COMP90042
Web search and text analysis

Workshop Week 3

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Review

- Tokenization
- Stemming and Lemmatisation
- Term-document matrix
- Inverted index
- TF*IDF
- BM25

This workshop

- Postings list
- Variable Byte Compression
- WAND
- Query expansion
- Relevance feedback

Posting List Compression

Motivations:

- Minimise storage costs
- Fast sequential access
- Support GEQ(x) operation: Return the smallest item in the list that is greater or equal to x

Posting List Compression

Inverted index

the	ids:	25	26	29	…	12345	12347
house	ids:	5213	5234	5454	5591	…	
aeronaut	ids:	251235	251239	251240			

8	10	13	15	18
256	1024	8192	32768	262144

Posting List Compression

the	ids:	25	26	29	…	12345	12347
	gaps:	25	1	3	…	1	2
house	ids:	5213	5234	5454	5591	…	
	gaps:	5213	1	220	137	…	
aeronaut	ids:	251235	251239	251240			
	gaps:	251235	4	1			

Gaps between ids or term frequencies?

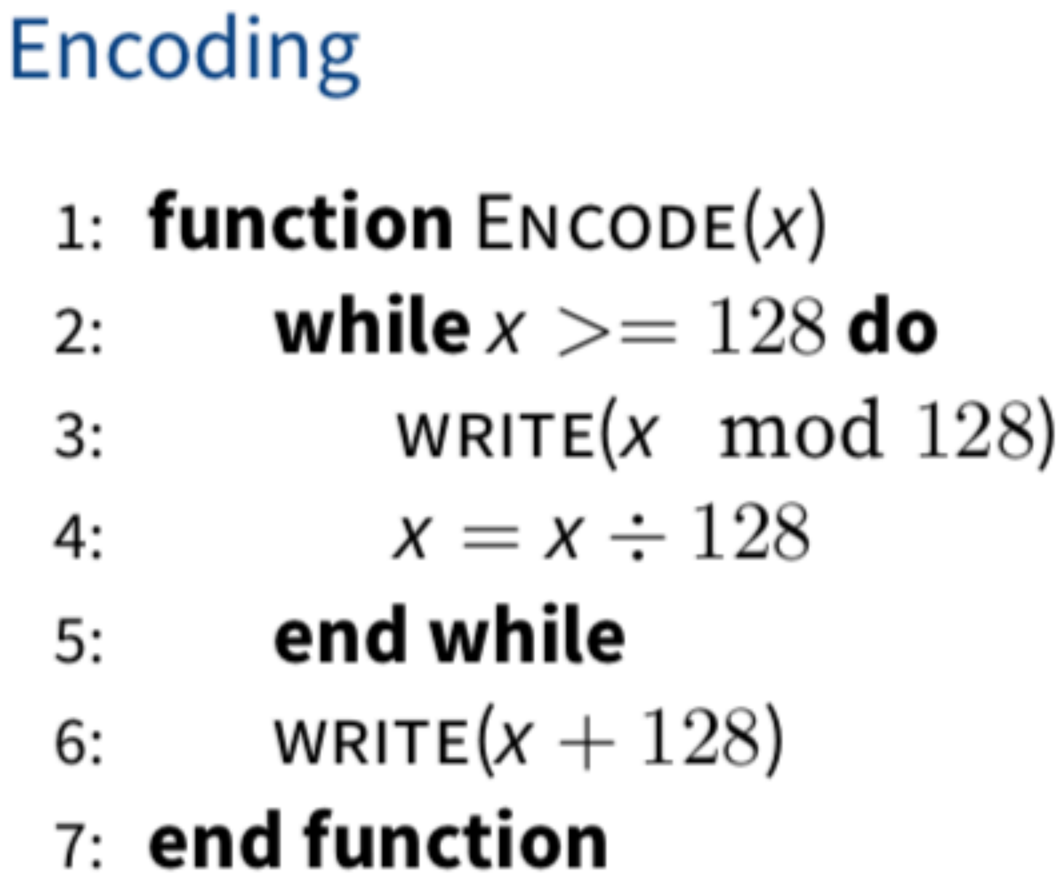
Variable Byte Compression

Idea of Variable Byte Compression:

Use variable number of bytes to represent integers. Each byte contains 7 bits “payload” and one continuation bit.

