

⚙️ Select NLP Options

- Tokenization
- Remove Stopwords
- Part-of-Speech Tagging
- N-Grams
- Stemming
- Lemmatization

🧠 NLP Playground (NLTK + Streamlit)

Explore NLP techniques like Tokenization, Stemming, Lemmatization, and N-Grams interactively.

📌 Enter Text

Type or paste your text below:

```
AI = '''Artificial Intelligence refers to the intelligence of machines. This is in  
contrast to the natural intelligence of  
humans and animals. With Artificial Intelligence, machines perform  
functions such as learning, planning, reasoning and'''
```

abc Tokenization

Word Tokens:

```
[  
  0 : "AI"  
  1 : "="  
  2 : "\\" "  
  3 : "'Artificial"  
  4 : "Intelligence"  
  5 : "refers"  
  6 : "to"  
  7 : "the"  
  8 : "intelligence"  
  9 : "of"  
 10 : "machines"  
 11 : "."  
 12 : "This"  
 13 : "is"  
 14 : "in"  
 15 : "contrast"  
 16 : "to"  
 17 : "the"]
```

```
18 : "natural"
19 : "intelligence"
20 : "of"
21 : "humans"
22 : "and"
23 : "animals"
24 : "."
25 : "With"
26 : "Artificial"
27 : "Intelligence"
28 : ","
29 : "machines"
30 : "perform"
31 : "functions"
32 : "such"
33 : "as"
34 : "learning"
35 : ","
36 : "planning"
37 : ","
38 : "reasoning"
39 : "and"
40 : "problem-solving"
41 : "."
42 : "Most"
43 : "noteworthy"
44 : ","
45 : "Artificial"
46 : "Intelligence"
47 : "is"
48 : "the"
49 : "simulation"
50 : "of"
51 : "human"
52 : "intelligence"
53 : "by"
54 : "machines"
55 : "."
```

```
56 : "It"
57 : "is"
58 : "probably"
59 : "the"
60 : "fastest-growing"
61 : "development"
62 : "in"
63 : "the"
64 : "World"
65 : "of"
66 : "technology"
67 : "and"
68 : "innovation"
69 : "."
70 : "Furthermore"
71 : ","
72 : "many"
73 : "experts"
74 : "believe"
75 : "AI"
76 : "could"
77 : "solve"
78 : "major"
79 : "challenges"
80 : "and"
81 : "crisis"
82 : "situations"
83 : "."
84 : """
85 : """
]
```

Sentence Tokens:

```
▼ [
  0 :
  "
  AI = '''Artificial Intelligence refers to the intelligence
  of machines.'''
  1 : "This is in contrast to the natural intelligence of
      humans and animals."
```

```
2 :  
    "With Artificial Intelligence, machines perform functions  
    such as learning, planning, reasoning and  
    problem-solving."  
3 :  
    "Most noteworthy, Artificial Intelligence is the simulation  
    of human intelligence by machines."  
4 :  
    "It is probably the fastest-growing development in the World  
    of technology and innovation."  
5 :  
    "Furthermore, many experts believe  
    AI could solve major challenges and crisis situations.''''"  
]
```

Blankline Tokens:

```
▼ [  
    0 :  
        "  
        AI = '''Artificial Intelligence refers to the intelligence  
        of machines. This is in contrast to the natural intelligence  
        of  
        humans and animals. With Artificial Intelligence, machines  
        perform functions such as learning, planning, reasoning and  
        problem-solving. Most noteworthy, Artificial Intelligence is  
        the simulation of human intelligence by machines.  
        It is probably the fastest-growing development in the World  
        of technology and innovation. Furthermore, many experts  
        believe  
        AI could solve major challenges and crisis situations.'''"  
        "  
]
```

Whitespace Tokens:

```
▼ [  
    0 : "AI"  
    1 : "="  
    2 : "'''Artificial"  
    3 : "Intelligence"  
    4 : "refers"  
    5 : "to"  
    6 : "the"  
    7 : "intelligence"  
    8 : "of"
```

```
9 : "machines."
10 : "This"
11 : "is"
12 : "in"
13 : "contrast"
14 : "to"
15 : "the"
16 : "natural"
17 : "intelligence"
18 : "of"
19 : "humans"
20 : "and"
21 : "animals."
22 : "With"
23 : "Artificial"
24 : "Intelligence,"
25 : "machines"
26 : "perform"
27 : "functions"
28 : "such"
29 : "as"
30 : "learning,"
31 : "planning,"
32 : "reasoning"
33 : "and"
34 : "problem-solving."
35 : "Most"
36 : "noteworthy,"
37 : "Artificial"
38 : "Intelligence"
39 : "is"
40 : "the"
41 : "simulation"
42 : "of"
43 : "human"
44 : "intelligence"
45 : "by"
46 : "machines."
```

```
47 : "It"
48 : "is"
49 : "probably"
50 : "the"
51 : "fastest-growing"
52 : "development"
53 : "in"
54 : "the"
55 : "World"
56 : "of"
57 : "technology"
58 : "and"
59 : "innovation."
60 : "Furthermore,"
61 : "many"
62 : "experts"
63 : "believe"
64 : "AI"
65 : "could"
66 : "solve"
67 : "major"
68 : "challenges"
69 : "and"
70 : "crisis"
71 : "situations.'''"
]
```

WordPunct Tokens:

```
▼ [
  0 : "AI"
  1 : "="
  2 : "''''"
  3 : "Artificial"
  4 : "Intelligence"
  5 : "refers"
  6 : "to"
  7 : "the"
  8 : "intelligence"
  9 : "of"
```

```
10 : "machines"
11 : "."
12 : "This"
13 : "is"
14 : "in"
15 : "contrast"
16 : "to"
17 : "the"
18 : "natural"
19 : "intelligence"
20 : "of"
21 : "humans"
22 : "and"
23 : "animals"
24 : "."
25 : "With"
26 : "Artificial"
27 : "Intelligence"
28 : ","
29 : "machines"
30 : "perform"
31 : "functions"
32 : "such"
33 : "as"
34 : "learning"
35 : ","
36 : "planning"
37 : ","
38 : "reasoning"
39 : "and"
40 : "problem"
41 : "-"
42 : "solving"
43 : "."
44 : "Most"
45 : "noteworthy"
46 : ","
47 : "Artificial"
```

```
48 : "Intelligence"
49 : "is"
50 : "the"
51 : "simulation"
52 : "of"
53 : "human"
54 : "intelligence"
55 : "by"
56 : "machines"
57 : "."
58 : "It"
59 : "is"
60 : "probably"
61 : "the"
62 : "fastest"
63 : "-"
64 : "growing"
65 : "development"
66 : "in"
67 : "the"
68 : "World"
69 : "of"
70 : "technology"
71 : "and"
72 : "innovation"
73 : "."
74 : "Furthermore"
75 : ","
76 : "many"
77 : "experts"
78 : "believe"
79 : "AI"
80 : "could"
81 : "solve"
82 : "major"
83 : "challenges"
84 : "and"
85 : "crisis"
```

```
86 : "situations"
87 : "."
]
```

