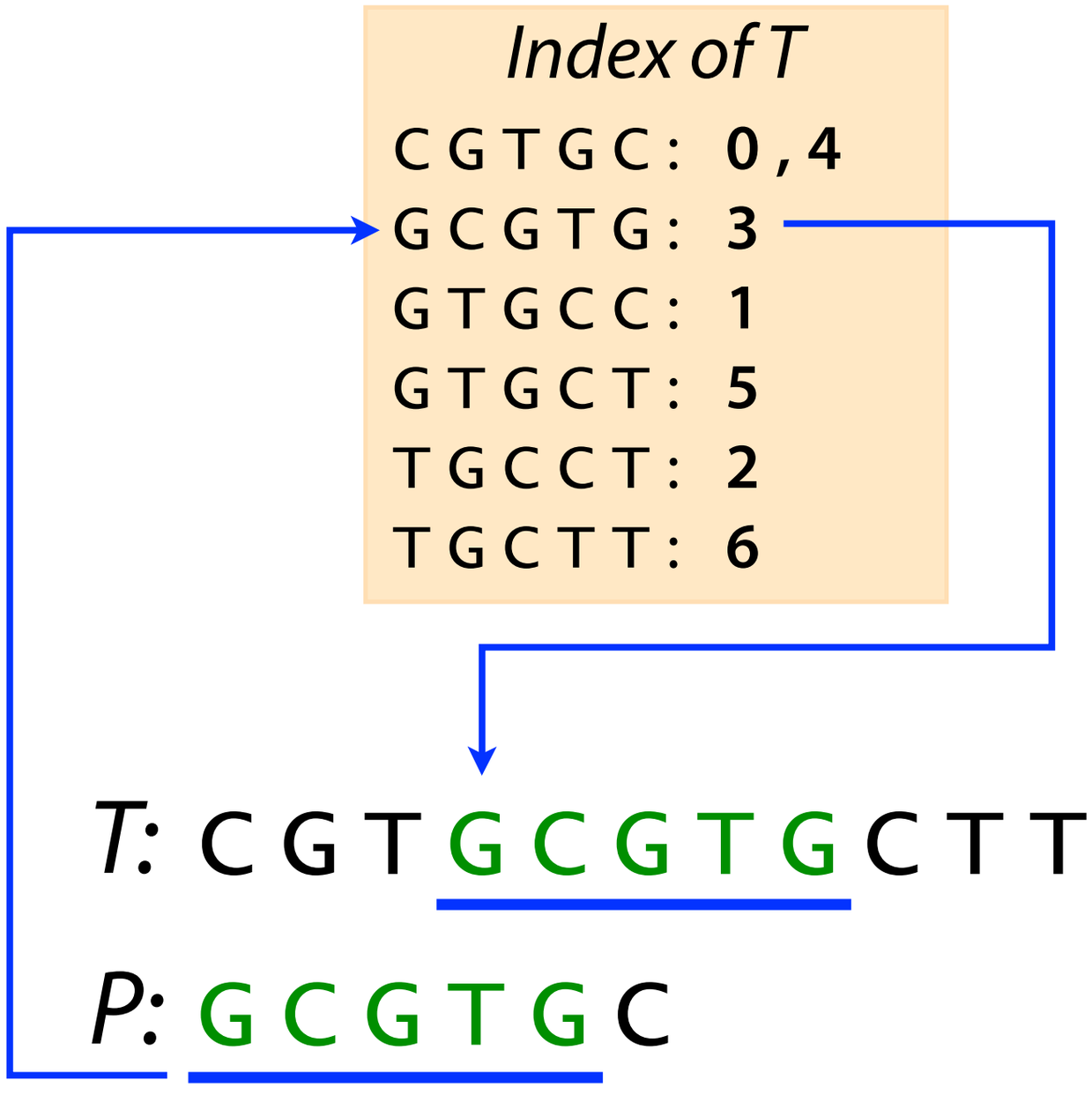

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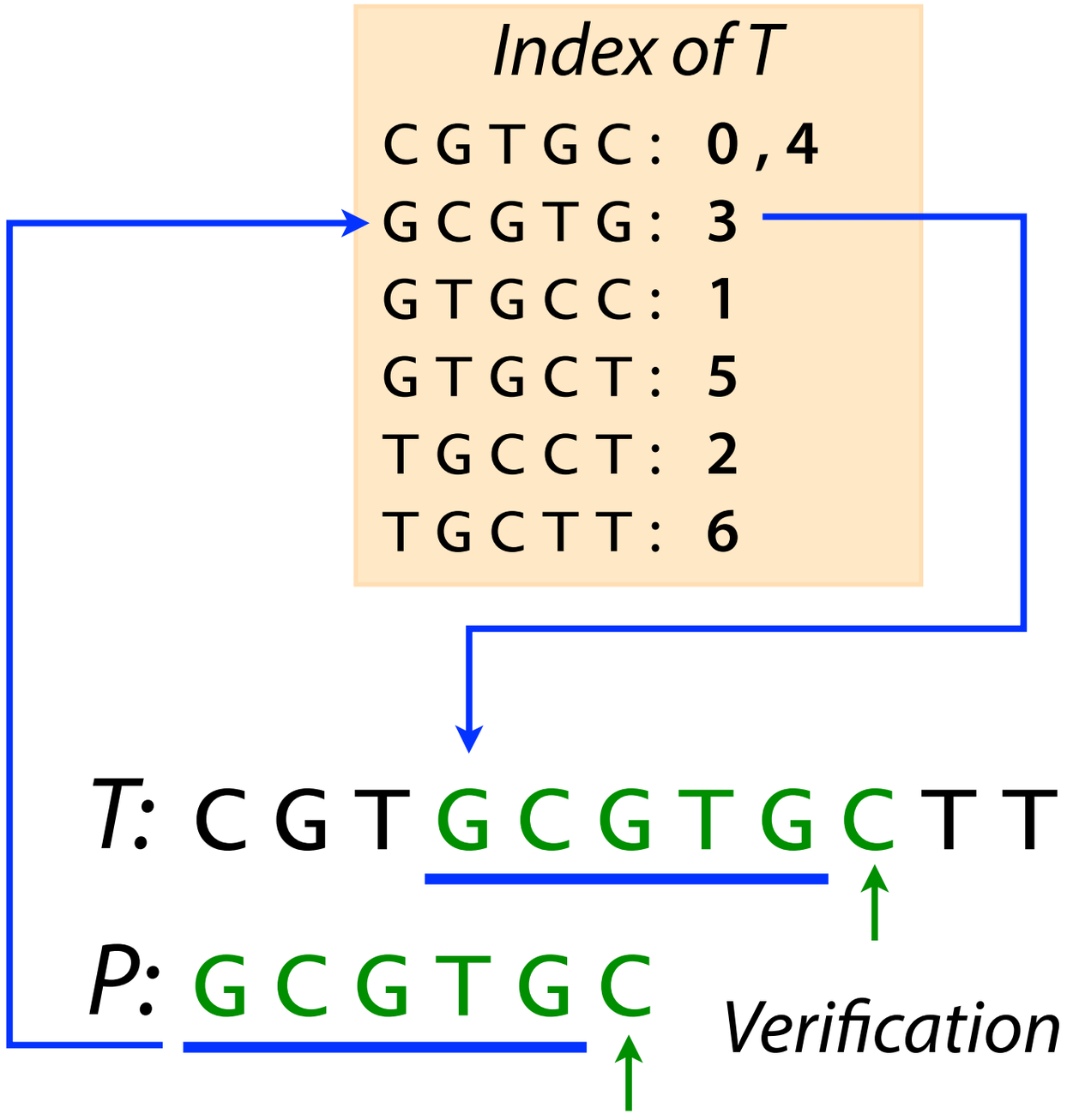