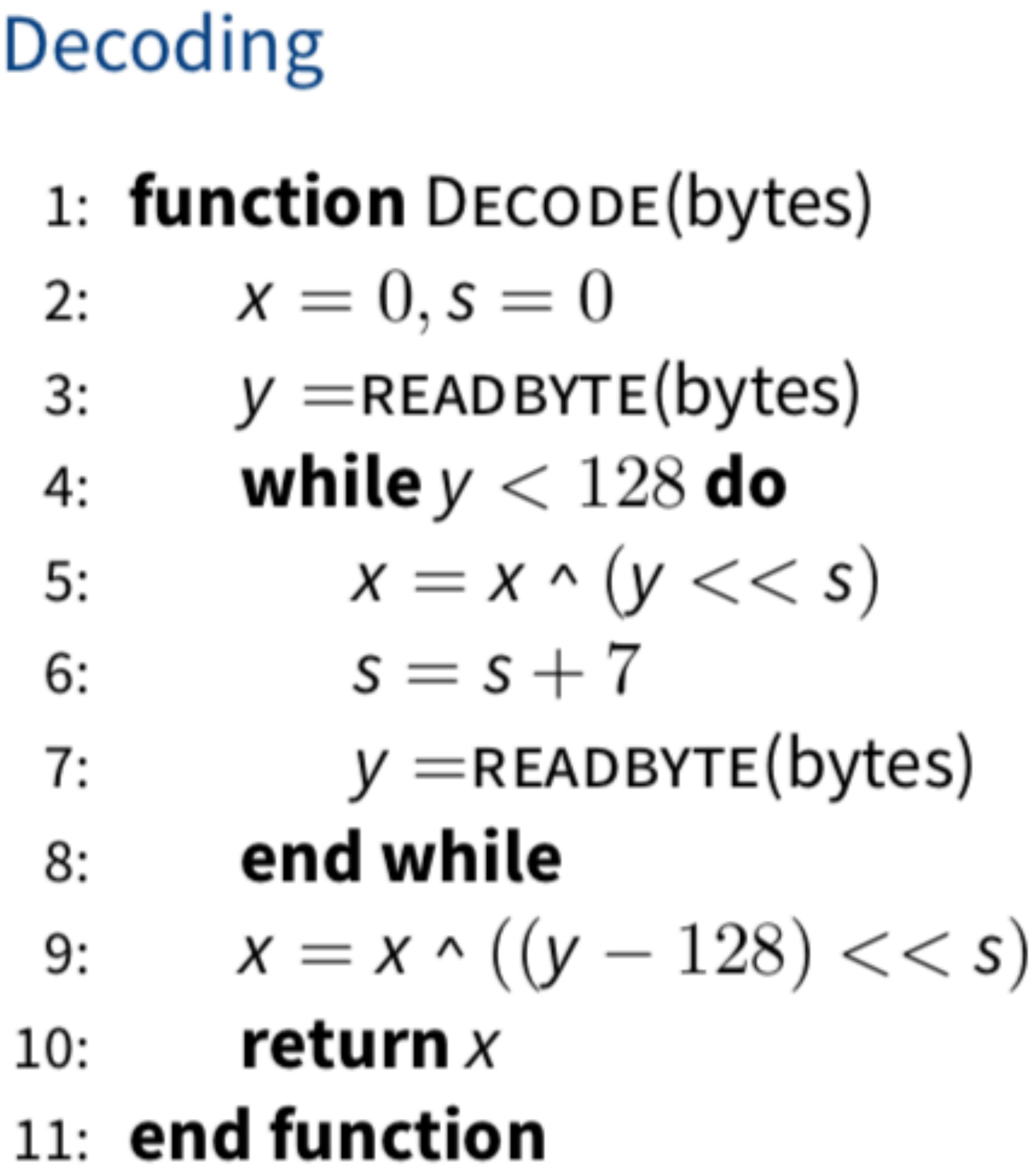
Number	Encoding	
824	00000110	10111000
5	10000101	

Variable Byte Compression



Encoding

```
function ENCODE($x$)
    while $x >= 128$ do
        WRITE($x \mod 128$)
        $x = x \div 128$
    end while
    WRITE($x + 128$)
end function
```



Decoding

```
function DECODE(bytes)
    $x = 0, s = 0$
    $y =$ READBYTE(bytes)
    while $y < 128$ do
        $x = x$ ^ $(y << s)$
        $s = s + 7$
        $y =$ READBYTE(bytes)
    end while
    $x = x$ ^ $((y - 128) << s)$
    return $x$
end function
```