🚫 Stopword Removal

Filtered Tokens:

```
▼ [
  0 : "AI"
  1 : "="
  2 : "``"
  3 : "'Artificial"
  4 : "Intelligence"
  5 : "refers"
  6 : "intelligence"
  7 : "machines"
  8 : "."
  9 : "contrast"
  10 : "natural"
  11 : "intelligence"
  12 : "humans"
  13 : "animals"
  14 : "."
  15 : "Artificial"
  16 : "Intelligence"
  17 : ","
  18 : "machines"
  19 : "perform"
  20 : "functions"
  21 : "learning"
  22 : ","
  23 : "planning"
  24 : ","
  25 : "reasoning"
  26 : "problem-solving"
  27 : "."
  28 : "noteworthy"
  29 : ","
  30 : "Artificial"
```

```
31 : "Intelligence"
32 : "simulation"
33 : "human"
34 : "intelligence"
35 : "machines"
36 : "."
37 : "probably"
38 : "fastest-growing"
39 : "development"
40 : "World"
41 : "technology"
42 : "innovation"
43 : "."
44 : "Furthermore"
45 : ","
46 : "many"
47 : "experts"
48 : "believe"
49 : "AI"
50 : "could"
51 : "solve"
52 : "major"
53 : "challenges"
54 : "crisis"
55 : "situations"
56 : "."
57 : """
58 : """
]
```

🔍 Part-of-Speech (POS) Tagging

POS Tags:

```
▼ [
  ▼ 0 : [
    0 : "AI"
    1 : "NNP"
  ]
  ▼ 1 : [
```

```
    0 : "="  
    1 : "NNP"  
]  
▼ 2 : [  
    0 : "``"  
    1 : "``"  
]  
▼ 3 : [  
    0 : "'Artificial"  
    1 : "JJ"  
]  
▼ 4 : [  
    0 : "Intelligence"  
    1 : "NN"  
]  
▼ 5 : [  
    0 : "refers"  
    1 : "NNS"  
]  
▼ 6 : [  
    0 : "to"  
    1 : "TO"  
]  
▼ 7 : [  
    0 : "the"  
    1 : "DT"  
]  
▼ 8 : [  
    0 : "intelligence"  
    1 : "NN"  
]  
▼ 9 : [  
    0 : "of"  
    1 : "IN"  
]  
▼ 10 : [  
    0 : "machines"  
    1 : "NNS"  
]  
▼ 11 : [
```

```
    0 : "."
    1 : "."
]
▼ 12 : [
    0 : "This"
    1 : "DT"
]
▼ 13 : [
    0 : "is"
    1 : "VBZ"
]
▼ 14 : [
    0 : "in"
    1 : "IN"
]
▼ 15 : [
    0 : "contrast"
    1 : "NN"
]
▼ 16 : [
    0 : "to"
    1 : "TO"
]
▼ 17 : [
    0 : "the"
    1 : "DT"
]
▼ 18 : [
    0 : "natural"
    1 : "JJ"
]
▼ 19 : [
    0 : "intelligence"
    1 : "NN"
]
▼ 20 : [
    0 : "of"
    1 : "IN"
]
▼ 21 : [
```

```
    0 : "humans"
    1 : "NNS"
]
▼ 22 : [
    0 : "and"
    1 : "CC"
]
▼ 23 : [
    0 : "animals"
    1 : "NNS"
]
▼ 24 : [
    0 : "."
    1 : "."
]
▼ 25 : [
    0 : "With"
    1 : "IN"
]
▼ 26 : [
    0 : "Artificial"
    1 : "JJ"
]
▼ 27 : [
    0 : "Intelligence"
    1 : "NNP"
]
▼ 28 : [
    0 : ","
    1 : ","
]
▼ 29 : [
    0 : "machines"
    1 : "NNS"
]
▼ 30 : [
    0 : "perform"
    1 : "VBP"
]
▼ 31 : [
```

```
    0 : "functions"
    1 : "NNS"
]
▼ 32 : [
    0 : "such"
    1 : "JJ"
]
▼ 33 : [
    0 : "as"
    1 : "IN"
]
▼ 34 : [
    0 : "learning"
    1 : "NN"
]
▼ 35 : [
    0 : ","
    1 : ","
]
▼ 36 : [
    0 : "planning"
    1 : "NN"
]
▼ 37 : [
    0 : ","
    1 : ","
]
▼ 38 : [
    0 : "reasoning"
    1 : "VBG"
]
▼ 39 : [
    0 : "and"
    1 : "CC"
]
▼ 40 : [
    0 : "problem-solving"
    1 : "JJ"
]
▼ 41 : [
```

```
    0 : "."
    1 : "."
]
▼ 42 : [
    0 : "Most"
    1 : "JJ$"
]
▼ 43 : [
    0 : "noteworthy"
    1 : "JJ"
]
▼ 44 : [
    0 : ","
    1 : ","
]
▼ 45 : [
    0 : "Artificial"
    1 : "JJ"
]
▼ 46 : [
    0 : "Intelligence"
    1 : "NNP"
]
▼ 47 : [
    0 : "is"
    1 : "VBZ"
]
▼ 48 : [
    0 : "the"
    1 : "DT"
]
▼ 49 : [
    0 : "simulation"
    1 : "NN"
]
▼ 50 : [
    0 : "of"
    1 : "IN"
]
▼ 51 : [
```

```
    0 : "human"
    1 : "JJ"
]
▼ 52 : [
    0 : "intelligence"
    1 : "NN"
]
▼ 53 : [
    0 : "by"
    1 : "IN"
]
▼ 54 : [
    0 : "machines"
    1 : "NNS"
]
▼ 55 : [
    0 : "."
    1 : "."
]
▼ 56 : [
    0 : "It"
    1 : "PRP"
]
▼ 57 : [
    0 : "is"
    1 : "VBZ"
]
▼ 58 : [
    0 : "probably"
    1 : "RB"
]
▼ 59 : [
    0 : "the"
    1 : "DT"
]
▼ 60 : [
    0 : "fastest-growing"
    1 : "JJ"
]
▼ 61 : [
```

```
    0 : "development"
    1 : "NN"
]
▼ 62 : [
    0 : "in"
    1 : "IN"
]
▼ 63 : [
    0 : "the"
    1 : "DT"
]
▼ 64 : [
    0 : "World"
    1 : "NNP"
]
▼ 65 : [
    0 : "of"
    1 : "IN"
]
▼ 66 : [
    0 : "technology"
    1 : "NN"
]
▼ 67 : [
    0 : "and"
    1 : "CC"
]
▼ 68 : [
    0 : "innovation"
    1 : "NN"
]
▼ 69 : [
    0 : "."
    1 : "."
]
▼ 70 : [
    0 : "Furthermore"
    1 : "NNP"
]
▼ 71 : [
```

```
[0 : ","
1 : ","
]

▼ 72 : [
0 : "many"
1 : "JJ"
]

▼ 73 : [
0 : "experts"
1 : "NNS"
]

▼ 74 : [
0 : "believe"
1 : "VBP"
]

▼ 75 : [
0 : "AI"
1 : "NNP"
]

▼ 76 : [
0 : "could"
1 : "MD"
]

▼ 77 : [
0 : "solve"
1 : "VB"
]

▼ 78 : [
0 : "major"
1 : "JJ"
]

▼ 79 : [
0 : "challenges"
1 : "NNS"
]

▼ 80 : [
0 : "and"
1 : "CC"
]

▼ 81 : [
```

```
    0 : "crisis"
    1 : "NN"
]
▼ 82 : [
    0 : "situations"
    1 : "NNS"
]
▼ 83 : [
    0 : "."
    1 : "."
]
▼ 84 : [
    0 : "''"
    1 : "'''"
]
▼ 85 : [
    0 : "''"
    1 : "'''"
]
]
```