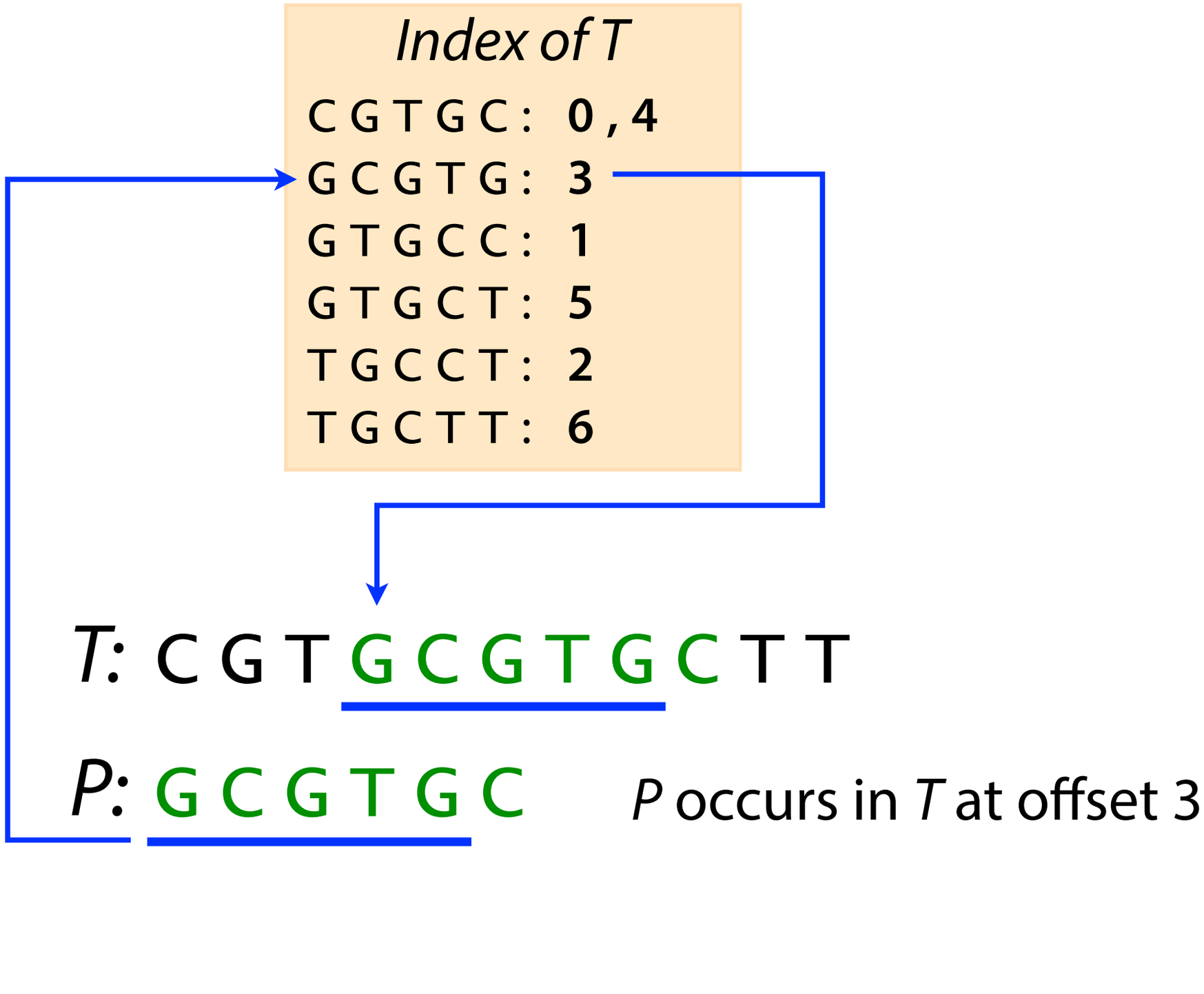


Querying the index



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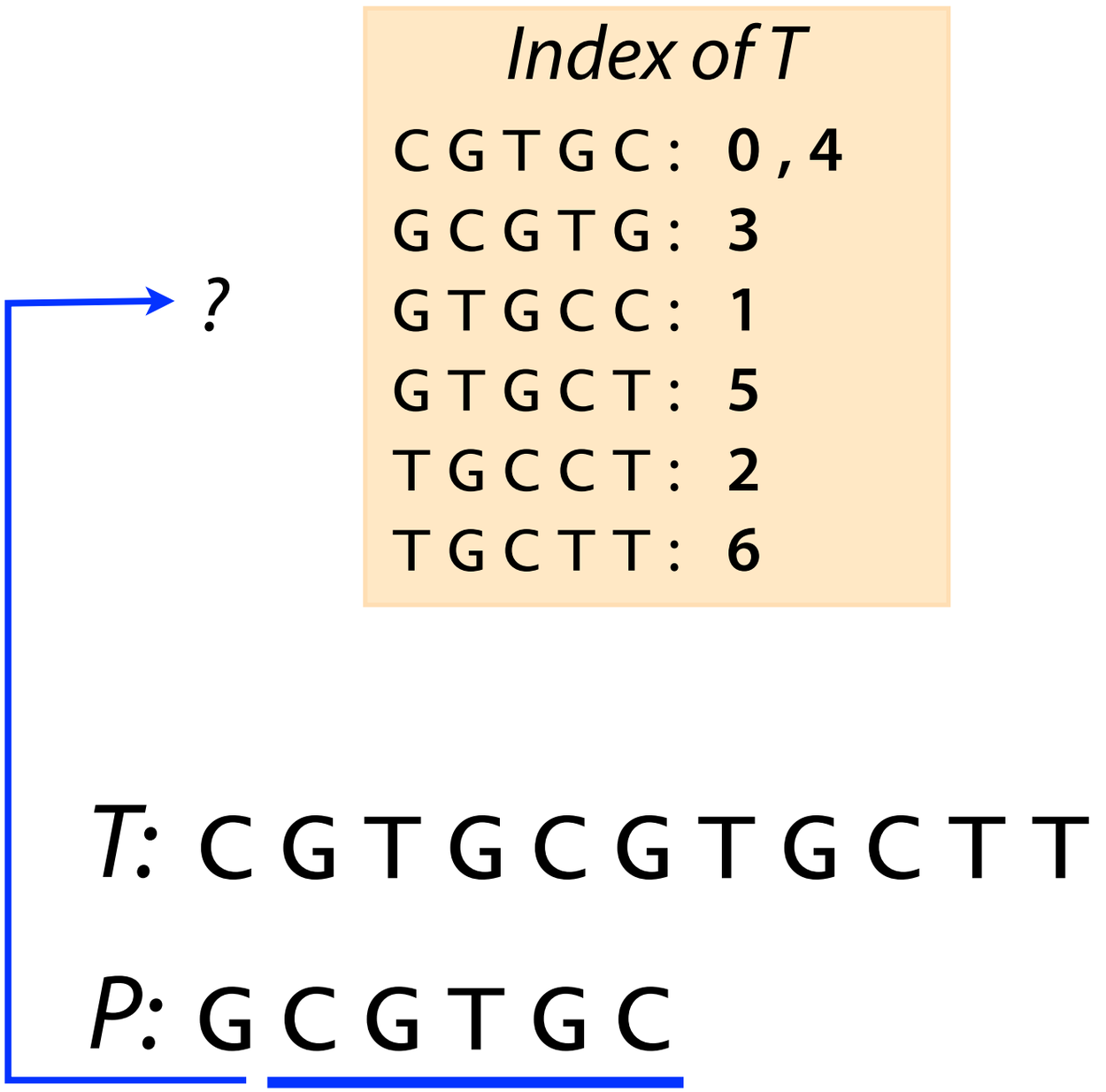

