

List of full sensitivity spaced seeds for at most 7 mismatches

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Each spaced seed s is a periodic seed (b is a periodic block). It consists of n_b repetitions of the block and first n_d symbols of the blocks. Other parameters: w is the weight of the periodic seed, n_m is the maximum number of mismatches allowed to achieve the full sensitivity, L_{min} is the minimum length of a read required for the found seed.

We used the following selection criteria:

- by setting n_m and the length L of a read, we found all seeds of a maximum weight w ;
- for a given weight w we found the shortest length L_{min} of reads when we are able to find seeds;
- among all seeds found for n_m , w and L_{min} , we used only seeds of maximum length.

If a seed s is found, then its reverse version \bar{s} (all digits are in the reverse order) can also be used. To form the seeds below lists of seed blocks b were used. Those blocks were found for sizes from 10 to 50 for $n_m = 3, 4, \dots, 9$ and from 10 to 70 for $n_m = 2$. For each block size only sequences of maximum weight were used. There is a possibility that in a future longer seed blocks can be found and new spaced seeds can be formed for a given weight w (it will be possible to use them for shorter reads, i.e. L_{min} will be smaller).

- 1) $n_m = 7, w = 16, L_{min} = 82, n_b = 1, n_d = 23$,
 $b = 100000101000100010101010000000$,
 $s = 10000010100010001010101000000010000010100010001010101$
- 2) $n_m = 7, w = 17, L_{min} = 88, n_b = 2, n_d = 11$,
 $b = 10100010101000000000001000$,
 $s = 10100010101000000000001000101000101010000000000100010100010101$
- 3) $n_m = 7, w = 17, L_{min} = 88, n_b = 2, n_d = 11$,
 $b = 10001010101000000010000000$,
 $s = 100010101010000000100000010001010101000000100000010001010101$
- 4) $n_m = 7, w = 18, L_{min} = 92, n_b = 3, n_d = 5$,
 $b = 1010100000001000001000$,
 $s = 101010000000100000100010101000000100000100010101000000100000100010101$
- 5) $n_m = 7, w = 19, L_{min} = 94, n_b = 2, n_d = 5$,
 $b = 101010100000001000001010001000$,
 $s = 1010101000000010000010100010001010101000000100000101000100010101$
- 6) $n_m = 7, w = 19, L_{min} = 94, n_b = 2, n_d = 5$,
 $b = 101010000000100000101000100010$,
 $s = 1010100000001000001010001000101010100000010000010100010001010101$
- 7) $n_m = 7, w = 20, L_{min} = 96, n_b = 2, n_d = 7$,
 $b = 101010100000001000001010001000$,
 $s = 101010100000001000001010001000101010100000010000010100010001010101$
- 8) $n_m = 7, w = 21, L_{min} = 100, n_b = 2, n_d = 11$,
 $b = 100010101010000000100000101000$,
 $s = 1000101010100000001000001010001000101010100000010000010100010001010101$
- 9) $n_m = 7, w = 22, L_{min} = 104, n_b = 2, n_d = 15$,
 $b = 101000100010101010000000100000$,
 $s = 101000100010101010000000100000101000100010101010000000100000101000100010101$
- 10) $n_m = 7, w = 22, L_{min} = 104, n_b = 2, n_d = 15$,
 $b = 100010001010101000000010000010$,
 $s = 100010001010101000000010000010100010001010101000000010000010100010001010101$
- 11) $n_m = 7, w = 23, L_{min} = 106, n_b = 2, n_d = 17$,
 $b = 101000100010101010000000100000$,
 $s = 10100010001010101000000010000010100010001010101000000010000010100010001010101$