🔗 N-Grams

Bigrams:

```
▼ [
    ▼ 0 : [
        0 : "AI"
        1 : "="
    ]
    ▼ 1 : [
        0 : "="
        1 : "``"
    ]
    ▼ 2 : [
        0 : "``"
        1 : "'Artificial"
    ]
    ▼ 3 : [
        0 : "'Artificial"
        1 : "Intelligence"
    ]
]
```

```
]
▼ 4 : [
    0 : "Intelligence"
    1 : "refers"
]
▼ 5 : [
    0 : "refers"
    1 : "to"
]
▼ 6 : [
    0 : "to"
    1 : "the"
]
▼ 7 : [
    0 : "the"
    1 : "intelligence"
]
▼ 8 : [
    0 : "intelligence"
    1 : "of"
]
▼ 9 : [
    0 : "of"
    1 : "machines"
]
▼ 10 : [
    0 : "machines"
    1 : "."
]
▼ 11 : [
    0 : "."
    1 : "This"
]
▼ 12 : [
    0 : "This"
    1 : "is"
]
▼ 13 : [
    0 : "is"
    1 : "in"
]
```

```
    ▼ 14 : [
      |   0 : "in"
      |   1 : "contrast"
      ]
    ▼ 15 : [
      |   0 : "contrast"
      |   1 : "to"
      ]
    ▼ 16 : [
      |   0 : "to"
      |   1 : "the"
      ]
    ▼ 17 : [
      |   0 : "the"
      |   1 : "natural"
      ]
    ▼ 18 : [
      |   0 : "natural"
      |   1 : "intelligence"
      ]
    ▼ 19 : [
      |   0 : "intelligence"
      |   1 : "of"
      ]
    ▼ 20 : [
      |   0 : "of"
      |   1 : "humans"
      ]
    ▼ 21 : [
      |   0 : "humans"
      |   1 : "and"
      ]
    ▼ 22 : [
      |   0 : "and"
      |   1 : "animals"
      ]
    ▼ 23 : [
      |   0 : "animals"
      |   1 : "."
      ]
    ▼ 24 : [
```

```
0 : "."
1 : "With"
]
▼ 25 : [
0 : "With"
1 : "Artificial"
]
▼ 26 : [
0 : "Artificial"
1 : "Intelligence"
]
▼ 27 : [
0 : "Intelligence"
1 : ","
]
▼ 28 : [
0 : ","
1 : "machines"
]
▼ 29 : [
0 : "machines"
1 : "perform"
]
▼ 30 : [
0 : "perform"
1 : "functions"
]
▼ 31 : [
0 : "functions"
1 : "such"
]
▼ 32 : [
0 : "such"
1 : "as"
]
▼ 33 : [
0 : "as"
1 : "learning"
]
▼ 34 : [
```

```
    0 : "learning"
    1 : ","
]
▼ 35 : [
    0 : ","
    1 : "planning"
]
▼ 36 : [
    0 : "planning"
    1 : ","
]
▼ 37 : [
    0 : ","
    1 : "reasoning"
]
▼ 38 : [
    0 : "reasoning"
    1 : "and"
]
▼ 39 : [
    0 : "and"
    1 : "problem-solving"
]
▼ 40 : [
    0 : "problem-solving"
    1 : "."
]
▼ 41 : [
    0 : "."
    1 : "Most"
]
▼ 42 : [
    0 : "Most"
    1 : "noteworthy"
]
▼ 43 : [
    0 : "noteworthy"
    1 : ","
]
▼ 44 : [
```

```
    0 : ","
    1 : "Artificial"
]
▼ 45 : [
    0 : "Artificial"
    1 : "Intelligence"
]
▼ 46 : [
    0 : "Intelligence"
    1 : "is"
]
▼ 47 : [
    0 : "is"
    1 : "the"
]
▼ 48 : [
    0 : "the"
    1 : "simulation"
]
▼ 49 : [
    0 : "simulation"
    1 : "of"
]
▼ 50 : [
    0 : "of"
    1 : "human"
]
▼ 51 : [
    0 : "human"
    1 : "intelligence"
]
▼ 52 : [
    0 : "intelligence"
    1 : "by"
]
▼ 53 : [
    0 : "by"
    1 : "machines"
]
▼ 54 : [
```

```
          0 : "machines"
          1 : "."
      ]
▼ 55 : [
    0 : "."
    1 : "It"
]
▼ 56 : [
    0 : "It"
    1 : "is"
]
▼ 57 : [
    0 : "is"
    1 : "probably"
]
▼ 58 : [
    0 : "probably"
    1 : "the"
]
▼ 59 : [
    0 : "the"
    1 : "fastest-growing"
]
▼ 60 : [
    0 : "fastest-growing"
    1 : "development"
]
▼ 61 : [
    0 : "development"
    1 : "in"
]
▼ 62 : [
    0 : "in"
    1 : "the"
]
▼ 63 : [
    0 : "the"
    1 : "World"
]
▼ 64 : [
```

```
          0 : "World"
          1 : "of"
        ]
      ▼ 65 : [
          0 : "of"
          1 : "technology"
        ]
      ▼ 66 : [
          0 : "technology"
          1 : "and"
        ]
      ▼ 67 : [
          0 : "and"
          1 : "innovation"
        ]
      ▼ 68 : [
          0 : "innovation"
          1 : "."
        ]
      ▼ 69 : [
          0 : "."
          1 : "Furthermore"
        ]
      ▼ 70 : [
          0 : "Furthermore"
          1 : ","
        ]
      ▼ 71 : [
          0 : ","
          1 : "many"
        ]
      ▼ 72 : [
          0 : "many"
          1 : "experts"
        ]
      ▼ 73 : [
          0 : "experts"
          1 : "believe"
        ]
      ▼ 74 : [
```

```
    0 : "believe"
    1 : "AI"
]
▼ 75 : [
    0 : "AI"
    1 : "could"
]
▼ 76 : [
    0 : "could"
    1 : "solve"
]
▼ 77 : [
    0 : "solve"
    1 : "major"
]
▼ 78 : [
    0 : "major"
    1 : "challenges"
]
▼ 79 : [
    0 : "challenges"
    1 : "and"
]
▼ 80 : [
    0 : "and"
    1 : "crisis"
]
▼ 81 : [
    0 : "crisis"
    1 : "situations"
]
▼ 82 : [
    0 : "situations"
    1 : "."
]
▼ 83 : [
    0 : "."
    1 : "!!!"
]
▼ 84 : [
```

```
    0 : "'''"
    1 : "'''"
]
]
```