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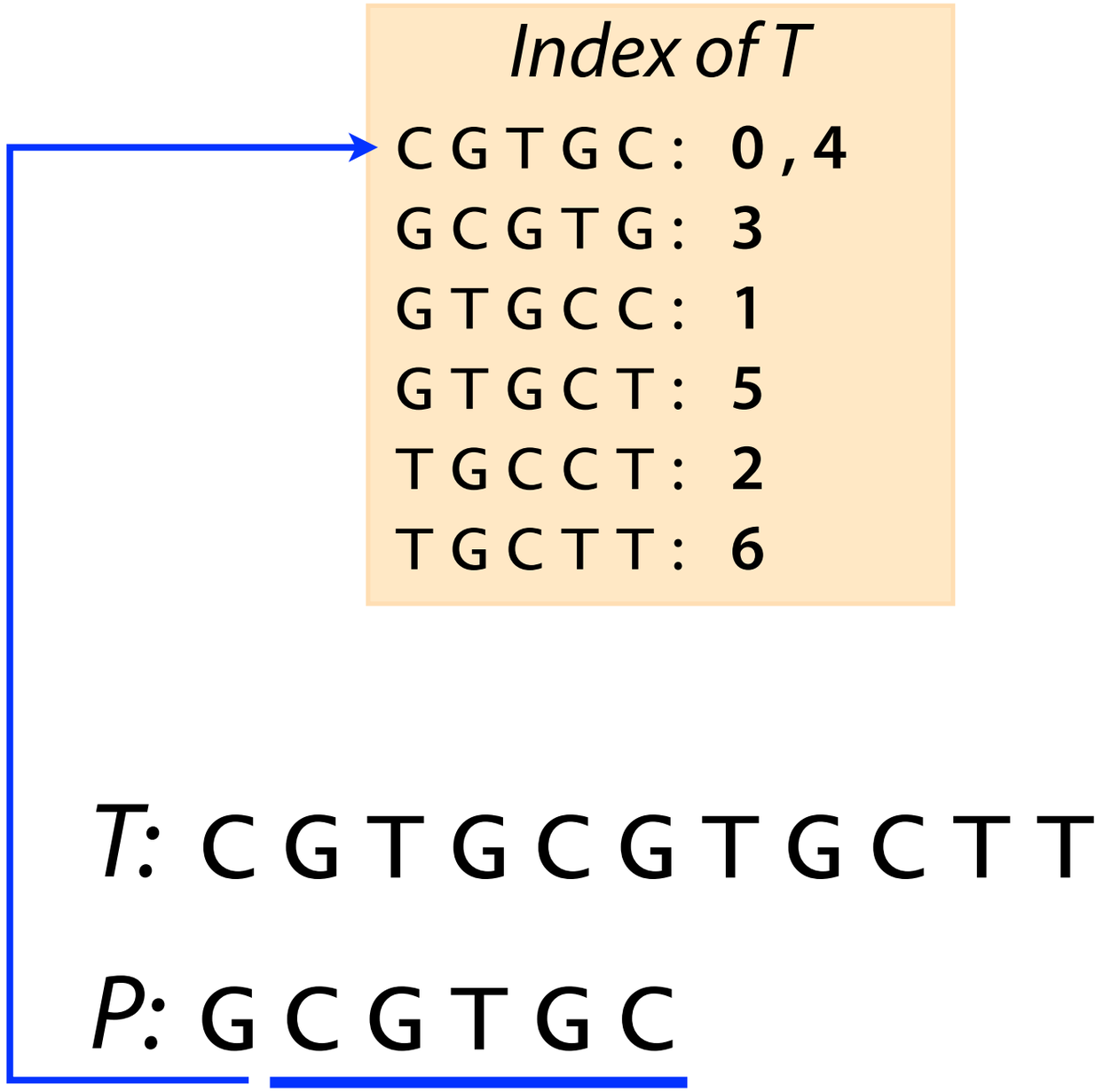
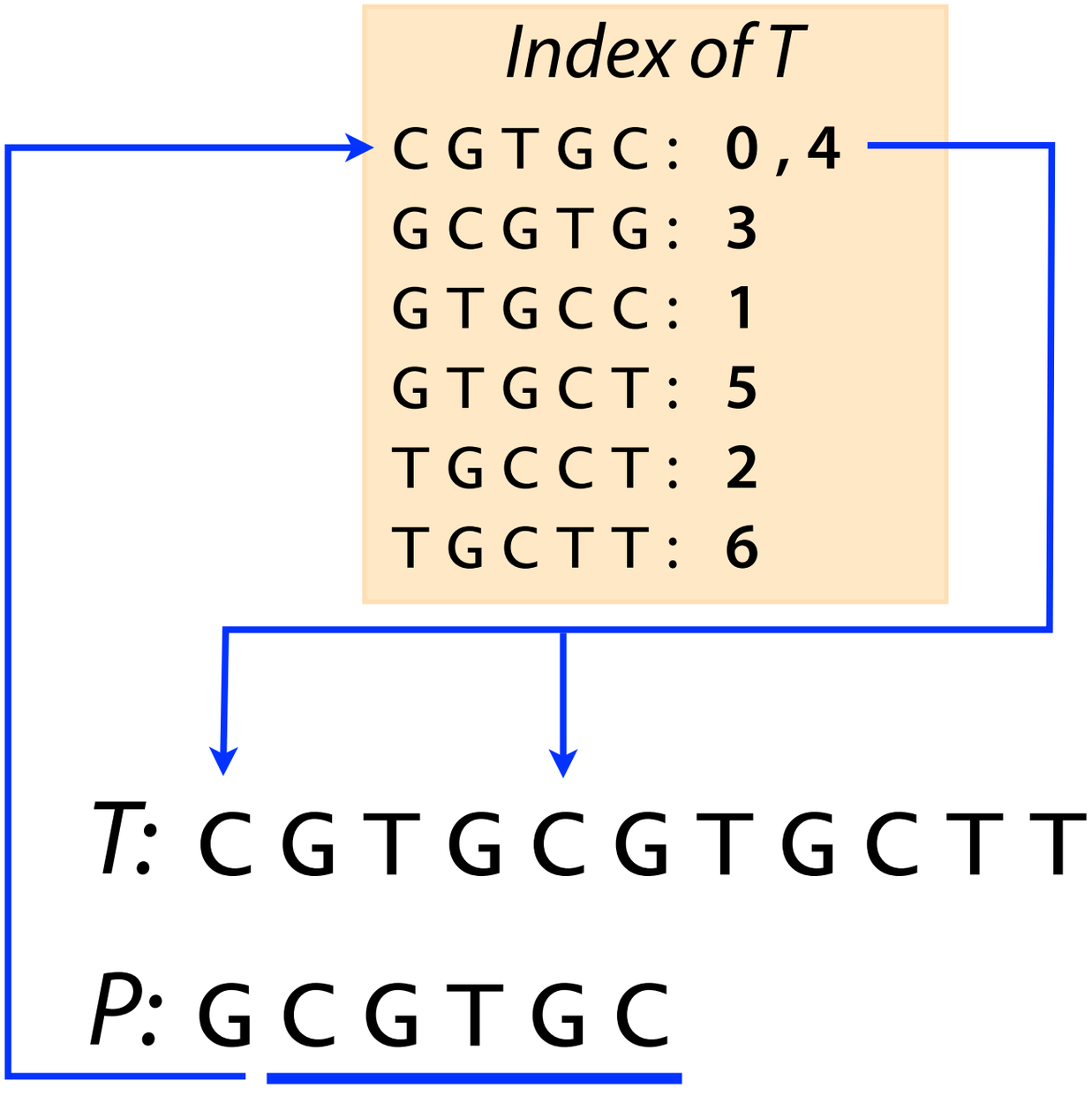


