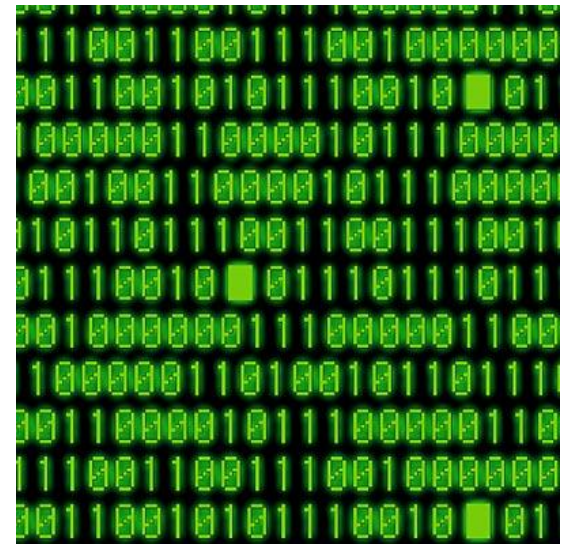


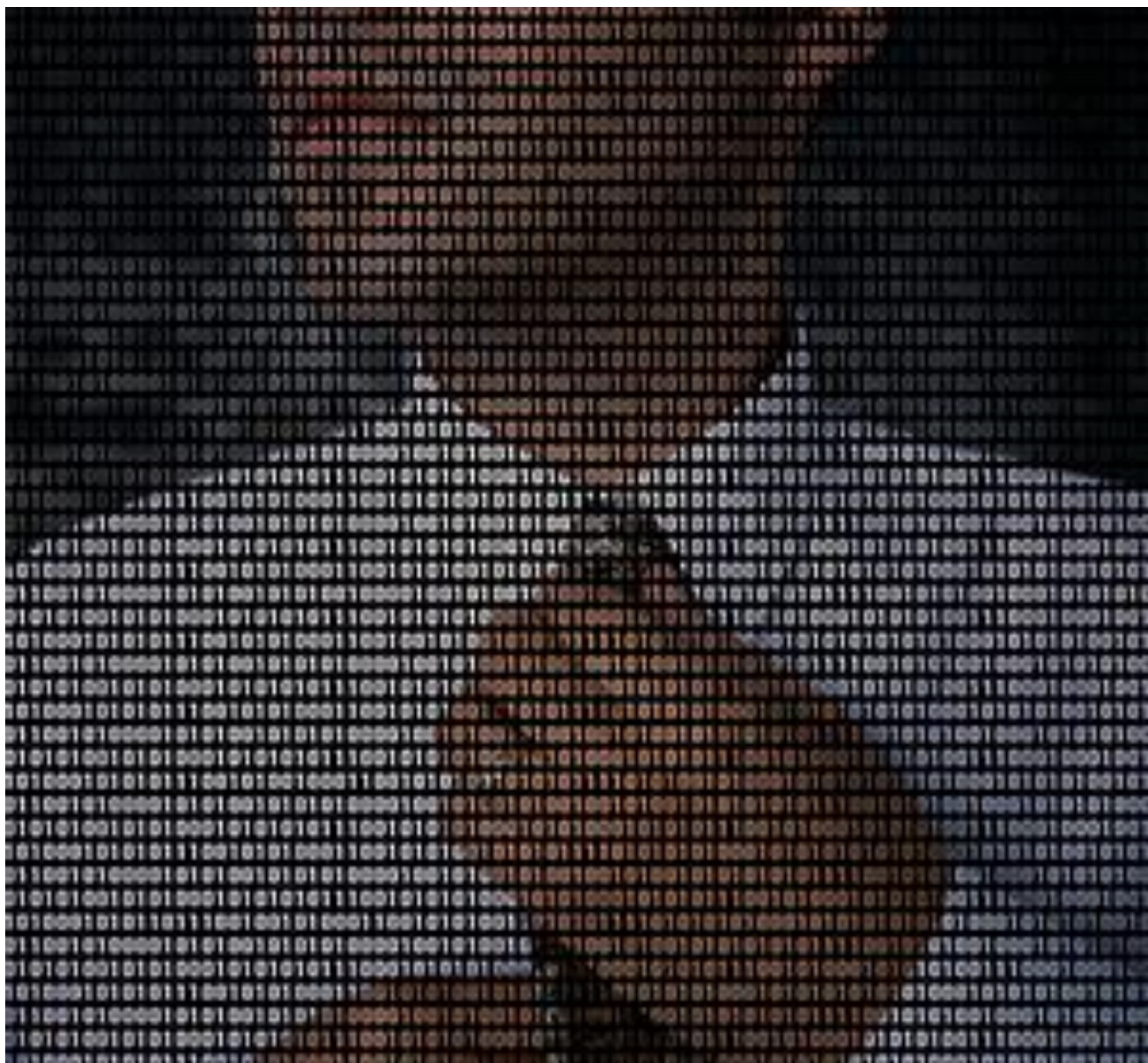
Computer Fundamentals

Week 1

Computer Fundamentals

1. Binary Representation: the power of 0 and 1
2. Data Storage: how to record 0 and 1
3. Logic Table and Circuit: how to process 0 and 1





Binary Numbers

- It is based on the binary representation (0, 1).
- It also uses positional notation
 - Use the same symbols for different orders of magnitude, but in different places, e.g., ones place, twos place, fours place.
- Each next-place (order) digit adds $2^0, 2^1, 2^2, 2^3$, etc.

- Example: In binary, 1101 means

1 - is in the ones place so multiply it by 2^0 (1) = 1

0 - is in the twos place so multiply it by 2^1 (2) = 0

1 - is in the fours place so multiply it by 2^2 (4) = 4

1 - is in the eights place so multiply it by 2^3 (8) = 8

=> $1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 8 + 4 + 0 + 1 = 13$

Binary 1101 = Decimal 13

1101 B = 13 D

From Decimal to Binary

- Division by 2 with remainder
- Dividing each new quotient by two and writing the remainders to the right of each dividend. Stop when the quotient is 0
- Starting with the bottom remainder, read the sequence of remainders upwards to the top.
- Exp: what is decimal 13 in binary?

$$\begin{array}{r} 2 \overline{)13} \quad 1 \\ \quad 2 \overline{)6} \quad 0 \\ \quad \quad 2 \overline{)3} \quad 1 \\ \quad \quad \quad 2 \overline{)1} \quad 1 \\ \quad \quad \quad \quad 0 \end{array}$$

The answer: 1101

Binary Numeral Numbers

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111

Binary	Decimal
0	0
1	1
10	2
100	4
1000	8
10000	16
100000	32
1000000	64

Computer

A computer is a machine that manipulates data according to a set of instructions called a computer program

--<http://en.wikipedia.org/wiki/Computing>

- Machine: electronic machine built upon electronic logic circuits
- Manipulate: the operation of logic circuits
- Data: encoded into binary data