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- 41) $n_m = 7, w = 34, L_{min} = 152, n_b = 4, n_d = 3,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $00100010101010000000100000101$
- 42) $n_m = 7, w = 34, L_{min} = 152, n_b = 4, n_d = 3,$
 $b = 101010100000001000001010001000,$
 $s = 1010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010$
 $10100000001000001010001000101$
- 43) $n_m = 7, w = 34, L_{min} = 152, n_b = 4, n_d = 3,$
 $b = 101010000000100000101000100010,$
 $s = 1010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010$
 $10000000100000101000100010101$
- 44) $n_m = 7, w = 34, L_{min} = 152, n_b = 4, n_d = 3,$
 $b = 101000000010000010100010001010,$
 $s = 1010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101010$
 $00000010000010100010001010101$
- 45) $n_m = 7, w = 35, L_{min} = 154, n_b = 4, n_d = 5,$
 $b = 101010100000001000001010001000,$
 $s = 1010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010$
 $1010000000100000101000100010101$
- 46) $n_m = 7, w = 35, L_{min} = 154, n_b = 4, n_d = 5,$
 $b = 101010000000100000101000100010,$
 $s = 1010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010$
 $1000000010000010100010001010101$
- 47) $n_m = 7, w = 36, L_{min} = 156, n_b = 4, n_d = 7,$
 $b = 101010100000001000001010001000,$
 $s = 1010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010$
 $101000000010000010100010001010101$
- 48) $n_m = 7, w = 37, L_{min} = 160, n_b = 4, n_d = 11,$
 $b = 100010101010000000100000101000,$
 $s = 1000101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000$
 $1010101000000010000010100010001010101$
- 49) $n_m = 7, w = 38, L_{min} = 164, n_b = 4, n_d = 15,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $00100010101010000000100000101000100010101$
- 50) $n_m = 7, w = 38, L_{min} = 164, n_b = 4, n_d = 15,$
 $b = 100010001010101000000010000010,$
 $s = 1000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000$
 $10001010101000000010000010100010001010101$
- 51) $n_m = 7, w = 39, L_{min} = 166, n_b = 4, n_d = 17,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $0010001010101000000010000010100010001010101$
- 52) $n_m = 7, w = 40, L_{min} = 172, n_b = 4, n_d = 23,$
 $b = 100000101000100010101010000000,$
 $s = 1000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000$
 $0010100010001010101000000010000010100010001010101$
- 53) $n_m = 7, w = 41, L_{min} = 178, n_b = 2, n_d = 35,$
 $b = 100010101000001000101010101000101010000000100000,$
 $s = 10001010100000100010101010100010101000000010000010001010100000100010101010001010100000001000$
 $00100010101000001000101010100010101$

- 54) $n_m = 7, w = 42, L_{min} = 182, n_b = 5, n_d = 3,$
 $b = 101000100010101010000000100000,$
 $s = 10100010001010101000000010000010100010001010101000000010000010100010001010101000000010000010100100010101010000000100000101$
- 55) $n_m = 7, w = 42, L_{min} = 182, n_b = 5, n_d = 3,$
 $b = 101010100000001000001010001000,$
 $s = 101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101$
- 56) $n_m = 7, w = 42, L_{min} = 182, n_b = 5, n_d = 3,$
 $b = 101010000000100000101000100010,$
 $s = 101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101$
- 57) $n_m = 7, w = 42, L_{min} = 182, n_b = 5, n_d = 3,$
 $b = 101000000010000010100010001010,$
 $s = 101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101$
- 58) $n_m = 7, w = 43, L_{min} = 184, n_b = 5, n_d = 5,$
 $b = 101010100000001000001010001000,$
 $s = 10101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101$
- 59) $n_m = 7, w = 43, L_{min} = 184, n_b = 5, n_d = 5,$
 $b = 101010000000100000101000100010,$
 $s = 10101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101$
- 60) $n_m = 7, w = 44, L_{min} = 186, n_b = 5, n_d = 7,$
 $b = 101010100000001000001010001000,$
 $s = 10101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101$
- 61) $n_m = 7, w = 45, L_{min} = 190, n_b = 5, n_d = 11,$
 $b = 100010101010000000100000101000,$
 $s = 10001010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101$
- 62) $n_m = 7, w = 46, L_{min} = 194, n_b = 5, n_d = 15,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
- 63) $n_m = 7, w = 46, L_{min} = 194, n_b = 5, n_d = 15,$
 $b = 100010001010101000000010000010,$
 $s = 1000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000$
- 64) $n_m = 7, w = 47, L_{min} = 196, n_b = 5, n_d = 17,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
- 65) $n_m = 7, w = 48, L_{min} = 202, n_b = 5, n_d = 23,$
 $b = 100000101000100010101010000000,$
 $s = 1000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000$
- 66) $n_m = 7, w = 49, L_{min} = 204, n_b = 3, n_d = 13,$
 $b = 101010101010100000001010001000001010000010001000,$
 $s = 101010101010100000001010001000001010000010001000101010101010000000101000100000101000001000100010001000100010001000101010101$

