

DATA & INFORMATION & COMPUTERS & QUANTITIES & INTERNET & SEARCHING MEDICAL INFORMATION

MĂDĂLINA VĂLEANU ASSOCIATE PROF. (mvaleanu@umfcluj.ro)

"IULIU HAȚIEGANU" UNIVERSITY OF MEDICINE AND PHARMACY, CLUJ-NAPOCA

DEPARTMENT OF MEDICAL INFORMATICS AND BIOSTATISTICS

Objectives

About ... medical informatics and statistics

Data – Information - Knowledge

Computer ...

Information Theory & Quantity of Information

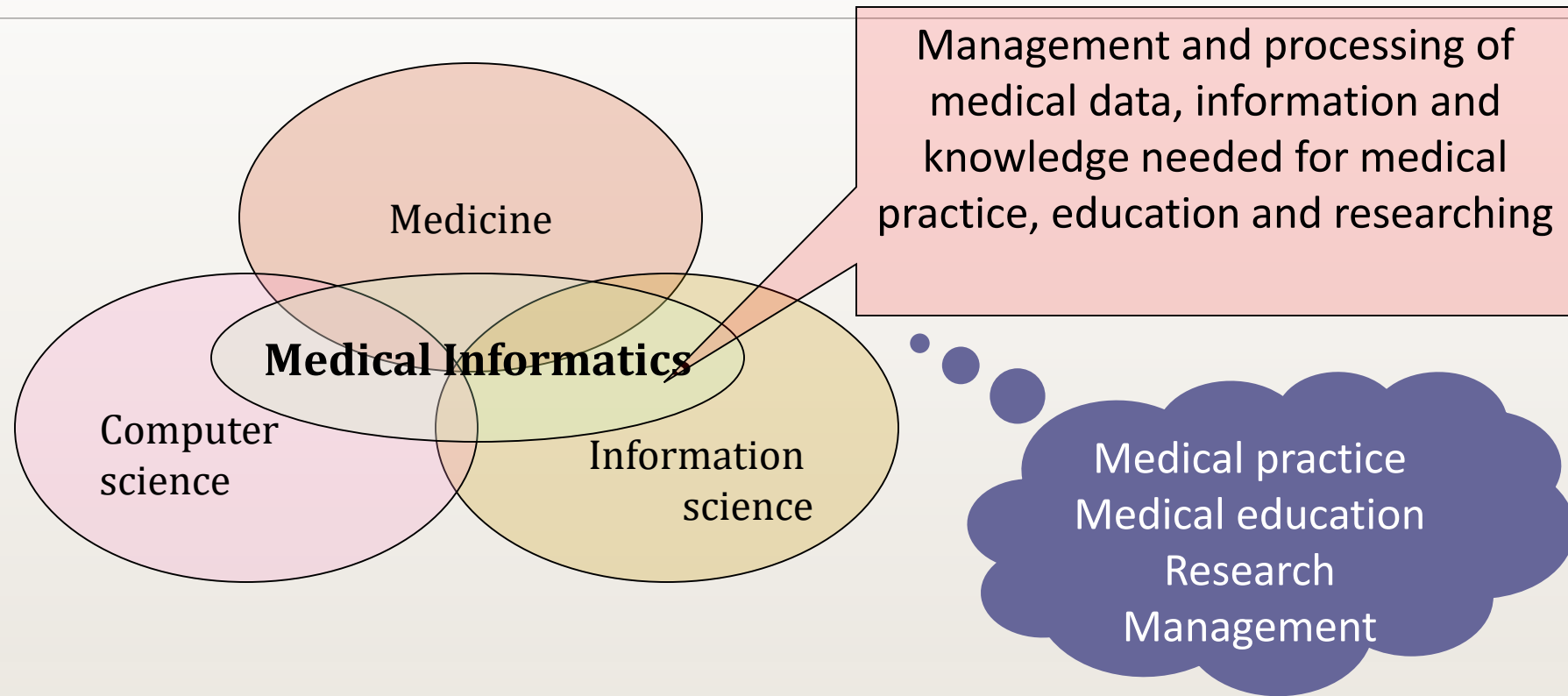
Coding Information

Internet

WHY Medical Informatics ...

- ✓ The information is doubling in less than 5 years
- ✓ Information = power
- ✓ The development of communications technology solves a number of problems in health care

WHY Medical Informatics ...