Querying the index



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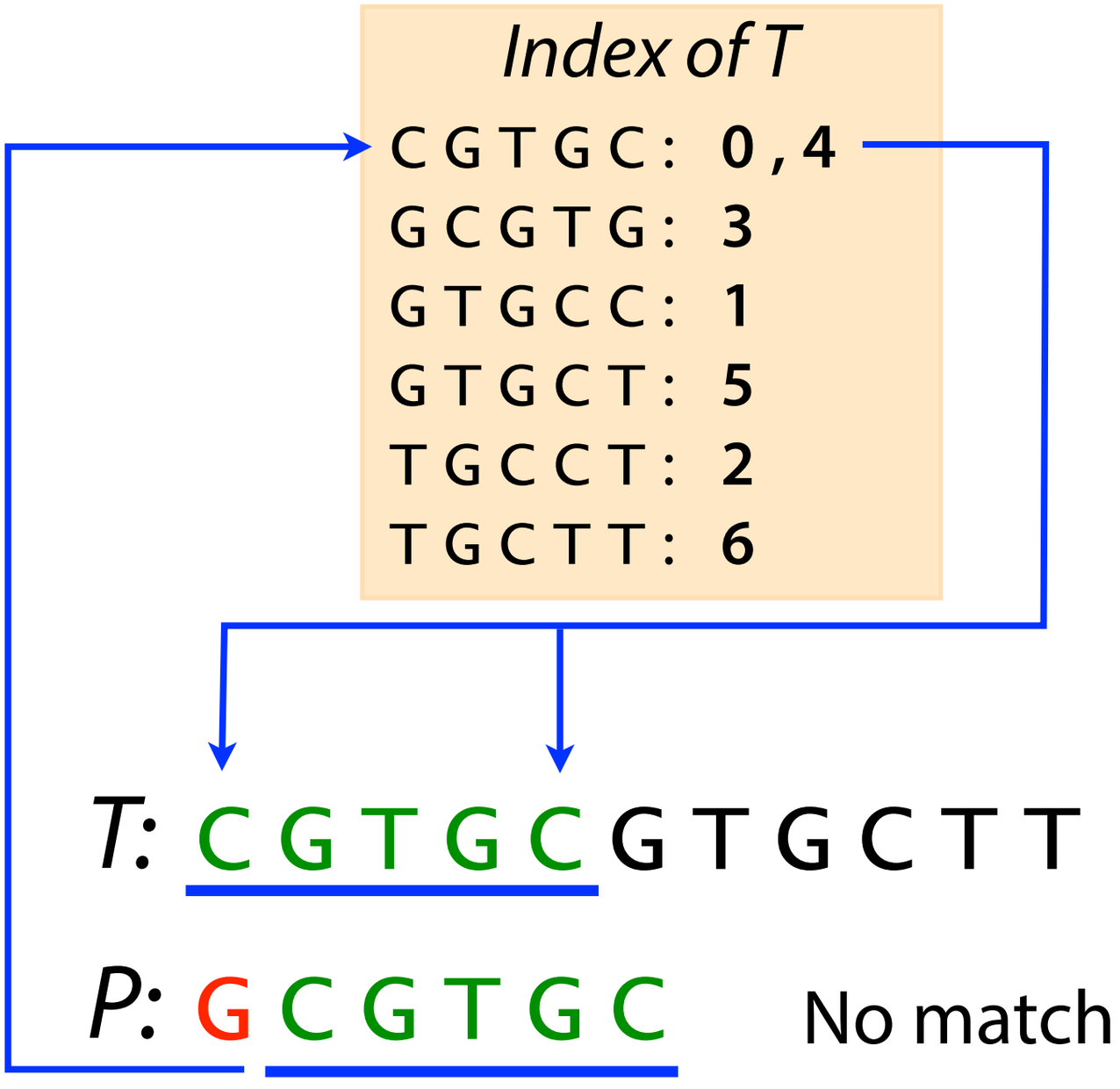