Trigrams:

```
▼ [
  ▼ 0 : [
    0 : "AI"
    1 : "="
    2 : "``"
  ]
  ▼ 1 : [
    0 : "="
    1 : "``"
    2 : "'Artificial"
  ]
  ▼ 2 : [
    0 : "``"
    1 : "'Artificial"
    2 : "Intelligence"
  ]
  ▼ 3 : [
    0 : "'Artificial"
    1 : "Intelligence"
    2 : "refers"
  ]
  ▼ 4 : [
    0 : "Intelligence"
    1 : "refers"
    2 : "to"
  ]
  ▼ 5 : [
    0 : "refers"
    1 : "to"
    2 : "the"
  ]
  ▼ 6 : [
    0 : "to"
    1 : "the"
  ]
]
```

```
    2 : "intelligence"
]
▼ 7 : [
    0 : "the"
    1 : "intelligence"
    2 : "of"
]
▼ 8 : [
    0 : "intelligence"
    1 : "of"
    2 : "machines"
]
▼ 9 : [
    0 : "of"
    1 : "machines"
    2 : "."
]
▼ 10 : [
    0 : "machines"
    1 : "."
    2 : "This"
]
▼ 11 : [
    0 : "."
    1 : "This"
    2 : "is"
]
▼ 12 : [
    0 : "This"
    1 : "is"
    2 : "in"
]
▼ 13 : [
    0 : "is"
    1 : "in"
    2 : "contrast"
]
▼ 14 : [
    0 : "in"
    1 : "contrast"
]
```

```
        2 : "to"
    ]
    ▼ 15 : [
        0 : "contrast"
        1 : "to"
        2 : "the"
    ]
    ▼ 16 : [
        0 : "to"
        1 : "the"
        2 : "natural"
    ]
    ▼ 17 : [
        0 : "the"
        1 : "natural"
        2 : "intelligence"
    ]
    ▼ 18 : [
        0 : "natural"
        1 : "intelligence"
        2 : "of"
    ]
    ▼ 19 : [
        0 : "intelligence"
        1 : "of"
        2 : "humans"
    ]
    ▼ 20 : [
        0 : "of"
        1 : "humans"
        2 : "and"
    ]
    ▼ 21 : [
        0 : "humans"
        1 : "and"
        2 : "animals"
    ]
    ▼ 22 : [
        0 : "and"
        1 : "animals"
    ]
```

```
    2 : "."
]
▼ 23 : [
    0 : "animals"
    1 : "."
    2 : "With"
]
▼ 24 : [
    0 : "."
    1 : "With"
    2 : "Artificial"
]
▼ 25 : [
    0 : "With"
    1 : "Artificial"
    2 : "Intelligence"
]
▼ 26 : [
    0 : "Artificial"
    1 : "Intelligence"
    2 : ","
]
▼ 27 : [
    0 : "Intelligence"
    1 : ","
    2 : "machines"
]
▼ 28 : [
    0 : ","
    1 : "machines"
    2 : "perform"
]
▼ 29 : [
    0 : "machines"
    1 : "perform"
    2 : "functions"
]
▼ 30 : [
    0 : "perform"
    1 : "functions"
]
```

```
    2 : "such"
]
▼ 31 : [
    0 : "functions"
    1 : "such"
    2 : "as"
]
▼ 32 : [
    0 : "such"
    1 : "as"
    2 : "learning"
]
▼ 33 : [
    0 : "as"
    1 : "learning"
    2 : ","
]
▼ 34 : [
    0 : "learning"
    1 : ","
    2 : "planning"
]
▼ 35 : [
    0 : ","
    1 : "planning"
    2 : ","
]
▼ 36 : [
    0 : "planning"
    1 : ","
    2 : "reasoning"
]
▼ 37 : [
    0 : ","
    1 : "reasoning"
    2 : "and"
]
▼ 38 : [
    0 : "reasoning"
    1 : "and"
]
```

```
    2 : "problem-solving"
]
▼ 39 : [
    0 : "and"
    1 : "problem-solving"
    2 : "."
]
▼ 40 : [
    0 : "problem-solving"
    1 : "."
    2 : "Most"
]
▼ 41 : [
    0 : "."
    1 : "Most"
    2 : "noteworthy"
]
▼ 42 : [
    0 : "Most"
    1 : "noteworthy"
    2 : ","
]
▼ 43 : [
    0 : "noteworthy"
    1 : ","
    2 : "Artificial"
]
▼ 44 : [
    0 : ","
    1 : "Artificial"
    2 : "Intelligence"
]
▼ 45 : [
    0 : "Artificial"
    1 : "Intelligence"
    2 : "is"
]
▼ 46 : [
    0 : "Intelligence"
    1 : "is"
]
```

```
    2 : "the"
]
▼ 47 : [
    0 : "is"
    1 : "the"
    2 : "simulation"
]
▼ 48 : [
    0 : "the"
    1 : "simulation"
    2 : "of"
]
▼ 49 : [
    0 : "simulation"
    1 : "of"
    2 : "human"
]
▼ 50 : [
    0 : "of"
    1 : "human"
    2 : "intelligence"
]
▼ 51 : [
    0 : "human"
    1 : "intelligence"
    2 : "by"
]
▼ 52 : [
    0 : "intelligence"
    1 : "by"
    2 : "machines"
]
▼ 53 : [
    0 : "by"
    1 : "machines"
    2 : "."
]
▼ 54 : [
    0 : "machines"
    1 : "."
]
```

```
    2 : "It"
]
▼ 55 : [
    0 : "."
    1 : "It"
    2 : "is"
]
▼ 56 : [
    0 : "It"
    1 : "is"
    2 : "probably"
]
▼ 57 : [
    0 : "is"
    1 : "probably"
    2 : "the"
]
▼ 58 : [
    0 : "probably"
    1 : "the"
    2 : "fastest-growing"
]
▼ 59 : [
    0 : "the"
    1 : "fastest-growing"
    2 : "development"
]
▼ 60 : [
    0 : "fastest-growing"
    1 : "development"
    2 : "in"
]
▼ 61 : [
    0 : "development"
    1 : "in"
    2 : "the"
]
▼ 62 : [
    0 : "in"
    1 : "the"
]
```

```
    2 : "World"
]
▼ 63 : [
    0 : "the"
    1 : "World"
    2 : "of"
]
▼ 64 : [
    0 : "World"
    1 : "of"
    2 : "technology"
]
▼ 65 : [
    0 : "of"
    1 : "technology"
    2 : "and"
]
▼ 66 : [
    0 : "technology"
    1 : "and"
    2 : "innovation"
]
▼ 67 : [
    0 : "and"
    1 : "innovation"
    2 : "."
]
▼ 68 : [
    0 : "innovation"
    1 : "."
    2 : "Furthermore"
]
▼ 69 : [
    0 : "."
    1 : "Furthermore"
    2 : ","
]
▼ 70 : [
    0 : "Furthermore"
    1 : ","
]
```

```
    2 : "many"
]
▼ 71 : [
    0 : ","
    1 : "many"
    2 : "experts"
]
▼ 72 : [
    0 : "many"
    1 : "experts"
    2 : "believe"
]
▼ 73 : [
    0 : "experts"
    1 : "believe"
    2 : "AI"
]
▼ 74 : [
    0 : "believe"
    1 : "AI"
    2 : "could"
]
▼ 75 : [
    0 : "AI"
    1 : "could"
    2 : "solve"
]
▼ 76 : [
    0 : "could"
    1 : "solve"
    2 : "major"
]
▼ 77 : [
    0 : "solve"
    1 : "major"
    2 : "challenges"
]
▼ 78 : [
    0 : "major"
    1 : "challenges"
]
```

```
        2 : "and"
    ]
    ▼ 79 : [
        0 : "challenges"
        1 : "and"
        2 : "crisis"
    ]
    ▼ 80 : [
        0 : "and"
        1 : "crisis"
        2 : "situations"
    ]
    ▼ 81 : [
        0 : "crisis"
        1 : "situations"
        2 : "."
    ]
    ▼ 82 : [
        0 : "situations"
        1 : "."
        2 : "''''"
    ]
    ▼ 83 : [
        0 : "."
        1 : "''''"
        2 : "''"
    ]
]
```