Medical statistics

deals with applications of statistics to medicine and the health sciences, including epidemiology, public health, forensic medicine, and clinical research.

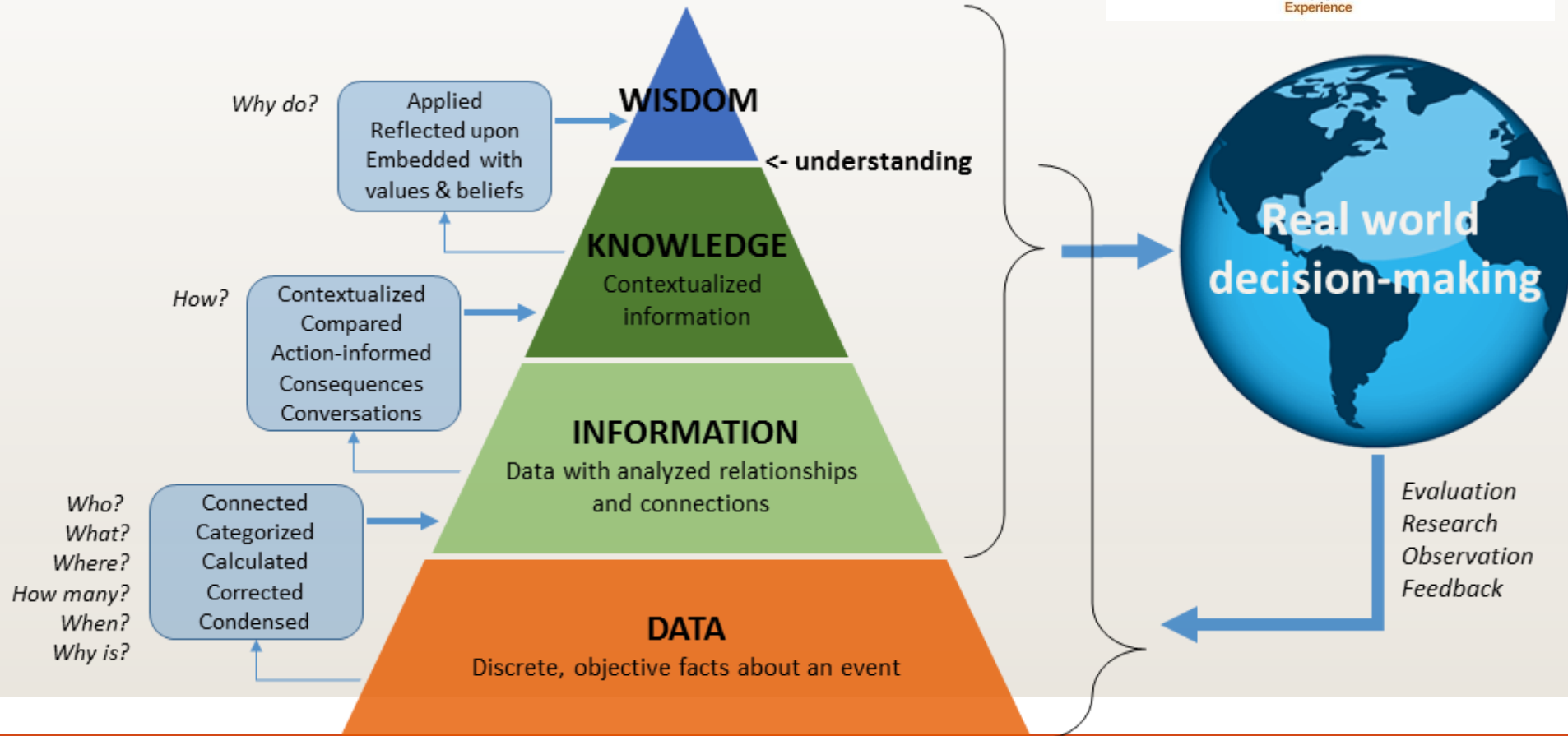
Definition: it is a mathematical science pertaining to the collection, analysis, interpretation or explanation, and presentation of ***data***

- provides tools for prediction and forecasting using data and statistical models

Branches:

- Descriptive statistics
- Inferential statistics

Data vs. Information



Data - Information - Knowledge

Data (datum) = a single piece of *information*, as a fact, statistic, or code; an item of data.