- 67) $n_m = 7, w = 50, L_{min} = 208, n_b = 3, n_d = 17,$
 $b = 100010101010101010000000101000100000101000001000,$
 $s = 100010101010101010000000101000100000101000001000100010101010101010100000001010001000001010000010$
 $00100010101010101010000000101000100000101000001000100010101010101$
- 68) $n_m = 7, w = 50, L_{min} = 208, n_b = 3, n_d = 17,$
 $b = 101010101000101010000000100000100010101000001000,$
 $s = 10101010100010101000000010000010001010100000100010101010001010100000001000001000101010000010$
 $00101010101000101010000000100000100010101000001000101010100010101$
- 69) $n_m = 7, w = 51, L_{min} = 212, n_b = 3, n_d = 21,$
 $b = 100010001010101010101000000010100010000010100000,$
 $s = 10001000101010101010100000001010001000001010000010001000101010101010000000101000100000101000$
 $001000100010101010101010000000101000100000101000001000100010101010101$
- 70) $n_m = 7, w = 51, L_{min} = 212, n_b = 3, n_d = 21,$
 $b = 100010101010100010101000000010000010001010100000,$
 $s = 10001010101010001010100000001000001000101010000010001010101000101010000000100000100010101000$
 $001000101010101000101010000000100000100010101000001000101010100010101$
- 71) $n_m = 7, w = 52, L_{min} = 216, n_b = 6, n_d = 7,$
 $b = 1010101000000001000001010001000,$
 $s = 10101010000000010000010100010001010101000000010000010100010001010101000000010000010100010001010$
 $101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101$
- 72) $n_m = 7, w = 53, L_{min} = 220, n_b = 6, n_d = 11,$
 $b = 1000101010100000000100000101000,$
 $s = 10001010101000000001000001010001000101010100000001000001010001000101010100000001000001010001000$
 $10101010000000010000010100010001010101000000010000010100010001010101000000010000010100010001010101$
- 73) $n_m = 7, w = 54, L_{min} = 222, n_b = 3, n_d = 31,$
 $b = 101010000010001010101010001010100000001000001000,$
 $s = 10101000001000101010101000101010000000100000100010101000001000101010100010101000000010000010$
 $001010100000100010101010100010101000000010000010001010100000100010101010001010100010101$
- 74) $n_m = 7, w = 55, L_{min} = 226, n_b = 6, n_d = 17,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $00100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010$
 10101
- 75) $n_m = 7, w = 56, L_{min} = 232, n_b = 6, n_d = 23,$
 $b = 100000101000100010101010000000,$
 $s = 1000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000$
 $00101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000$
 10001010101
- 76) $n_m = 7, w = 57, L_{min} = 240, n_b = 7, n_d = 1,$
 $b = 100000101000100010101010000000,$
 $s = 1000001010001000101010100000001000001010001000101010100000001000001010001000101010100000001000$
 $00101000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000$
 1000101010100000001
- 77) $n_m = 7, w = 57, L_{min} = 240, n_b = 7, n_d = 1,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $00100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010$
 1010100000001000001
- 78) $n_m = 7, w = 57, L_{min} = 240, n_b = 7, n_d = 1,$
 $b = 100010001010101000000010000010,$
 $s = 1000100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000$
 $10001010101000000010000010100010001010101000000010000010100010001010101000000010000010100010001010$
 1010000000100000101