Select N for N-Grams

6

6-Grams:

```
    ▼ [
        ▼ 0 : [
            0 : "AI"
            1 : "="
            2 : "``"
            3 : "'Artificial"
            4 : "Intelligence"
        ]
    ]
```

```
      5 : "refers"
    ]
  ▼ 1 : [
    0 : "="
    1 : "``"
    2 : "'Artificial"
    3 : "Intelligence"
    4 : "refers"
    5 : "to"
  ]
  ▼ 2 : [
    0 : "``"
    1 : "'Artificial"
    2 : "Intelligence"
    3 : "refers"
    4 : "to"
    5 : "the"
  ]
  ▼ 3 : [
    0 : "'Artificial"
    1 : "Intelligence"
    2 : "refers"
    3 : "to"
    4 : "the"
    5 : "intelligence"
  ]
  ▼ 4 : [
    0 : "Intelligence"
    1 : "refers"
    2 : "to"
    3 : "the"
    4 : "intelligence"
    5 : "of"
  ]
  ▼ 5 : [
    0 : "refers"
    1 : "to"
    2 : "the"
    3 : "intelligence"
  ]
```

```
        4 : "of"
        5 : "machines"
    ]
    ▼ 6 : [
        0 : "to"
        1 : "the"
        2 : "intelligence"
        3 : "of"
        4 : "machines"
        5 : "."
    ]
    ▼ 7 : [
        0 : "the"
        1 : "intelligence"
        2 : "of"
        3 : "machines"
        4 : "."
        5 : "This"
    ]
    ▼ 8 : [
        0 : "intelligence"
        1 : "of"
        2 : "machines"
        3 : "."
        4 : "This"
        5 : "is"
    ]
    ▼ 9 : [
        0 : "of"
        1 : "machines"
        2 : "."
        3 : "This"
        4 : "is"
        5 : "in"
    ]
    ▼ 10 : [
        0 : "machines"
        1 : "."
        2 : "This"
    ]
```

```
    3 : "is"
    4 : "in"
    5 : "contrast"
]
▼ 11 : [
    0 : "."
    1 : "This"
    2 : "is"
    3 : "in"
    4 : "contrast"
    5 : "to"
]
▼ 12 : [
    0 : "This"
    1 : "is"
    2 : "in"
    3 : "contrast"
    4 : "to"
    5 : "the"
]
▼ 13 : [
    0 : "is"
    1 : "in"
    2 : "contrast"
    3 : "to"
    4 : "the"
    5 : "natural"
]
▼ 14 : [
    0 : "in"
    1 : "contrast"
    2 : "to"
    3 : "the"
    4 : "natural"
    5 : "intelligence"
]
▼ 15 : [
    0 : "contrast"
    1 : "to"
]
```

```
2 : "the"
3 : "natural"
4 : "intelligence"
5 : "of"
]
▼ 16 : [
0 : "to"
1 : "the"
2 : "natural"
3 : "intelligence"
4 : "of"
5 : "humans"
]
▼ 17 : [
0 : "the"
1 : "natural"
2 : "intelligence"
3 : "of"
4 : "humans"
5 : "and"
]
▼ 18 : [
0 : "natural"
1 : "intelligence"
2 : "of"
3 : "humans"
4 : "and"
5 : "animals"
]
▼ 19 : [
0 : "intelligence"
1 : "of"
2 : "humans"
3 : "and"
4 : "animals"
5 : "."
]
▼ 20 : [
0 : "of"
]
```

```
1 : "humans"
2 : "and"
3 : "animals"
4 : "."
5 : "With"
]
▼ 21 : [
    0 : "humans"
    1 : "and"
    2 : "animals"
    3 : "."
    4 : "With"
    5 : "Artificial"
]
▼ 22 : [
    0 : "and"
    1 : "animals"
    2 : "."
    3 : "With"
    4 : "Artificial"
    5 : "Intelligence"
]
▼ 23 : [
    0 : "animals"
    1 : "."
    2 : "With"
    3 : "Artificial"
    4 : "Intelligence"
    5 : ","
]
▼ 24 : [
    0 : "."
    1 : "With"
    2 : "Artificial"
    3 : "Intelligence"
    4 : ","
    5 : "machines"
]
▼ 25 : [
```

```
0 : "With"
1 : "Artificial"
2 : "Intelligence"
3 : ","
4 : "machines"
5 : "perform"
]
▼ 26 : [
0 : "Artificial"
1 : "Intelligence"
2 : ","
3 : "machines"
4 : "perform"
5 : "functions"
]
▼ 27 : [
0 : "Intelligence"
1 : ","
2 : "machines"
3 : "perform"
4 : "functions"
5 : "such"
]
▼ 28 : [
0 : ","
1 : "machines"
2 : "perform"
3 : "functions"
4 : "such"
5 : "as"
]
▼ 29 : [
0 : "machines"
1 : "perform"
2 : "functions"
3 : "such"
4 : "as"
5 : "learning"
]
```

```
▼ 30 : [  
    0 : "perform"  
    1 : "functions"  
    2 : "such"  
    3 : "as"  
    4 : "learning"  
    5 : ","  
]  
▼ 31 : [  
    0 : "functions"  
    1 : "such"  
    2 : "as"  
    3 : "learning"  
    4 : ","  
    5 : "planning"  
]  
▼ 32 : [  
    0 : "such"  
    1 : "as"  
    2 : "learning"  
    3 : ","  
    4 : "planning"  
    5 : ","  
]  
▼ 33 : [  
    0 : "as"  
    1 : "learning"  
    2 : ","  
    3 : "planning"  
    4 : ","  
    5 : "reasoning"  
]  
▼ 34 : [  
    0 : "learning"  
    1 : ","  
    2 : "planning"  
    3 : ","  
    4 : "reasoning"  
    5 : "and"
```

```
]
▼ 35 : [
    0 : ","
    1 : "planning"
    2 : ","
    3 : "reasoning"
    4 : "and"
    5 : "problem-solving"
]
▼ 36 : [
    0 : "planning"
    1 : ","
    2 : "reasoning"
    3 : "and"
    4 : "problem-solving"
    5 : "."
]
▼ 37 : [
    0 : ","
    1 : "reasoning"
    2 : "and"
    3 : "problem-solving"
    4 : "."
    5 : "Most"
]
▼ 38 : [
    0 : "reasoning"
    1 : "and"
    2 : "problem-solving"
    3 : "."
    4 : "Most"
    5 : "noteworthy"
]
▼ 39 : [
    0 : "and"
    1 : "problem-solving"
    2 : "."
    3 : "Most"
    4 : "noteworthy"
]
```

```
      5 : ","
    ]
  ▼ 40 : [