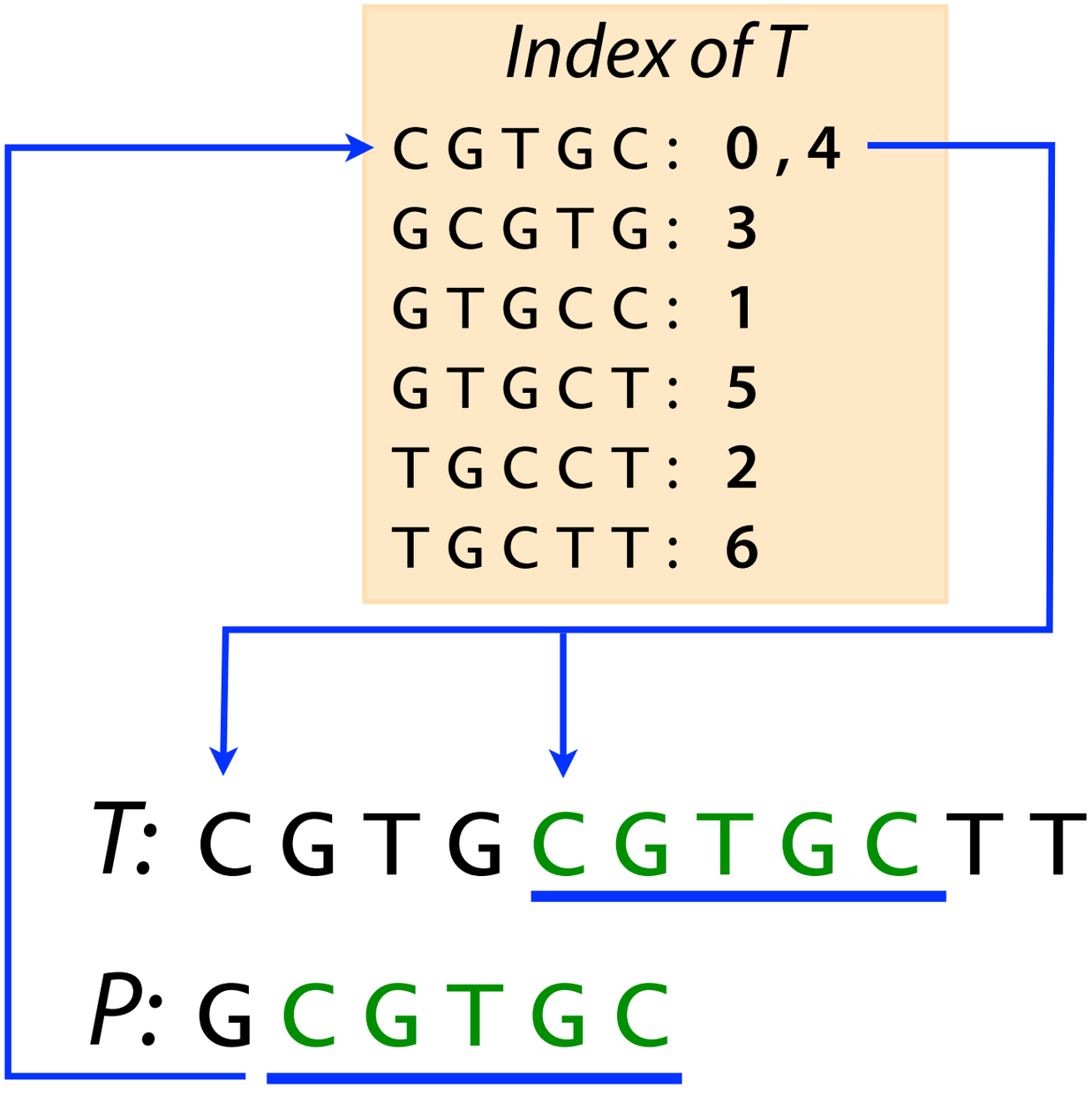
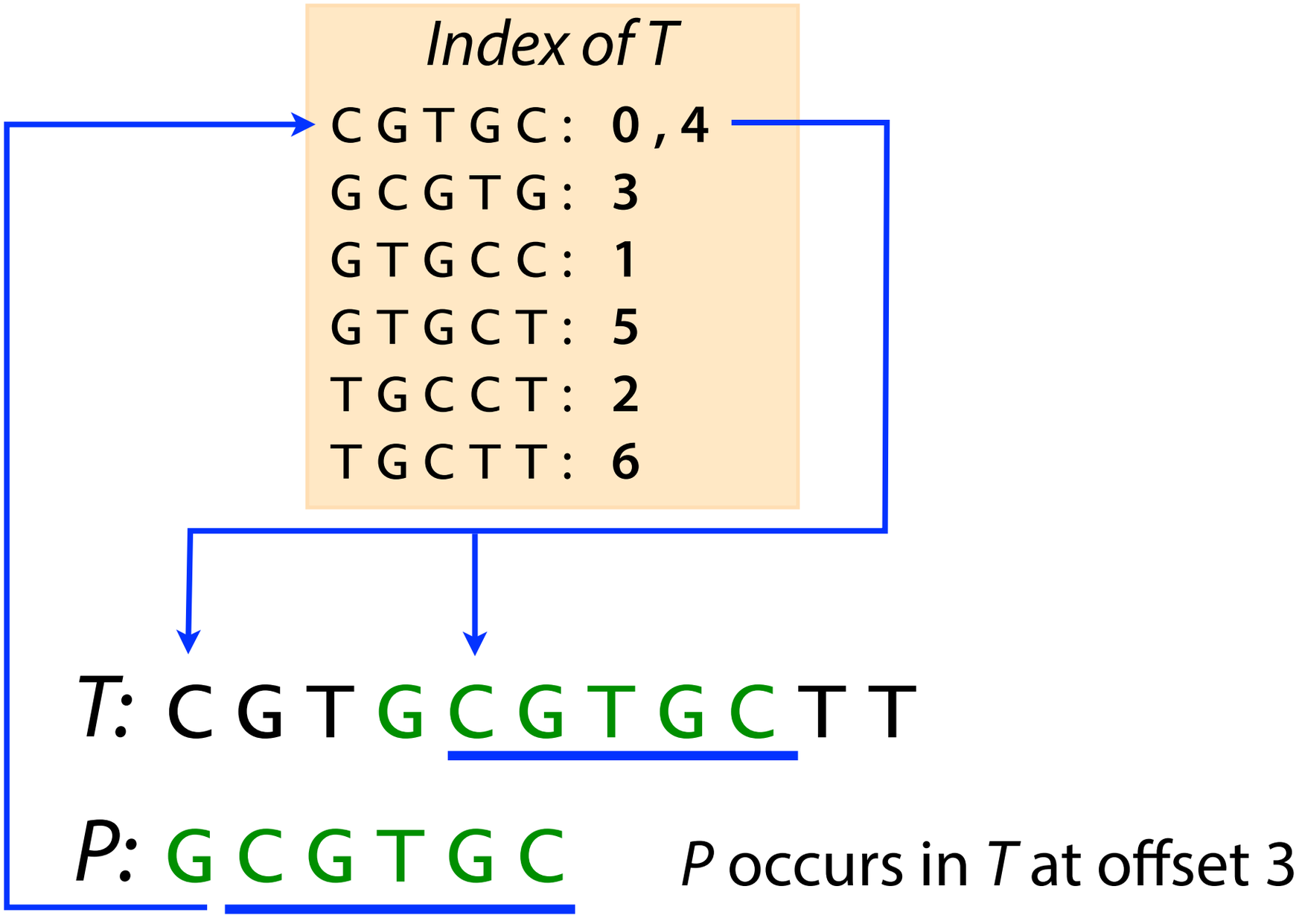