- When data are processed, organized, structured or presented in a given context to make them useful, they are called **Information**.

Information = facts and data organized to describe a particular situation or condition

Knowledge = facts, truths, and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how.

- Knowledge is accumulated and integrated and held over time to handle specific situations and challenges.

Data

- Symbol set that is quantified and/or qualified.
- It only exists and has no significance beyond its existence (in and of itself).
- It can exist in any form, usable or not.
- It does not have a meaning of itself.

Information

- Data that are processed to be useful
- Provides answers to "who", "what", "where", and "when"
- Data that has been given meaning by way of relational connection. This "meaning" can be useful but does not have to be.
- Is related to meaning or human intention

Knowledge

application of data and information

answers "how" questions

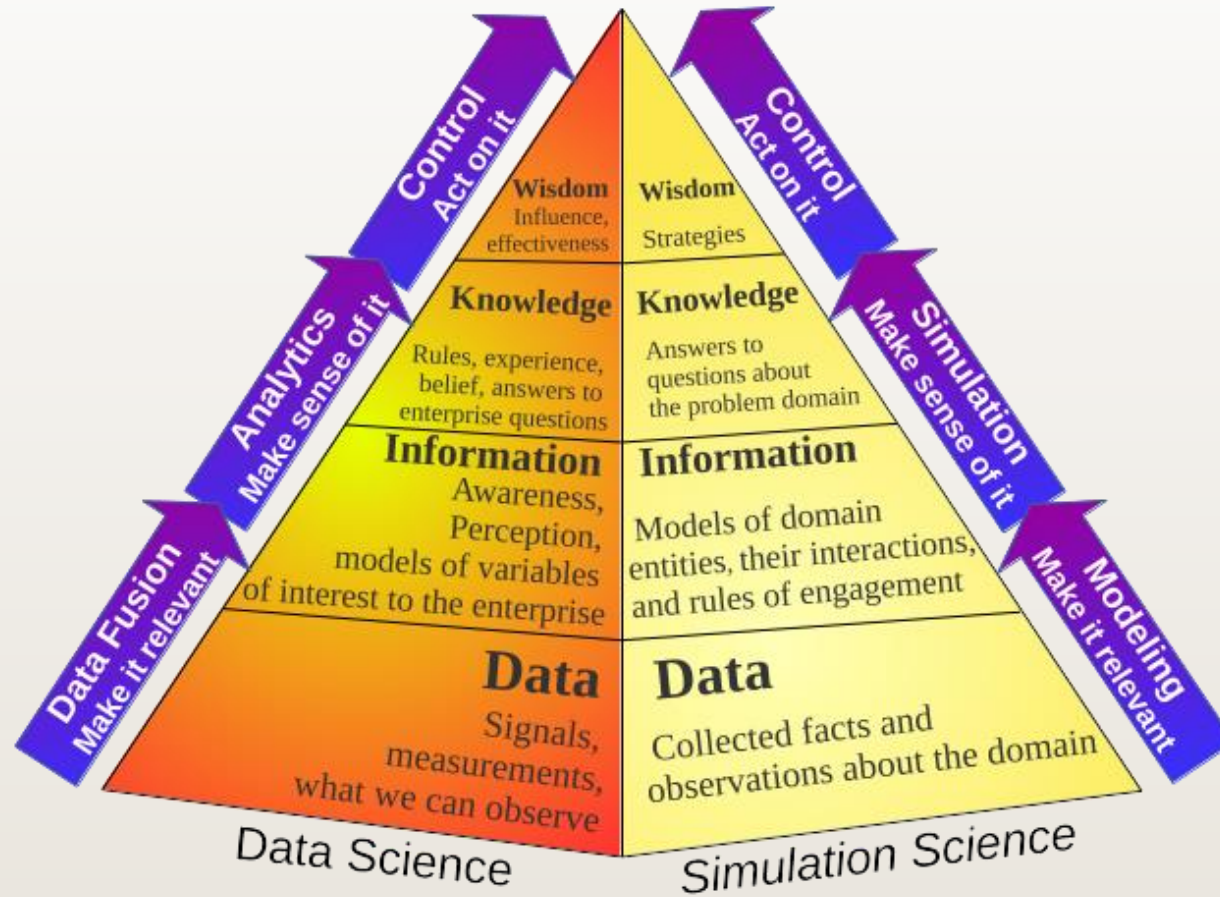
is the appropriate collection of information, such that it's intent is to be useful.