    0 : "problem-solving"
    1 : "."
    2 : "Most"
    3 : "noteworthy"
    4 : ","
    5 : "Artificial"
  ]
  ▼ 41 : [
    0 : "."
    1 : "Most"
    2 : "noteworthy"
    3 : ","
    4 : "Artificial"
    5 : "Intelligence"
  ]
  ▼ 42 : [
    0 : "Most"
    1 : "noteworthy"
    2 : ","
    3 : "Artificial"
    4 : "Intelligence"
    5 : "is"
  ]
  ▼ 43 : [
    0 : "noteworthy"
    1 : ","
    2 : "Artificial"
    3 : "Intelligence"
    4 : "is"
    5 : "the"
  ]
  ▼ 44 : [
    0 : ","
    1 : "Artificial"
    2 : "Intelligence"
    3 : "is"
  ]
```

```
        4 : "the"
        5 : "simulation"
    ]
    ▼ 45 : [
        0 : "Artificial"
        1 : "Intelligence"
        2 : "is"
        3 : "the"
        4 : "simulation"
        5 : "of"
    ]
    ▼ 46 : [
        0 : "Intelligence"
        1 : "is"
        2 : "the"
        3 : "simulation"
        4 : "of"
        5 : "human"
    ]
    ▼ 47 : [
        0 : "is"
        1 : "the"
        2 : "simulation"
        3 : "of"
        4 : "human"
        5 : "intelligence"
    ]
    ▼ 48 : [
        0 : "the"
        1 : "simulation"
        2 : "of"
        3 : "human"
        4 : "intelligence"
        5 : "by"
    ]
    ▼ 49 : [
        0 : "simulation"
        1 : "of"
        2 : "human"
```

```
3 : "intelligence"
4 : "by"
5 : "machines"
]

▼ 50 : [
    0 : "of"
    1 : "human"
    2 : "intelligence"
    3 : "by"
    4 : "machines"
    5 : "."
]

▼ 51 : [
    0 : "human"
    1 : "intelligence"
    2 : "by"
    3 : "machines"
    4 : "."
    5 : "It"
]

▼ 52 : [
    0 : "intelligence"
    1 : "by"
    2 : "machines"
    3 : "."
    4 : "It"
    5 : "is"
]

▼ 53 : [
    0 : "by"
    1 : "machines"
    2 : "."
    3 : "It"
    4 : "is"
    5 : "probably"
]

▼ 54 : [
    0 : "machines"
    1 : "."
]
```

```
    2 : "It"
    3 : "is"
    4 : "probably"
    5 : "the"
]
▼ 55 : [
    0 : "."
    1 : "It"
    2 : "is"
    3 : "probably"
    4 : "the"
    5 : "fastest-growing"
]
▼ 56 : [
    0 : "It"
    1 : "is"
    2 : "probably"
    3 : "the"
    4 : "fastest-growing"
    5 : "development"
]
▼ 57 : [
    0 : "is"
    1 : "probably"
    2 : "the"
    3 : "fastest-growing"
    4 : "development"
    5 : "in"
]
▼ 58 : [
    0 : "probably"
    1 : "the"
    2 : "fastest-growing"
    3 : "development"
    4 : "in"
    5 : "the"
]
▼ 59 : [
    0 : "the"
```

```
1 : "fastest-growing"
2 : "development"
3 : "in"
4 : "the"
5 : "World"
]
▼ 60 : [
  0 : "fastest-growing"
  1 : "development"
  2 : "in"
  3 : "the"
  4 : "World"
  5 : "of"
]
▼ 61 : [
  0 : "development"
  1 : "in"
  2 : "the"
  3 : "World"
  4 : "of"
  5 : "technology"
]
▼ 62 : [
  0 : "in"
  1 : "the"
  2 : "World"
  3 : "of"
  4 : "technology"
  5 : "and"
]
▼ 63 : [
  0 : "the"
  1 : "World"
  2 : "of"
  3 : "technology"
  4 : "and"
  5 : "innovation"
]
▼ 64 : [
```

```
0 : "World"
1 : "of"
2 : "technology"
3 : "and"
4 : "innovation"
5 : "."
]
▼ 65 : [
0 : "of"
1 : "technology"
2 : "and"
3 : "innovation"
4 : "."
5 : "Furthermore"
]
▼ 66 : [
0 : "technology"
1 : "and"
2 : "innovation"
3 : "."
4 : "Furthermore"
5 : ","
]
▼ 67 : [
0 : "and"
1 : "innovation"
2 : "."
3 : "Furthermore"
4 : ","
5 : "many"
]
▼ 68 : [
0 : "innovation"
1 : "."
2 : "Furthermore"
3 : ","
4 : "many"
5 : "experts"
]
```

```
▼ 69 : [
    0 : "."
    1 : "Furthermore"
    2 : ","
    3 : "many"
    4 : "experts"
    5 : "believe"
]
▼ 70 : [
    0 : "Furthermore"
    1 : ","
    2 : "many"
    3 : "experts"
    4 : "believe"
    5 : "AI"
]
▼ 71 : [
    0 : ","
    1 : "many"
    2 : "experts"
    3 : "believe"
    4 : "AI"
    5 : "could"
]
▼ 72 : [
    0 : "many"
    1 : "experts"
    2 : "believe"
    3 : "AI"
    4 : "could"
    5 : "solve"
]
▼ 73 : [
    0 : "experts"
    1 : "believe"
    2 : "AI"
    3 : "could"
    4 : "solve"
    5 : "major"
]
```

```
]
▼ 74 : [
    0 : "believe"
    1 : "AI"
    2 : "could"
    3 : "solve"
    4 : "major"
    5 : "challenges"
]
▼ 75 : [
    0 : "AI"
    1 : "could"
    2 : "solve"
    3 : "major"
    4 : "challenges"
    5 : "and"
]
▼ 76 : [
    0 : "could"
    1 : "solve"
    2 : "major"
    3 : "challenges"
    4 : "and"
    5 : "crisis"
]
▼ 77 : [
    0 : "solve"
    1 : "major"
    2 : "challenges"
    3 : "and"
    4 : "crisis"
    5 : "situations"
]
▼ 78 : [
    0 : "major"
    1 : "challenges"
    2 : "and"
    3 : "crisis"
    4 : "situations"
]
```

```
      5 : "."
    ]
  ▼ 79 : [
    0 : "challenges"
    1 : "and"
    2 : "crisis"
    3 : "situations"
    4 : "."
    5 : "!!!"
  ]
  ▼ 80 : [
    0 : "and"
    1 : "crisis"
    2 : "situations"
    3 : "."
    4 : "!!!"
    5 : "!!"
  ]
]
```