Variable Byte Compression

Decoding(Q1-c):

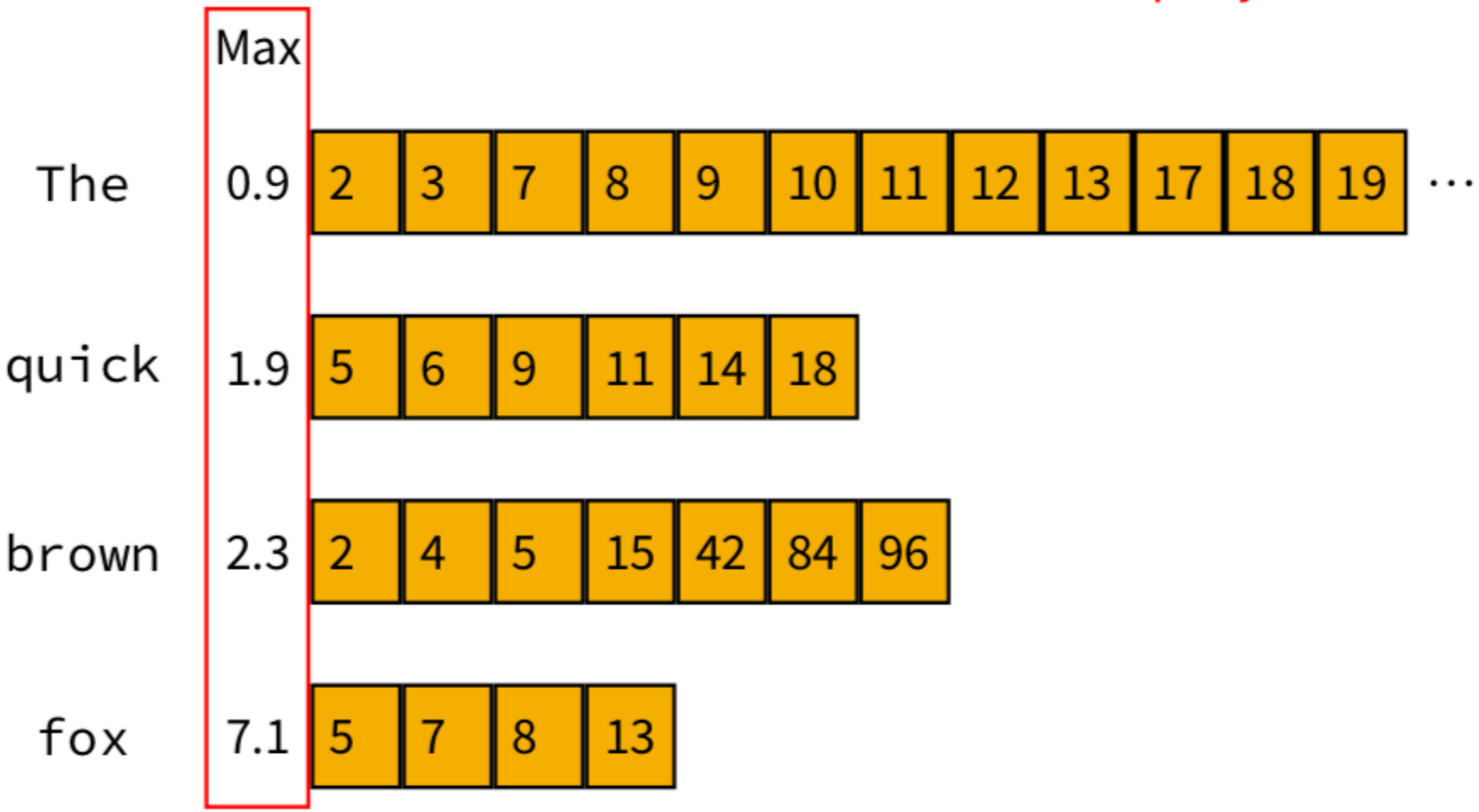
Determine the values of integers X and Y that were encoded as the byte sequence [52,34,147,42,197] using the Variable Byte algorithm described in the lecture slides 9/10.

