

Knuth-Morris-Pratt (KMP) Algorithm

String: a¹ b² c³ d⁴ e⁵ f⁶ g⁷ h⁸
 d e f

pattern: d e f

Knuth-Morris-Pratt (KMP) Algorithm

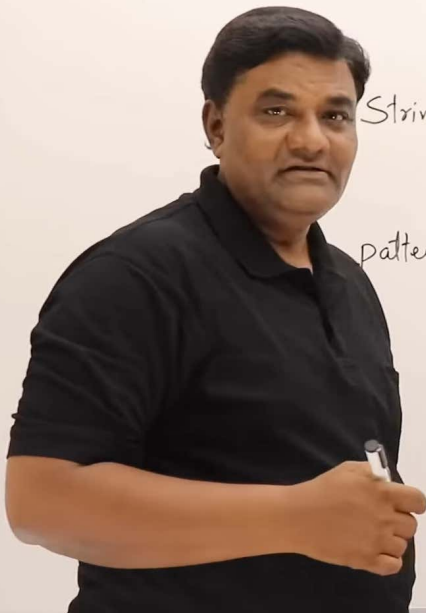
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Knuth-Morris-Pratt (KMP) Algorithm

String: a¹ b² c³ d⁴ e⁵ f⁶ g⁷ h⁸
 d e f

pattern: d e f



Knuth-Morris-Pratt (KMP) Algorithm

String: $\begin{matrix} & i \\ \downarrow & \\ a & b & c & d & a & b & c & a & b & c & d & f \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 \end{matrix}$

pattern: $\begin{matrix} a & b & c & d & f \\ 1 & 2 & 3 & 4 & 5 \\ \downarrow & & & & \\ 1 & & & & \\ j & & & & \end{matrix}$

Knuth-Morris-Pratt (KMP) Algorithm

g: a b c d a b c a b c d f
1 2 3 4 5 6 7 8 9 10 11 12

pattern: a b c d f
1 3 4 5
j

Knuth-Morris-Pratt (KMP) Algorithm

i
o c d a b c a b c d f
2 3 4 5 6 7 8 9 10 11 12

Pattern: a b c d f
1 2 3 4 5
j

Knuth-Morris-Pratt (KMP) Algorithm

String: ⁱ
a b c d a b c a b c d f
1 2 3 4 5 6 7 8 9 10 11 12

pattern: a b c d f
1 2 3 4 5
j

Knuth-Morris-Pratt (KMP) Algorithm

pattern: $\overline{abc}d\overline{abc}$
1 2 3 4 5 6 7

prefix: a, ab, abc, abcd,

suffix: c, bc, abc, dabc,

Knuth-Morris-Pratt (KMP) Algorithm

π or lps

P_1 : $\overset{1}{a}\overset{2}{b}c\overset{3}{d}a\overset{4}{b}e\overset{5}{a}\overset{6}{b}f$
0 0 0 0 1 2 0 1 2 0

P_2 : $a\overset{1}{b}c\overset{2}{d}e\overset{3}{a}\overset{4}{b}f\overset{5}{a}\overset{6}{b}c$
0 0 0 0 0 1 2 0 1 2 3

P_3 : $a\overset{1}{a}b\overset{2}{c}a\overset{3}{d}a\overset{4}{a}b\overset{5}{e}$
0 1 0 0 1 0 1 2 3 0

P_4 : $a\overset{1}{a}a\overset{2}{a}b\overset{3}{a}a\overset{4}{c}d$
0 1 2 3 0 1 2 0 0

Knuth-Morris-Pratt (KMP) Algorithm

↓
String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

↓
pattern: 0

	1	2	3	4	5
a	b	a	b	d	
0	0	1	2	0	

Knuth-Morris-Pratt (KMP) Algorithm

↓
String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

↓
pattern: 0

	1	2	3	4	5
0	a	b	a	b	d
	0	0	1	2	0

Knuth-Morris-Pratt (KMP) Algorithm

String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

pattern:

	i	j			
0	1	2	3	4	5
	a	b	a	b	d
	0	0	1	2	0

Knuth-Morris-Pratt (KMP) Algorithm

String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

pattern:

	i	1	2	3	4	5
0		a	b	a	b	d
	j	0	0	1	2	0

Knuth-Morris-Pratt (KMP) Algorithm

String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

pattern:

	i				
0	1	2	3	4	5
	a	b	a	b	d
	0	0	1	2	0

Knuth-Morris-Pratt (KMP) Algorithm

String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

j
^ 0

pattern:

i	1	2	3	4	5
	a	b	a	b	d
	0	0	1	2	0

Knuth-Morris-Pratt (KMP) Algorithm

String: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Pattern:

	1	2	3	4	5
0	a	b	a	b	d
	0	0	1	2	0