- Knowledge is a deterministic process.
- **Knowledge** is embodied in humans as the capacity to understand, explain and negotiate concepts, actions and intentions.

Healthcare Information/Knowledge

- knowledge from **research** (sometimes called evidence)
- knowledge from the analysis of **routinely collected and audit data** (sometimes called statistics)
- knowledge from the **experience of clinicians and patients**

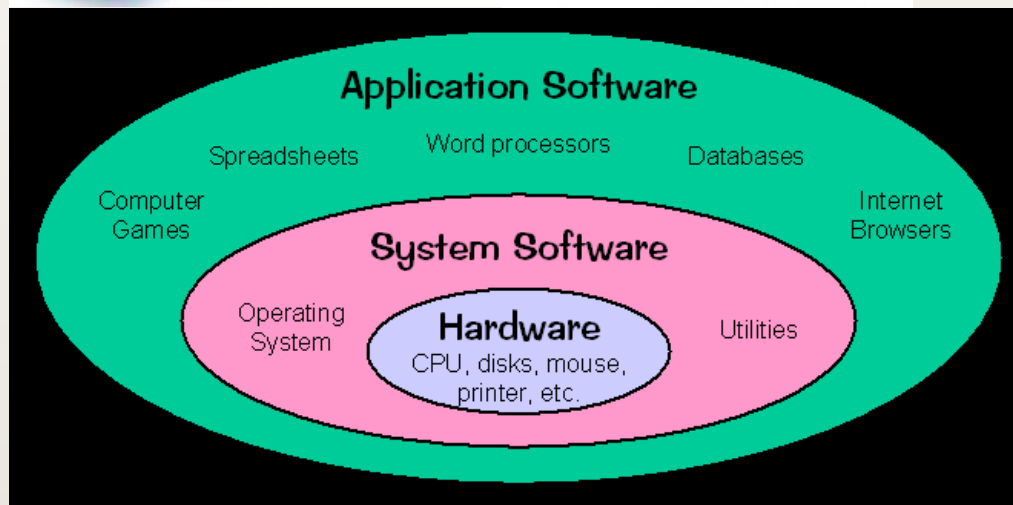
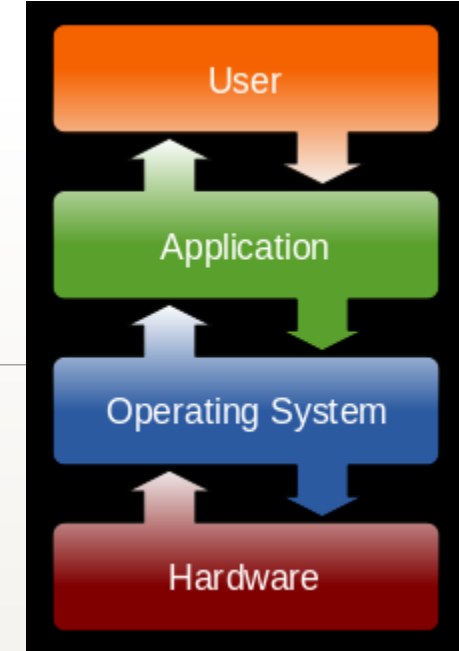
From Data to Knowledge in Medicine