52	00110100
34	00100010
147	10010011
42	00101010
167	11000101

WAND

- **Top K retrieval**
- **Overestimate**

Query Q: `The quick brown fox` with $k = 2$



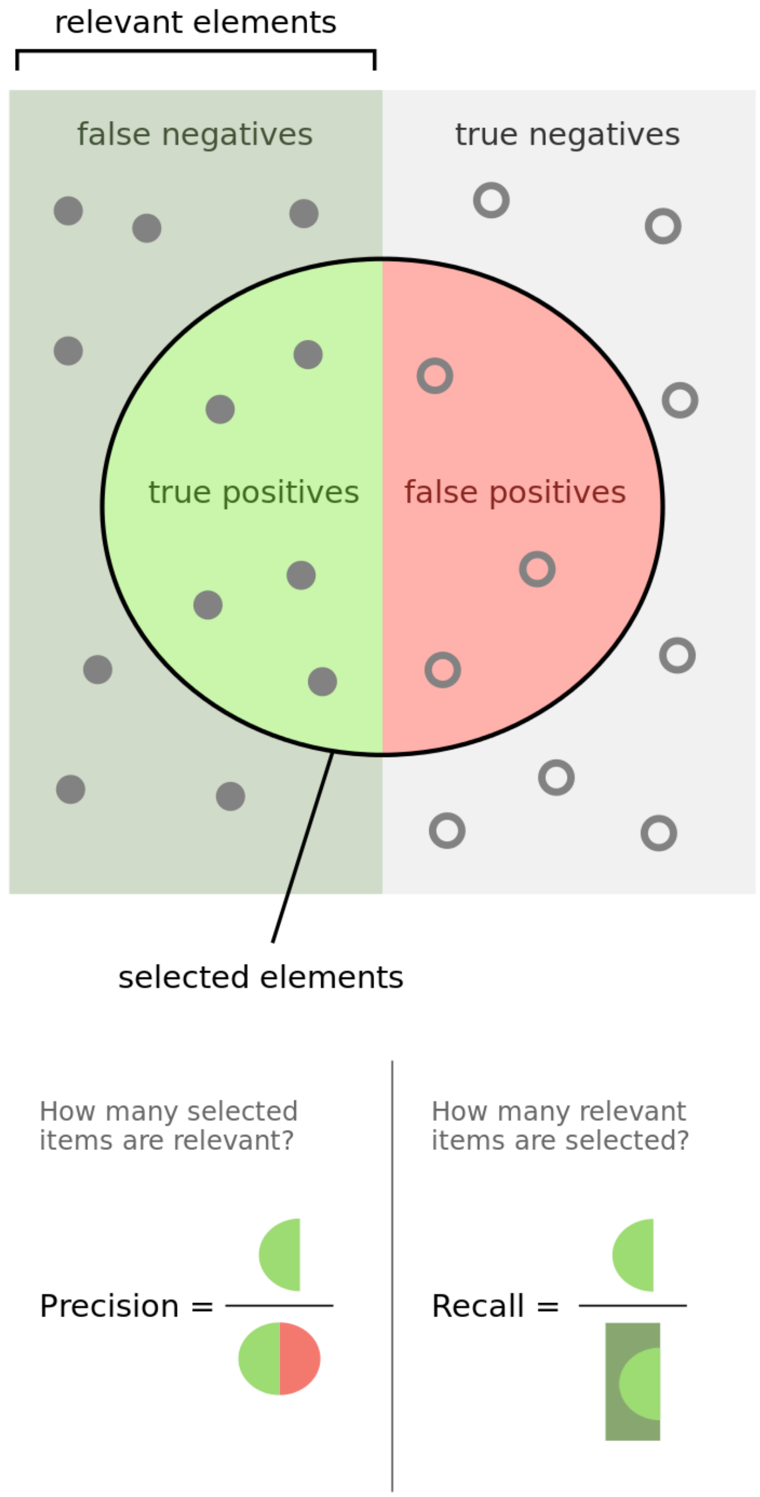
Maximum Contribution for each query term

	Max													
The	0.9	2	3	7	8	9	10	11	12	13	17	18	19	⋯
quick	1.9	5	6	9	11	14	18							
brown	2.3	2	4	5	15	42	84	96						
fox	7.1	5	7	8	13									

Query Expansion

Q3

Query expansion increases query recall



Relevance Feedback

Q4

A. **User relevance feedback**
   -E.g. ask users to click

B. **Pseudo relevance feedback**
   -E.g. blink feedback

C. **Indirect relevance feedback**
   -E.g. analysis query click logs to re-rank