- 7

- 100) $n_m = 7, w = 65, L_{min} = 260, n_b = 4, n_d = 21,$
 $b = 10001000101010101010101000000010100010000010100000,$
 $s = 10001000101010101010101000000010100010000010100000100010001010101010101010000000101000100000101000$
 $001000100010101010101010000000101000100000101000001000100010101010101010100000001010001000001010000$
 100010001010101010101
- 101) $n_m = 7, w = 65, L_{min} = 260, n_b = 4, n_d = 21,$
 $b = 100010101010100010101000000010000010001010100000,$
 $s = 10001010101010001010100000001000001000101010000010001010101000101010000000100000100010101000$
 $00100010101010100010101000000010000010001010100000100010101010001010100000001000001000101010000$
 100010101010100010101
- 102) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 101000001000100010101010101010000000101000100000,$
 $s = 10100000100010001010101010101000000010100010000010100000100010001010101010100000001010001000$
 $001010000010001000101010101010100000001010001000001010000010001000101010101010000000101000100000$
 $101000001000100010101010101$
- 103) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 100000100010001010101010101000000010100010000010,$
 $s = 1000001000100010101010101010000000101000100000101000001000100010101010101010000000101000100000$
 $101000001000100010101010101010000000101000100000101000001000100010101010101000000010100010000010$
 $100000100010001010101010101$
- 104) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 10001010101010101010000000101000100000101000001000,$
 $s = 10001010101010101000000010100010000010100000100010001010101010100000001010001000001010000010$
 $001000101010101010100000001010001000001010000010001000101010101010000000101000100000101000001000$
 $100010101010101010000000101$
- 105) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 101010101010100000001010001000001010000010001000,$
 $s = 10101010101010000000101000100000101000001000100010101010101000000010100010000010100000100010$
 $001010101010101000000010100010000010100000100010001010101010100000001010001000001010000010001000$
 $101010101010100000001010001$
- 106) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 100010101000001000101010101000101010000000100000,$
 $s = 1000101010000010001010101000101010000000100000100010101000001000101010001010100000001000$
 $00100010101000001000101010100010101000000010000010001010100000100010101000101010000000100000$
 $100010101000001000101010101$
- 107) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 101010000010001010101010001010100000001000001000,$
 $s = 101010000010001010101010001010100000001000001000101010000010001010100010101000000010000010$
 $00101010000010001010101000101010000000100000100010101000001000101010000010001010100000001000001000$
 $1010100000100010101010001$
- 108) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 101000001000101010101000101010000000100000100010,$
 $s = 101000001000101010101000101010000000100000100010101000001000101010000010001010100000001000001000$
 $10101000001000101010100010101000000010000010001010100000100010101000101010000000100000100010$
 $1010000010001010101000101$
- 109) $n_m = 7, w = 66, L_{min} = 266, n_b = 4, n_d = 27,$
 $b = 100000100010101010100010101000000010000010001010,$
 $s = 100000100010101010100010101000000010000010001010100000100010101000001000101010000000100000100010$
 $10100000100010101010001010100000001000001000101010000010001010100010101000000010000010001010$
 $1000001000101010100010101$
- 110) $n_m = 7, w = 67, L_{min} = 268, n_b = 4, n_d = 29,$
 $b = 101000001000100010101010101010000000101000100000,$
 $s = 10100000100010001010101010101000000010100010000010100000100010001010101010100000001010001000$

00101000001000100010101010101010000000101000100000101000001000100010101010101010000000101000100000
10100000100010001010101010101