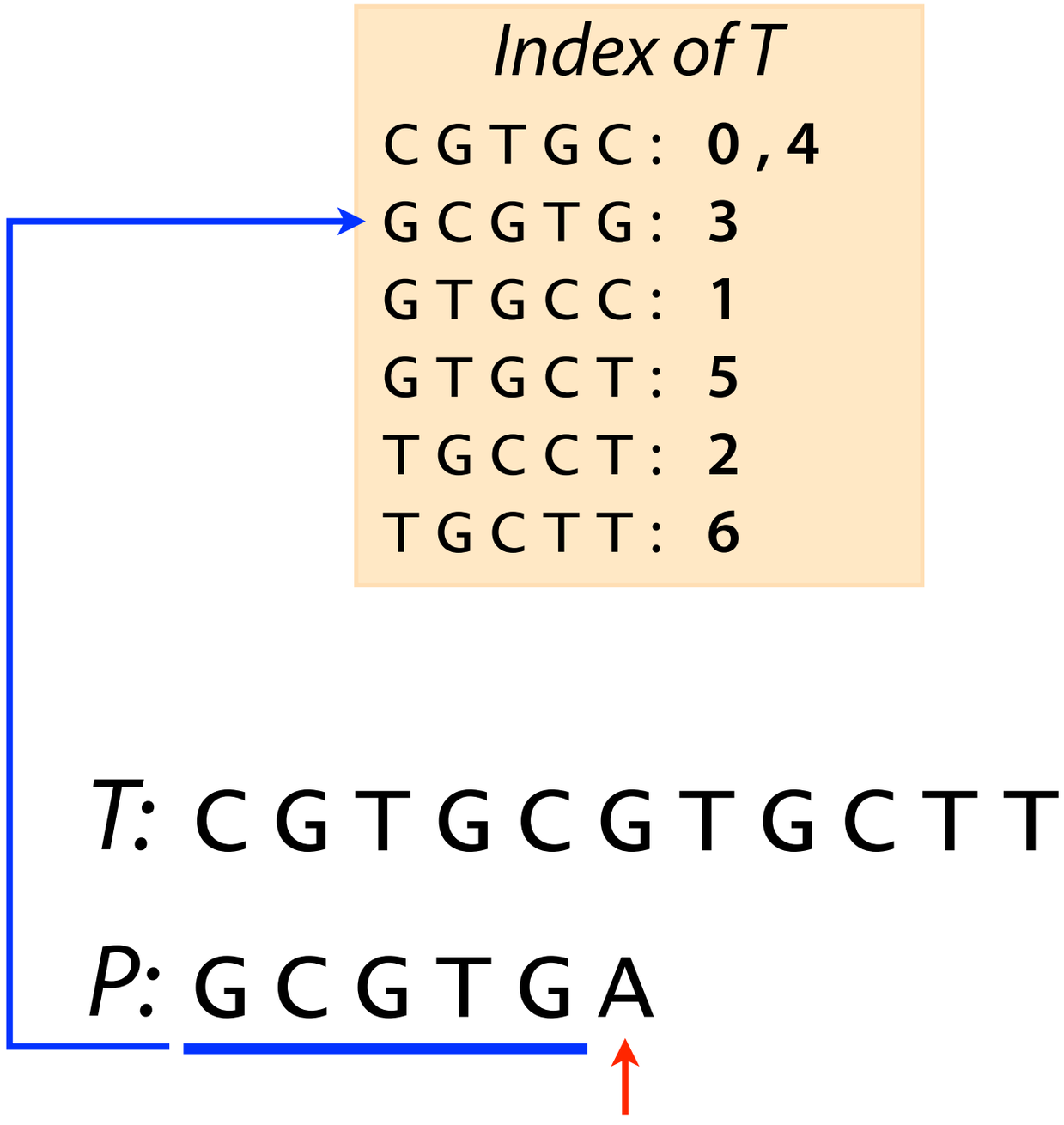
Querying the index



Querying the index



Querying the index



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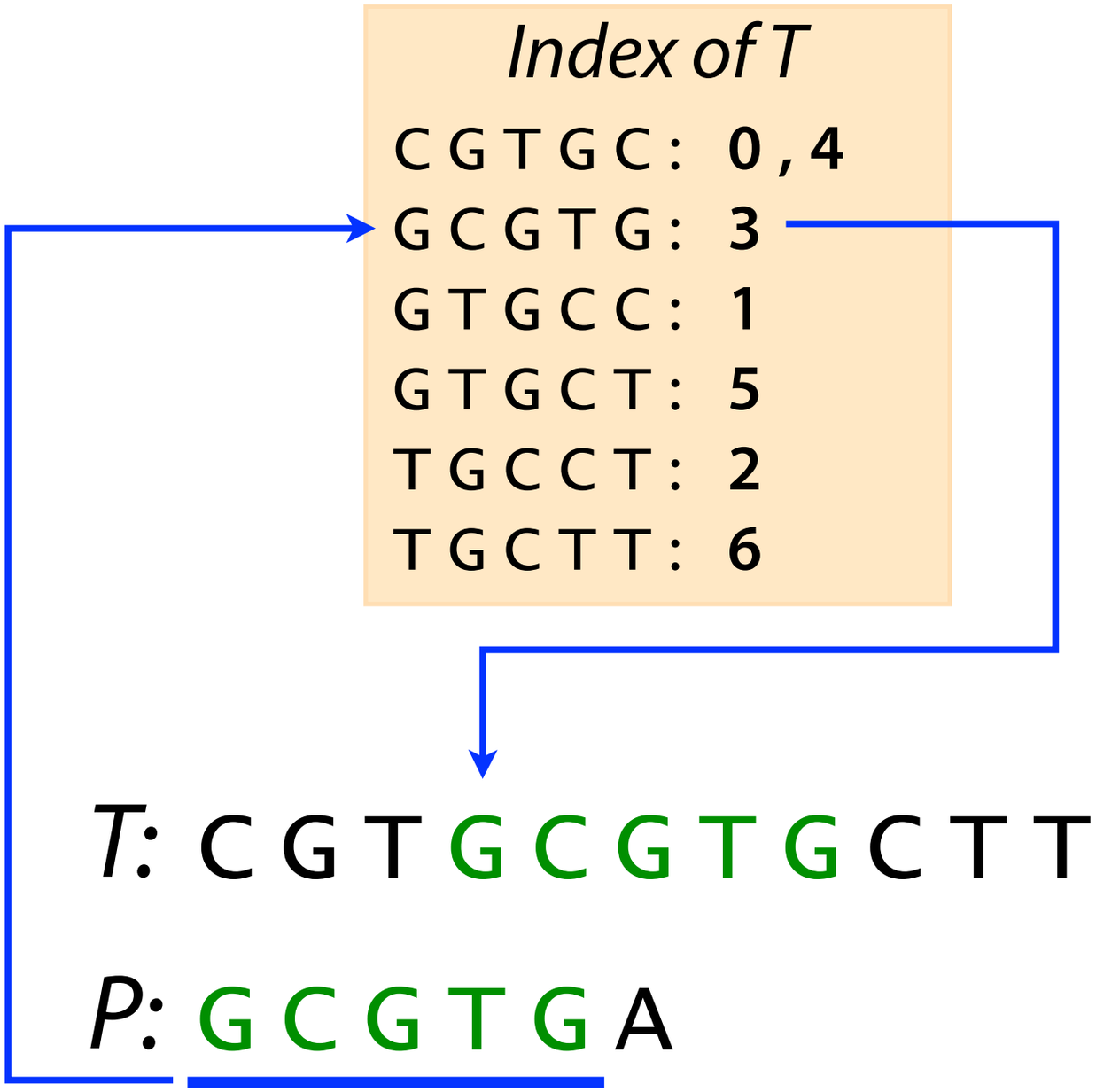