Computers

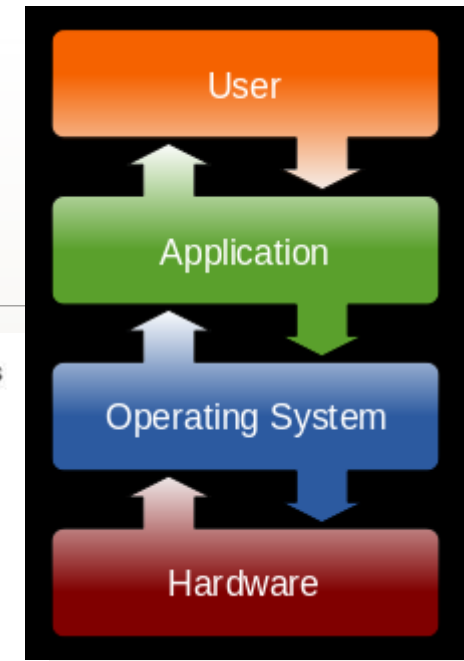
HARDWARE & SOFTWARE

Hardware & Software

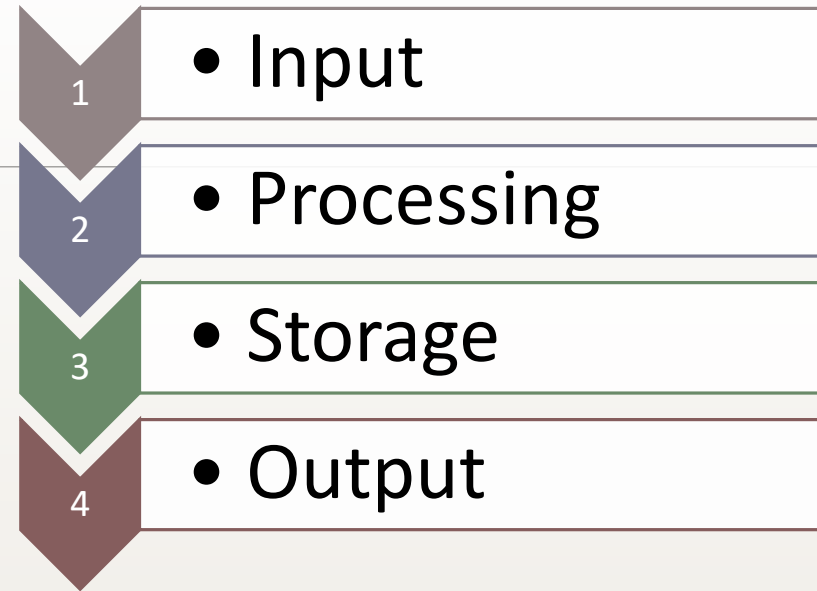


- Birotics: Microsoft Office
- Image processing: Photoshop
- Database: SQL Server
- Programming: C++, etc.
- Statistics: EpilInfo, Statistica, SPSS, etc.
- Protection: AVG, etc.

Hardware



Hardware



Input	Output
☐ keyboard, ☐ mouse, ☐ video capture card, ☐ soundboard, ☐ scanner, ☐ joystick, ☐ sensible touch screen, etc.	☐ printer, ☐ video capture card, ☐ soundboard, ☐ external memories, etc.

Software

Types (purpose/domain of use):

- Application software
- System software: Operating systems & Device drivers & Utilities

Types (nature/domain of execution):

- Desktop applications: web browsers, Microsoft Office
- Embedded software
- Plugins (extends or modifies the functionality of another piece of software)

INFORMATION THEORY

Information theory

Developed by Claude E. Shannon

- Data compression (JPEG, MP3)
- Reliable communication through noisy channels (memories, Cds, DVDs, Internet, etc.)
- Shannon CE. A Mathematical Theory of Communication. Bell System Technical Journal 1948; 27:379–423 & 623–656.

The field is at the intersection of mathematics, statistics, computer science, physics, neurobiology, and electrical engineering.

Sub-fields:

- source coding, channel coding, algorithmic complexity theory, algorithmic information theory, and measures of information.

Information theory

Information theory answers two fundamental questions:

- What is the ultimate data compression?
 - Answer: The Entropy (H)
- What is the ultimate transmission rate?
 - Answer: Channel Capacity C

Entropy:

- A measure of information (Shannon)
- Expressed by the average number of bits needed for storage or communication
- Quantify the uncertainty involved when encountering a random variable: a fair coin flip (2 equally likely outcomes) will have less entropy than a roll of a die (6 equally likely outcomes)

Information theory

Memoryless sources: generate successive independent and identically distributed outcome

The source (S) has outcomes that occur with probabilities (p)

The entropy of a source (S,p) in bits (binary digits) is:

$$H(S) = - \sum_i p_i \log_2 p_i$$

The larger the entropy, the less predictable is the source output and the more information is produced by seeing it!