Stemming

Porter Stemmer:

```
▼ [
  0 : "ai"
  1 : "="
  2 : "``"
  3 : "'artifici"
  4 : "intellig"
  5 : "refer"
  6 : "to"
  7 : "the"
  8 : "intellig"
  9 : "of"
  10 : "machin"
  11 : "."
  12 : "thi"
  13 : "is"
  14 : "in"
```

```
15 : "contrast"
16 : "to"
17 : "the"
18 : "natur"
19 : "intellig"
20 : "of"
21 : "human"
22 : "and"
23 : "anim"
24 : "."
25 : "with"
26 : "artifici"
27 : "intellig"
28 : ","
29 : "machin"
30 : "perform"
31 : "function"
32 : "such"
33 : "as"
34 : "learn"
35 : ","
36 : "plan"
37 : ","
38 : "reason"
39 : "and"
40 : "problem-solv"
41 : "."
42 : "most"
43 : "noteworthi"
44 : ","
45 : "artifici"
46 : "intellig"
47 : "is"
48 : "the"
49 : "simul"
50 : "of"
51 : "human"
52 : "intellig"
```

```
53 : "by"
54 : "machin"
55 : "."
56 : "it"
57 : "is"
58 : "probabl"
59 : "the"
60 : "fastest-grow"
61 : "develop"
62 : "in"
63 : "the"
64 : "world"
65 : "of"
66 : "technolog"
67 : "and"
68 : "innov"
69 : "."
70 : "furthermor"
71 : ","
72 : "mani"
73 : "expert"
74 : "believ"
75 : "ai"
76 : "could"
77 : "solv"
78 : "major"
79 : "challeng"
80 : "and"
81 : "crisi"
82 : "situat"
83 : "."
84 : "!!!"
85 : "!!!"
]
```

