Algoritmos Aleatorios y Motivos Regulatorios

Bioinformática 2025-2

Universidad de Sonora

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Distintos motivos

```
 1  T C G G G G g T T T t t
 2  c C G G t G A c T T a C
 3  a C G G G G A T T T t C
 4  T t G G G G A c T T t t
 5  a a G G G G A c T T C C
 6  T t G G G G A c T T C C
 7  T C G G G G A T T c a t
 8  T C G G G G A T T c C t
 9  T a G G G G A a c T a C
10  T C G G G t A T a a C C
```

Distintos motivos

```
 1 "atgaccgggatactgataaaaaaaaggggggggggcgtacacattagataaacgtatgaagtacgttagactcggcgccgccg"
 2 "acccctatttttttgagcagatttagtgacctggaaaaaaaatttgagtacaaaacttttccgaataaaaaaaaaggggggga"
 3 "tgagtatccctgggatgacttaaaaaaaaggggggggtgctctcccgatttttgaatatgtaggatcattcgccagggtccga"
 4 "gctgagaattggatgaaaaaaaaggggggggtccacgcaatcgcgaaccaacgcggacccaaaggcaagaccgataaaggaga"
 5 "tccctttttgcggtaatgtgccgggaggctggttacgtagggaagccctaacggacttaataaaaaaaaggggggggcttatag"
 6 "gtcaatcatgttcttgtgaatggatttaaaaaaaaggggggggggaccgcttggcgcacccaaattcagtgtgggcgagcgcaa"
 7 "cggttttggcccttgttagaggcccccgtaaaaaaaaggggggggcaattatgagagagctaatctatcgcgtgcgtgttcat"
 8 "aacttgagttaaaaaaaaggggggggctggggcacatacaagaggagtcttccttatcagttaatgctgtatgacactatgta"
 9 "ttggcccattggctaaaagcccaacttgacaaatggaagatagaatccttgcataaaaaaaaggggggggaccgaaagggaag"
10 "ctggtgagcaacgacagattcttacgtgcattagctcgcttccggggatctaatagcacgaagcttaaaaaaaaggggggga"
```

Distintos motivos

```
 1 "atgaccgggatactgatAAAAAAAAGGGGGGGggcgtacacattagataaacgtatgaagtacgttagactcggcgccgccg"
 2 "acccctatttttgagcagatttagtgacctggaaaaaaaatttgagtacaaaacttttccgaataAAAAAAAAGGGGGGGa"
 3 "tgagtatccctgggatgacttAAAAAAAAGGGGGGGtgctctcccgatttttgaatatgtaggatcattcgccagggtccga"
 4 "gctgagaattggatgAAAAAAAAGGGGGGGtccacgcaatcgcgaaccaacgcggacccaaaggcaagaccgataaaggaga"
 5 "tccctttgcggtaatgtgccgggaggctggttacgtagggaagccctaacggacttaatAAAAAAAAGGGGGGGcttatag"
 6 "gtcaatcatgttcttgtgaatggatttAAAAAAAAGGGGGGGgaccgcttggcgcacccaaattcagtgtgggcgagcgcaa"
 7 "cggttttggcccttgttagaggcccccgtAAAAAAAAGGGGGGGcaattatgagagagctaatctatcgcgtgcgtgttcat"
 8 "aacttgagttAAAAAAAAGGGGGGGctggggcacatacaagaggagtcttccttatcagttaatgctgtatgacactatgta"
 9 "ttggcccattggctaaaagcccaacttgacaaatggaagatagaatccttgcatAAAAAAAAGGGGGGGaccgaaagggaag"
10 "ctggtgagcaacgacagattcttacgtgcattagctcgcttccggggatctaatagcacgaagcttAAAAAAAAGGGGGGGa"
```

Distintos motivos

```
 1 "atgaccgggatactgatAgAAgAAAGGttGGGggcgtacacattagataaacgtatgaagtacgttagactcggcgccgccg"
 2 "acccctatttttgagcagatttagtgacctggaaaaaaaatttgagtacaaaacttttccgaatacAAtAAAAcGGcGGGa"
 3 "tgagtatccctgggatgacttAAAAtAAtGGaGtGGtgctctcccgatttttgaatatgtaggatcattcgccagggtccga"
 4 "gctgagaattggatgcAAAAAAAGGGattGtccacgcaatcgcgaaccaacgcggacccaaaggcaagaccgataaaggaga"
 5 "tccctttgcggtaatgtgccgggaggctggttacgtagggaagccctaacggacttaatAtAAtAAAGGaaGGGcttatag"
 6 "gtcaatcatgttcttgtgaatggatttAAcAAtAAGGGctGGgaccgcttggcgcacccaaattcagtgtgggcgagcgcaa"
 7 "cggttttggcccttgttagaggcccccgtAtAAAcAAGGaGGGccaattatgagagagctaatctatcgcgtgcgtgttcat"
 8 "aacttgagttAAAAAAtAGGGaGccctggggcacatacaagaggagtcttccttatcagttaatgctgtatgacactatgta"
 9 "ttggcccattggctaaaagcccaacttgacaaatggaagatagaatccttgcatActAAAAAGGaGcGGaccgaaagggaag"
10 "ctggtgagcaacgacagattcttacgtgcattagctcgcttccggggatctaatagcacgaagcttActAAAAAGGaGcGGa"
```