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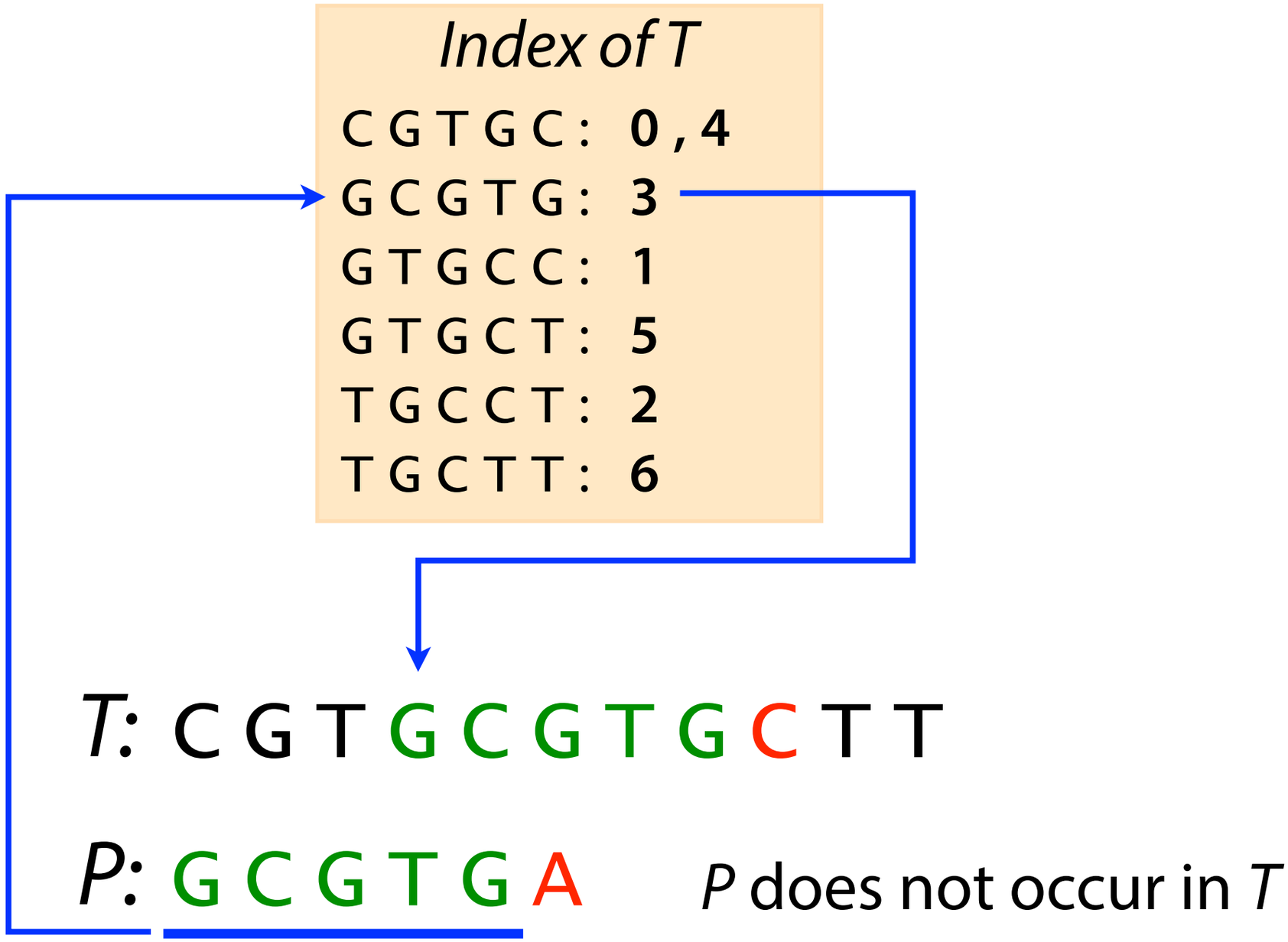


Querying the index

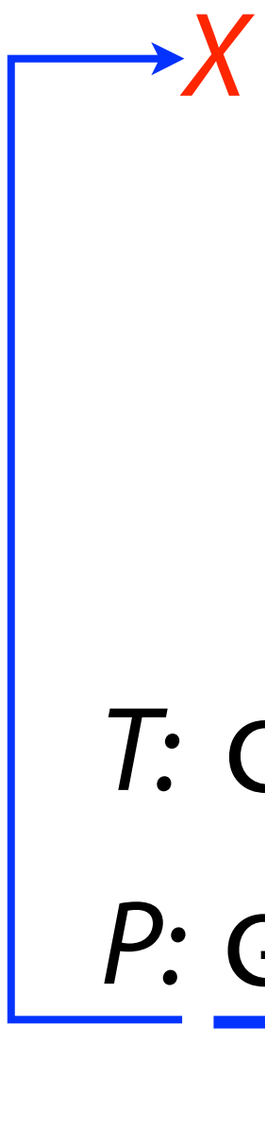
Index of T

```
CGTGC: 0,4
GCGTG: 3
GTGCC: 1
GTGCT: 5
TGCCT: 2
TGCTT: 6
```