Quantity of Information: Shannon

Let S be a system with the following states $\{S_1, S_2, \dots, S_n\}$

Let p_1, \dots, p_n be the probability of apparition of the states

The quantity of information produced by the apparition of S_k state is given by the formula: $I_k = -\log_2 p_k$

A system with two states (0 and 1):

- The system has two states $\{S_1, S_2\}$ with probabilities of apparition $p_1 = p_2 = \frac{1}{2}$
- The quantity of information produced through the apparition of S_1 OR S_2 is:
 $I_{1/2} = -\log_2 \frac{1}{2} = 1$ bit

Quantity of Information

All types of information in computers are representing using binary code:

- Numbers
- Letters
- Processor instructions
- Graphics
- Video
- Sound

Bits and Bytes

Binary digit = one numeral in a binary number

- Each 1 and 0 in the following number below is a binary digit: 11000101

BIT = binary digit

BYTE = 8 bits grouped together

2 symbols are used to represent binary numbers: 0 and 1

A bit (b) is the smallest unit of data comprised of just {0,1}

1 nibble (-) = 4 bits (a cutesy term with limited usage; mostly bitfields)

1 byte (B) = 8 bits (you could also say 2 nibbles)

Quantity of Information

Used to express storage capacity:

To the power
of

1. International Electrotechnical Commission (binary system)

- 1 kibibyte (**KiB**) = 1,024 B = $1,024^1$ B = 1,024 B
- 1 mebibyte (**MiB**) = 1,024 KB = $1,024^2$ B = 1,048,576 B
- 1 gibibyte (**GiB**) = 1,024 MB = $1,024^3$ B = 1,073,741,824 B
- 1 kibibit (**Kib**) = 1,024 b = $1,024^1$ b = 1,024 b
- 1 mebibit (**Mib**) = 1,024 Kb = $1,024^2$ b = 1,048,576 b
- 1 gibibit (**Gib**) = 1,024 Mb = $1,024^3$ b = 1,073,741,824 b...

Quantity of Information

Used to express commercial storage capacity:

2. International System of Units (decimal system)

- 1 kilobyte (**KB**) = 1,000 B = $1,000^1$ B = 1,000 B
- 1 megabyte (**MB**) = 1,000 KB = $1,000^2$ B = 1,000,000 B
- 1 gigabyte (**GB**) = 1,000 MB = $1,000^3$ B = 1,000,000,000 B
- 1 kilobit (**Kb**) = 1,000 b = $1,000^1$ b = 1,000 b
- 1 megabit (**Mb**) = 1,000 Kb = $1,000^2$ b = 1,000,000 b
- 1 gigabit (**Gb**) = 1,000 Mb = $1,000^3$ b = 1,000,000,000 b

kbps = kilobits per second → data rates

Quantity of Information

- 1 byte = one letter
- 1 KB = 1000 letters
- 1 CD = 650 MB / 700 MB
- Flash memory GB: 32GB – 128GB

$$8069844992 + 7057408 = 8076902400$$

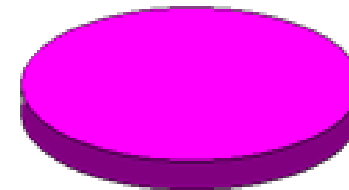
$$\text{GiB: } 8076902400 / (2^{30}) = 7.52 \text{ GiB}$$

$$\text{GB: } 8076902400 / (10^9) = 8.08 \text{ GB}$$

GiB \neq GB

Used space:	7,057,408 bytes	6.73 MB
Free space:	8,062,787,584 bytes	7.50 GB

Capacity:	8,069,844,992 bytes	7.51 GB
-----------	---------------------	---------



Drive G:

Decimal vs. Binary System

GB



GiB



Quantity of Information

Binary system: hardware, file size, etc.

Commercial system: CD, DVD, memory stick etc.

The speed of download/upload: ... MBps = megabytes per second

The speed of data processing:

- MIPS = millions of instructions per second
- FLOPS = FLoating-point Operations Per Second
 - Microprocessors had 4 FLOPS/cycles \rightarrow 2.5GHz = 10 billion FLOPS = 10 GFLOPS