Lancaster Stemmer:

```
▼ [
  0 : "ai"
  1 : "="
```

```
2 : "``"
3 : "'artificial"
4 : "intellig"
5 : "ref"
6 : "to"
7 : "the"
8 : "intellig"
9 : "of"
10 : "machin"
11 : "."
12 : "thi"
13 : "is"
14 : "in"
15 : "contrast"
16 : "to"
17 : "the"
18 : "nat"
19 : "intellig"
20 : "of"
21 : "hum"
22 : "and"
23 : "anim"
24 : "."
25 : "with"
26 : "art"
27 : "intellig"
28 : ","
29 : "machin"
30 : "perform"
31 : "funct"
32 : "such"
33 : "as"
34 : "learn"
35 : ","
36 : "plan"
37 : ","
38 : "reason"
39 : "and"
```

```
40 : "problem-solving"
41 : "."
42 : "most"
43 : "noteworthy"
44 : ","
45 : "art"
46 : "intellig"
47 : "is"
48 : "the"
49 : "sim"
50 : "of"
51 : "hum"
52 : "intellig"
53 : "by"
54 : "machin"
55 : "."
56 : "it"
57 : "is"
58 : "prob"
59 : "the"
60 : "fastest-growing"
61 : "develop"
62 : "in"
63 : "the"
64 : "world"
65 : "of"
66 : "technolog"
67 : "and"
68 : "innov"
69 : "."
70 : "furtherm"
71 : ","
72 : "many"
73 : "expert"
74 : "believ"
75 : "ai"
76 : "could"
77 : "solv"
```

```
78 : "maj"
79 : "challeng"
80 : "and"
81 : "cris"
82 : "situ"
83 : "."
84 : """
85 : """
]
```

Snowball Stemmer:

```
▼ [
  0 : "ai"
  1 : "="
  2 : "``"
  3 : "artifici"
  4 : "intellig"
  5 : "refer"
  6 : "to"
  7 : "the"
  8 : "intellig"
  9 : "of"
  10 : "machin"
  11 : "."
  12 : "this"
  13 : "is"
  14 : "in"
  15 : "contrast"
  16 : "to"
  17 : "the"
  18 : "natur"
  19 : "intellig"
  20 : "of"
  21 : "human"
  22 : "and"
  23 : "anim"
  24 : "."
  25 : "with"
  26 : "artifici"
]
```

```
27 : "intellig"
28 : ","
29 : "machin"
30 : "perform"
31 : "function"
32 : "such"
33 : "as"
34 : "learn"
35 : ","
36 : "plan"
37 : ","
38 : "reason"
39 : "and"
40 : "problem-solv"
41 : "."
42 : "most"
43 : "noteworthi"
44 : ","
45 : "artifici"
46 : "intellig"
47 : "is"
48 : "the"
49 : "simul"
50 : "of"
51 : "human"
52 : "intellig"
53 : "by"
54 : "machin"
55 : "."
56 : "it"
57 : "is"
58 : "probabl"
59 : "the"
60 : "fastest-grow"
61 : "develop"
62 : "in"
63 : "the"
64 : "world"
```

```
65 : "of"
66 : "technolog"
67 : "and"
68 : "innov"
69 : "."
70 : "furthermor"
71 : ","
72 : "mani"
73 : "expert"
74 : "believ"
75 : "ai"
76 : "could"
77 : "solv"
78 : "major"
79 : "challeng"
80 : "and"
81 : "crisi"
82 : "situat"
83 : "."
84 : "'''"
85 : "'''"
]
```

Lemmatization

WordNet Lemmatizer:

```
▼ [
  0 : "AI"
  1 : "="
  2 : "^^"
  3 : "'Artificial"
  4 : "Intelligence"
  5 : "refers"
  6 : "to"
  7 : "the"
  8 : "intelligence"
  9 : "of"
  10 : "machine"
  11 : "."
```

```
12 : "This"
13 : "is"
14 : "in"
15 : "contrast"
16 : "to"
17 : "the"
18 : "natural"
19 : "intelligence"
20 : "of"
21 : "human"
22 : "and"
23 : "animal"
24 : "."
25 : "With"
26 : "Artificial"
27 : "Intelligence"
28 : ","
29 : "machine"
30 : "perform"
31 : "function"
32 : "such"
33 : "a"
34 : "learning"
35 : ","
36 : "planning"
37 : ","
38 : "reasoning"
39 : "and"
40 : "problem-solving"
41 : "."
42 : "Most"
43 : "noteworthy"
44 : ","
45 : "Artificial"
46 : "Intelligence"
47 : "is"
48 : "the"
49 : "simulation"
```

```
50 : "of"
51 : "human"
52 : "intelligence"
53 : "by"
54 : "machine"
55 : "."
56 : "It"
57 : "is"
58 : "probably"
59 : "the"
60 : "fastest-growing"
61 : "development"
62 : "in"
63 : "the"
64 : "World"
65 : "of"
66 : "technology"
67 : "and"
68 : "innovation"
69 : "."
70 : "Furthermore"
71 : ","
72 : "many"
73 : "expert"
74 : "believe"
75 : "AI"
76 : "could"
77 : "solve"
78 : "major"
79 : "challenge"
80 : "and"
81 : "crisis"
82 : "situation"
83 : "."
84 : "!!!"
85 : "!!!"
]
```

 NLP Processing Completed!

