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English Alphabet

Redundancy:

- How often one letter appears (eg., in English “a” more often than “q”)
- If a letter appears often and we want to use it a lot, code it with less space/bits!
- This can be done with Huffman Coding, a greedy algorithm we will look at!

Redundancy and coding in Bits

BABABABADABACAABAACABDAAAAABAAAAAAAADBCA

$A \rightarrow 00$

$B \rightarrow 01$

$C \rightarrow 10$

$D \rightarrow 11$

0100010001000100110001001000000100001000
0111000000000001000000000000000011011000

Hyvarinen et al. book, 2009

Variable length coding

BABABABADABACAABAACABDAAAAABAAAAAAAADBCA

$A \rightarrow 0$

$B \rightarrow 10$

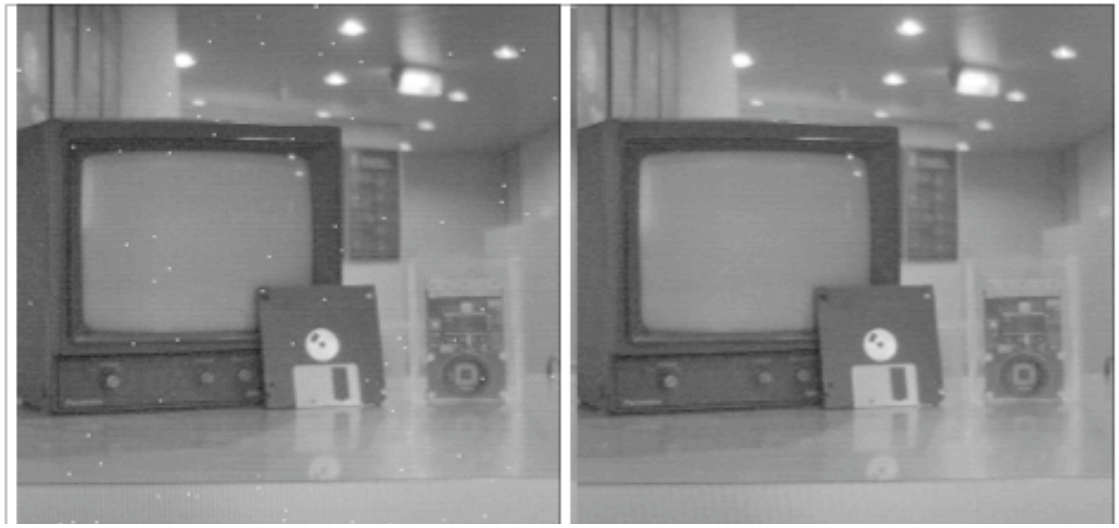
$C \rightarrow 110$

$D \rightarrow 111$

10010010010011101001100010001100101110000010000000000111101100

Hyvarinen et al. book, 2009

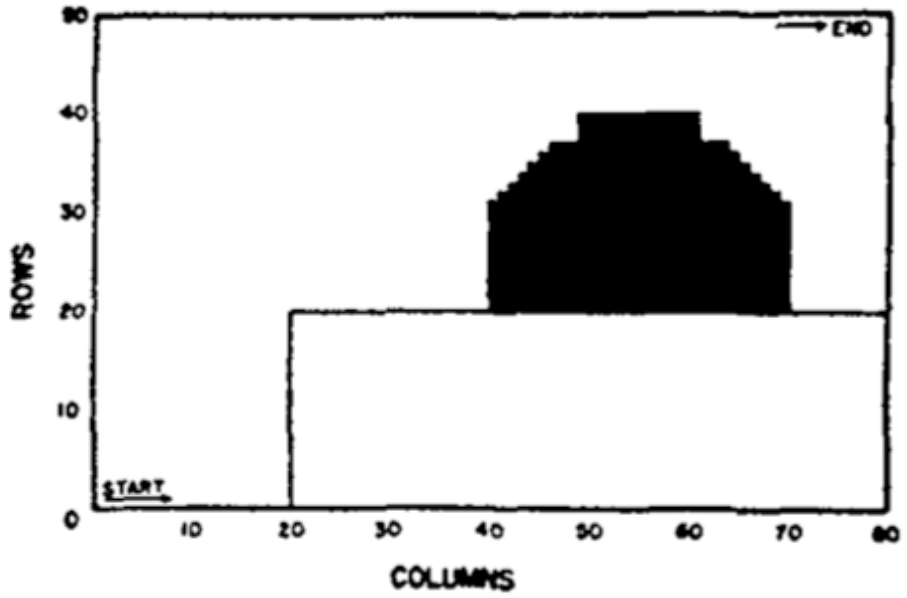
Images are spatially redundant



Kersten, 1992 (psychophysics);

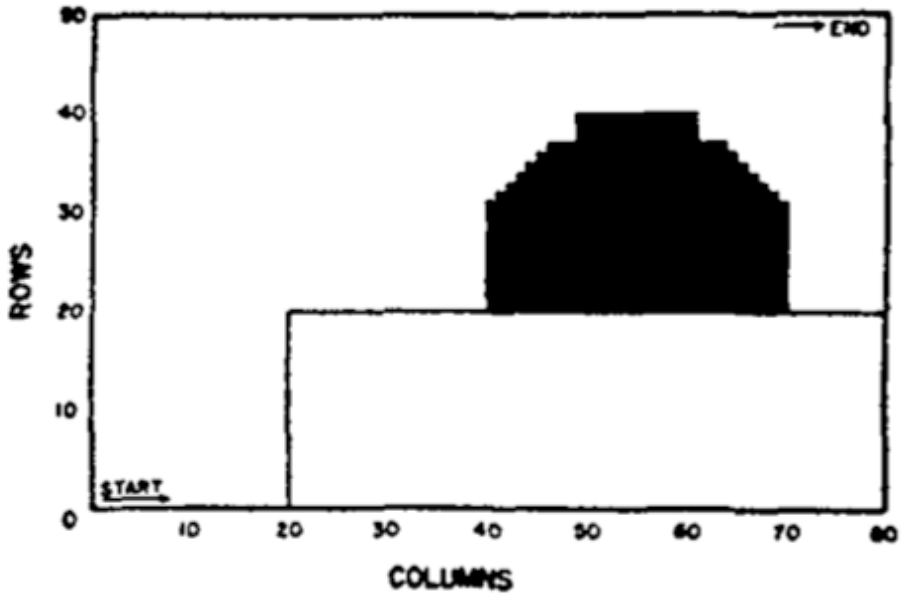
Dierickx and Meynants, 1987 (computer)

Images are spatially redundant



Attneave 1951; “guessing game”

Images are spatially redundant



Attneave 1951; “ink bottle on the corner of the desk”

Image compression can be lossy

JPEG

Compression:

- Includes a lossy part (reducing some of the visual information)

- Followed by variable length coding! (like with the alphabet example). This part is done with Huffman Coding (and is lossless). Symbols that appear more frequently are coded with less bits.

- Does the brain make use of redundancies in images to code efficiently??