Speed of Data Transfer

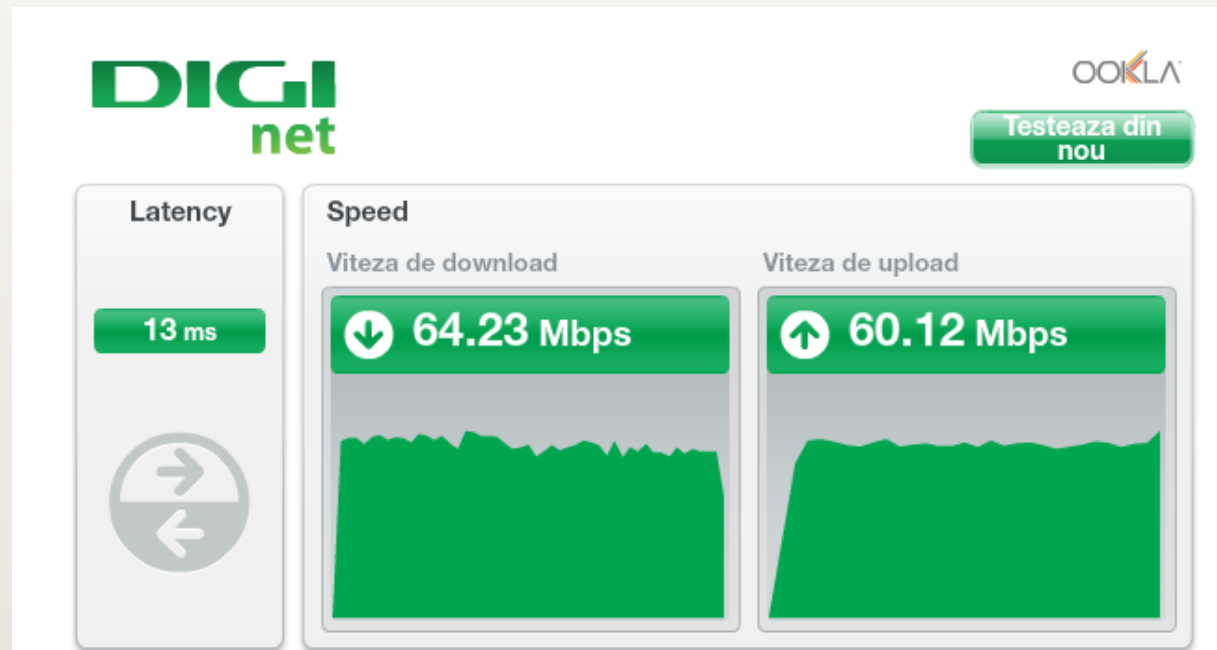
The amount transferred over a time period via a transfer medium (cable, optical fibre, etc.)

B/s	Byte/second
KB/s	Kilobyte per second
MB/s	Megabyte per second
GB/s	Gigabyte per second
TB/s	Terabyte per second

Speed of Data Transfer

Commercial: b(its)

Internal representation: B(yte)



Speed of Data Processing

Images:

- $4.31 \text{ MB (dimension)} = 4.31 * 1024 \text{ KiB} = 4413.44 \text{ KiB}$
- Speed of data transfer equal with 50 Mibps = 6.25 MiBps = $6.25 * 1024 \text{ KiBps} = 6400 \text{ KiBps}$
- Time needed to download the image = $4413.44 / 6400 = 0.6896 \text{ s}$

Video:

- 175080 KiB (dimension)
- Time needed to download the image : $175080 / 6400 = 37.36 \text{ s}$

Coding Information

Coding:

- Numbers
- Text
- Images

Binary representation

No.	No. UI	Message* [(message example)]	Formul a^*
1	2	2 [(0); (1)]	2^1
2	4	4 [(00); (01), (10), (11)]	2^2
3	8	8 [(000); (001); (010); (011); (100); (101); (110); (111)]	2^3
4	16	16 [(0000); (...); ...]	2^4
...			2^n
8	256	256 [(00000000); ...]	2^8
UI = units of information			

Coding Numbers: Binary

Symbol: 0 OR 1

- Addition:
 - $0 + 0 = 0$
 - $0 + 1 = 1$
 - $1 + 0 = 1$
 - $1 + 1 = 10$ (with exceeding)

- Subtraction:
 - $0 - 0 = 0$
 - $0 - 1 = 1$ (with loaning)
 - $1 - 0 = 1$
 - $1 - 1 = 10$

- Multiplication:
 - $0 \times 0 = 0$
 - $0 \times 1 = 0$
 - $1 \times 0 = 0$
 - $1 \times 1 = 1$