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

P: G C G T A C

Querying the index



Index of T

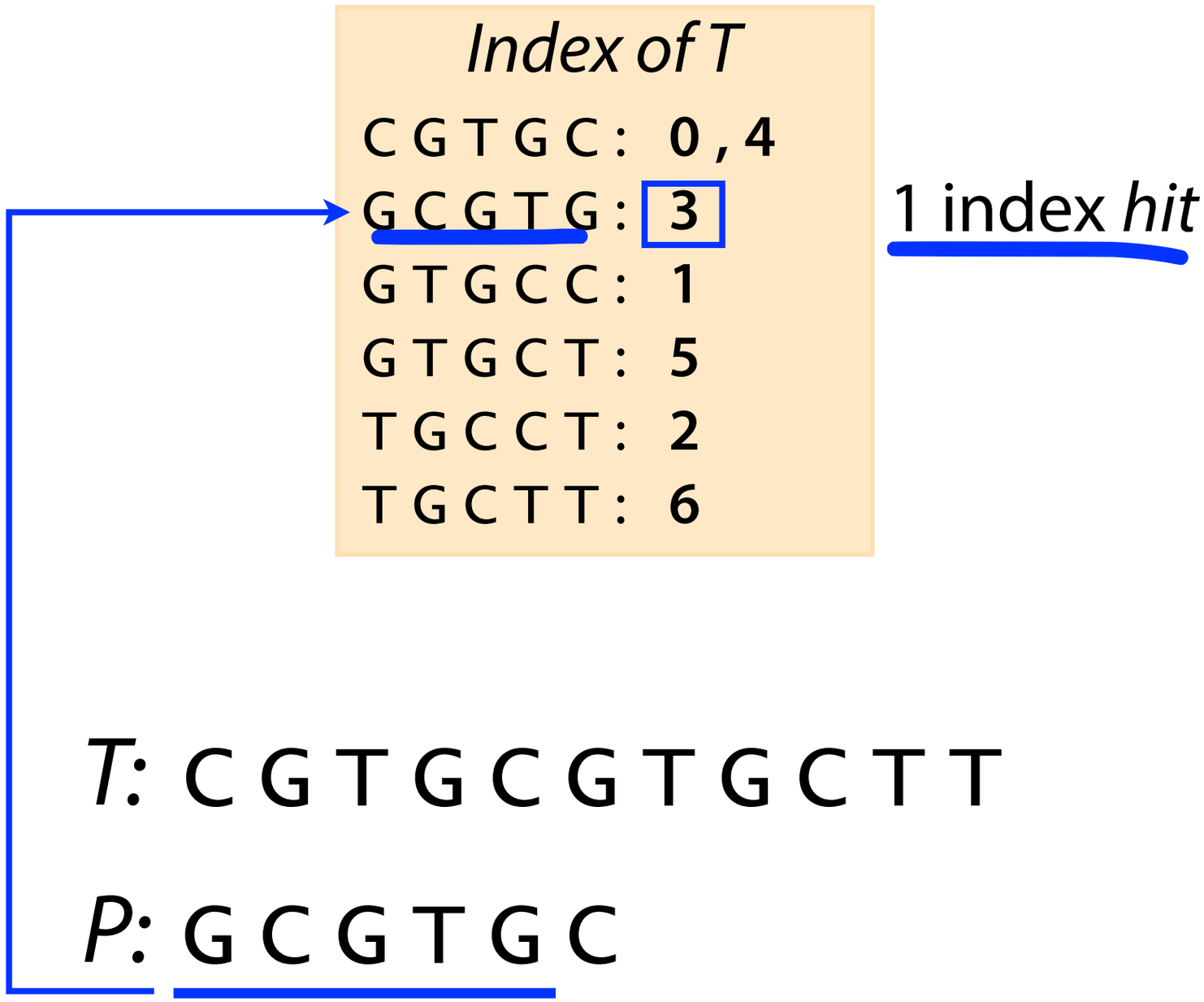
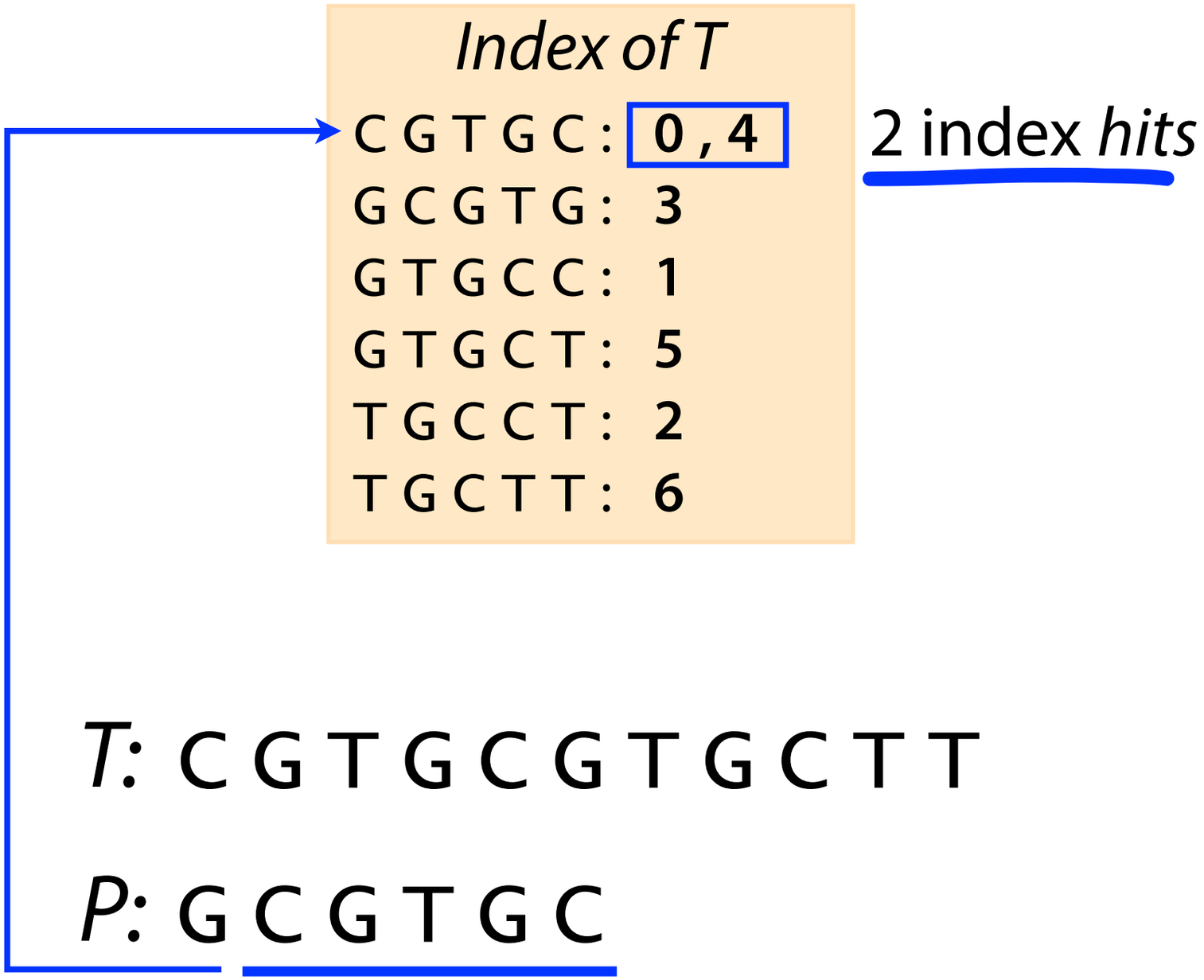
```
CGTGC: 0,4
GCGTG: 3
GTGCC: 1
GTGCT: 5
TGCCT: 2
TGCTT: 6
```

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

P: G C G T A C

P does not occur in *T*

Querying the index



Querying the index