- 111) $n_m = 7, w = 67, L_{min} = 268, n_b = 4, n_d = 29,$
 $b = 101010000010001010101010001010100000001000001000,$
 $s = 101010000010001010101010001010100000001000001000101010000010001010100010101000000010000010$
 $0010101000001000101010100010101000000010000010001010100000100010101010001010100000001000001000$
 $10101000001000101010101000101$
- 112) $n_m = 7, w = 67, L_{min} = 268, n_b = 4, n_d = 29,$
 $b = 101000001000101010101000101010000000100000100010,$
 $s = 10100000100010101010100010101000000010000010001010100000100010101010001010100000001000001000$
 $101010000010001010101010001010100000001000001000101010000010001010101000101010000000100000100010$
 $10100000100010101010100010101$
- 113) $n_m = 7, w = 68, L_{min} = 270, n_b = 4, n_d = 31,$
 $b = 101010000010001010101010001010100000001000001000,$
 $s = 10101000001000101010101000101010000000100000100010101000001000101010100010101000000010000010$
 $0010101000001000101010100010101000000010000010001010100000100010101010001010100000001000001000$
 $1010100000100010101010100010101$
- 114) $n_m = 7, w = 69, L_{min} = 274, n_b = 4, n_d = 35,$
 $b = 100010101000001000101010101000101010000000100000,$
 $s = 100010101000001000101010100010101000000010000010001010100000100010101010001010100000001000$
 $00100010101000001000101010100010101000000010000010001010100000100010101000101010000000100000$
 $100010101000001000101010100010101$
- 115) $n_m = 7, w = 70, L_{min} = 280, n_b = 4, n_d = 41,$
 $b = 101000100000101000001000100010101010101010000000,$
 $s = 10100010000010100000100010001010101010101000000010100010000010100000100010001010101010100000$
 $001010001000001010000010001000101010101010100000001010001000001010000010001000101010101010000000$
 $101000100000101000001000100010101010101$
- 116) $n_m = 7, w = 70, L_{min} = 280, n_b = 4, n_d = 41,$
 $b = 100000100010101000001000101010101000101010000000,$
 $s = 10000010001010100000100010101010100010101000000010000010001010100000100010101010001010100000$
 $0010000010001010100000100010101010001010100000001000001000101010000010001010101000101010000000$
 $100000100010101000001000101010100010101$
- 117) $n_m = 7, w = 71, L_{min} = 286, n_b = 8, n_d = 17,$
 $b = 101000100010101010000000100000,$
 $s = 1010001000101010100000001000001010001000101010100000001000001010001000101010100000001000001010$
 $00100010101010000000100000101000100010101010000000100000101000100010101010000000100000101000100010$
 $10101000000010000010100010001010101000000010000010100010001010101$
- 118) $n_m = 7, w = 72, L_{min} = 290, n_b = 5, n_d = 3,$
 $b = 101000100000101000001000100010101010101010000000,$
 $s = 10100010000010100000100010001010101010101000000010100010000010100000100010001010101010100000$
 $001010001000001010000010001000101010101010100000001010001000001010000010001000101010101010000000$
 $101000100000101000001000100010101010101010000000101$
- 119) $n_m = 7, w = 72, L_{min} = 290, n_b = 5, n_d = 3,$
 $b = 101000001000100010101010101010000000101000100000,$
 $s = 10100000100010001010101010101000000010100010000010100000100010001010101010100000001010001000$
 $001010000010001000101010101010100000001010001000001010000010001000101010101010000000101000100000$
 $101000001000100010101010101010000000101000100000101$
- 120) $n_m = 7, w = 72, L_{min} = 290, n_b = 5, n_d = 3,$
 $b = 101010101010100000001010001000001010000010001000,$
 $s = 10101010101010000000101000100000101000001000100010101010101000000010100010000010100000100010$
 $001010101010101000000010100010000010100000100010001010101010100000001010001000001010000010001000$
 $101010101010100000001010001000001010000010001000101$

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