Motif Enumeration

```
MotifEnumeration(Dna, k, d)
    Patterns ← an empty set
    for each k-mer Pattern in the first string in Dna
        for each k-mer Pattern' differing from Pattern by at most d mismatches
            if Pattern' appears in each string from Dna with at most d mismatches
                add Pattern' to Patterns
    remove duplicates from Patterns
    return Patterns
```

Matriz de motivos

Motifs

T	C	G	G	G	G	g	T	T	T	t	t
c	C	G	G	t	G	A	c	T	T	a	C
a	C	G	G	G	G	A	T	T	T	t	C
T	t	G	G	G	G	A	c	T	T	t	t
a	a	G	G	G	G	A	c	T	T	C	C
T	t	G	G	G	G	A	c	T	T	C	C
T	C	G	G	G	G	A	T	T	c	a	t
T	C	G	G	G	G	A	T	T	c	C	t
T	a	G	G	G	G	A	a	c	T	a	C
T	C	G	G	G	t	A	T	a	a	C	C

Matriz de motivos

Motifs	T	C	G	G	G	G	g	T	T	T	t	t
	c	C	G	G	t	G	A	c	T	T	a	C
	a	C	G	G	G	G	A	T	T	T	t	C
	T	t	G	G	G	G	A	c	T	T	t	t
	a	a	G	G	G	G	A	c	T	T	C	C
	T	t	G	G	G	G	A	c	T	T	C	C
	T	C	G	G	G	G	A	T	T	c	a	t
	T	C	G	G	G	G	A	T	T	c	C	t
	T	a	G	G	G	G	A	a	c	T	a	C
	T	C	G	G	G	t	A	T	a	a	C	C

Score(Motifs) $3 + 4 + 0 + 0 + 1 + 1 + 1 + 5 + 2 + 3 + 6 + 4 = 30$

Perfil de motivos

Motifs	T	C	G	G	G	G	g	T	T	T	t	t
	c	C	G	G	t	G	A	c	T	T	a	C
	a	C	G	G	G	G	A	T	T	T	t	C
	T	t	G	G	G	G	A	c	T	T	t	t
	a	a	G	G	G	G	A	c	T	T	C	C
	T	t	G	G	G	G	A	c	T	T	C	C
	T	C	G	G	G	G	A	T	T	c	a	t
	T	C	G	G	G	G	A	T	T	c	C	t
	T	a	G	G	G	G	A	a	c	T	a	C
	T	C	G	G	G	t	A	T	a	a	C	C

Score(Motifs) $3 + 4 + 0 + 0 + 1 + 1 + 1 + 5 + 2 + 3 + 6 + 4 = 30$

Count(Motifs)												
	A:	2	2	0	0	0	0	9	1	1	1	3	0
	C:	1	6	0	0	0	0	0	4	1	2	4	6
	G:	0	0	10	10	9	9	1	0	0	0	0	0
	T:	7	2	0	0	1	1	0	5	8	7	3	4

Profile(Motifs)												
	A:	.2	.2	0	0	0	0	.9	.1	.1	.1	.3	0
	C:	.1	.6	0	0	0	0	0	.4	.1	.2	.4	.6
	G:	0	0	1	1	.9	.9	.1	0	0	0	0	0
	T:	.7	.2	0	0	.1	.1	0	.5	.8	.7	.3	.4

Perfil de motivos

Motifs		T	C	G	G	G	G	g	T	T	T	t	t
		c	C	G	G	t	G	A	c	T	T	a	C
		a	C	G	G	G	G	A	T	T	T	t	C
		T	t	G	G	G	G	A	c	T	T	t	t
		a	a	G	G	G	G	A	c	T	T	C	C
		T	t	G	G	G	G	A	c	T	T	C	C
		T	C	G	G	G	G	A	T	T	c	a	t
		T	C	G	G	G	G	A	T	T	c	C	t
		T	a	G	G	G	G	A	a	c	T	a	C
		T	C	G	G	G	t	A	T	a	a	C	C
Score(Motifs)		3 + 4 + 0 + 0 + 1 + 1 + 1 + 5 + 2 + 3 + 6 + 4 = 30											
Count(Motifs)	A:	2	2	0	0	0	0	9	1	1	1	3	0
	C:	1	6	0	0	0	0	0	4	1	2	4	6
	G:	0	0	10	10	9	9	1	0	0	0	0	0
	T:	7	2	0	0	1	1	0	5	8	7	3	4
Profile(Motifs)	A:	.2	.2	0	0	0	0	.9	.1	.1	.1	.3	0
	C:	.1	.6	0	0	0	0	0	.4	.1	.2	.4	.6
	G:	0	0	1	1	.9	.9	.1	0	0	0	0	0
	T:	.7	.2	0	0	.1	.1	0	.5	.8	.7	.3	.4
Consensus(Motifs)		T	C	G	G	G	G	A	T	T	T	C	C