Coding Numbers: correspondence decimal – binary

○ 0 = 0

○ 1 = 1

○ 2 = 10

○ 3 = 11

○ 4 = 100

○ 5 = 101

○ 6 = 110

○ 7 = 111

○ 8 = 1000

○ 9 = 1001

○ 10 = 1010

Coding Numbers: Octal

The numerical values are represented using eight symbols: from 0 to 7

$$120 = 1 \times 8^2 + 1 \times 8^1 + 2 \times 8^0$$

For representation of octal values are necessary 3 bits: from 000 to 111

Transformation of a binary number into an octal number is made grouping the bytes in groups of 3 from right to left:

$$11011011011001_{(2)} = 66671_{(8)}$$

Transformation of an octal number into a binary number: $65_{(8)} = 110101_{(2)}$

- 0 = 000
- 1 = 001
- 2 = 010
- 3 = 011
- 4 = 100
- 5 = 101
- 6 = 110
- 7 = 111

Coding Numbers: Hexadecimal

Has the base 16 and use 16 hexadecimal code noted as:

- The code from $0_{(16)}$ to $9_{(16)}$ have the decimal equivalent values from $0_{(10)}$ to $9_{(10)}$
- The code from $A_{(16)}$ to $F_{(16)}$ have the decimal values from $10_{(10)}$ to $15_{(10)}$.

For their representation 4 bytes are needed

- Starting with 0000 and ending with 1111

Transformation of a binary number to a hexadecimal number can be performed by grouping as 4 bytes from right to left:

$$110110110111001_{(2)} = 6DD9_{(16)}$$

Coding Text

ASCII (American Standard Code for Information Interchange)

- Use 7 bits for representation of 128 characters
- Is the most used schema for coding the characters

Binary	Oct	Dec	Hex	Glyph
010 0000	040	32	20	␣
010 0001	041	33	21	!
010 0010	042	34	22	"
010 0011	043	35	23	#
010 0100	044	36	24	\$
010 0101	045	37	25	%
010 0110	046	38	26	&
010 0111	047	39	27	'
010 1000	050	40	28	(
010 1001	051	41	29)
010 1010	052	42	2A	*
010 1011	053	43	2B	+
010 1100	054	44	2C	,
010 1101	055	45	2D	-
010 1110	056	46	2E	.
010 1111	057	47	2F	/
011 0000	060	48	30	0
011 0001	061	49	31	1
011 0010	062	50	32	2
011 0011	063	51	33	3
011 0100	064	52	34	4
011 0101	065	53	35	5
011 0110	066	54	36	6
011 0111	067	55	37	7
011 1000	070	56	38	8
011 1001	071	57	39	9
011 1010	072	58	3A	:
011 1011	073	59	3B	;
011 1100	074	60	3C	<
011 1101	075	61	3D	=
011 1110	076	62	3E	>
011 1111	077	63	3F	?

Binary	Oct	Dec	Hex	Glyph
100 0000	100	64	40	@
100 0001	101	65	41	A
100 0010	102	66	42	B
100 0011	103	67	43	C
100 0100	104	68	44	D
100 0101	105	69	45	E
100 0110	106	70	46	F
100 0111	107	71	47	G
100 1000	110	72	48	H
100 1001	111	73	49	I
100 1010	112	74	4A	J
100 1011	113	75	4B	K
100 1100	114	76	4C	L
100 1101	115	77	4D	M
100 1110	116	78	4E	N
100 1111	117	79	4F	O
101 0000	120	80	50	P
101 0001	121	81	51	Q
101 0010	122	82	52	R
101 0011	123	83	53	S
101 0100	124	84	54	T
101 0101	125	85	55	U
101 0110	126	86	56	V
101 0111	127	87	57	W
101 1000	130	88	58	X
101 1001	131	89	59	Y
101 1010	132	90	5A	Z
101 1011	133	91	5B	[
101 1100	134	92	5C	\
101 1101	135	93	5D]
101 1110	136	94	5E	^
101 1111	137	95	5F	_

Binary	Oct	Dec	Hex	Glyph
110 0000	140	96	60	`
110 0001	141	97	61	a
110 0010	142	98	62	b
110 0011	143	99	63	c
110 0100	144	100	64	d
110 0101	145	101	65	e
110 0110	146	102	66	f
110 0111	147	103	67	g
110 1000	150	104	68	h
110 1001	151	105	69	i
110 1010	152	106	6A	j
110 1011	153	107	6B	k
110 1100	154	108	6C	l
110 1101	155	109	6D	m
110 1110	156	110	6E	n
110 1111	157	111	6F	o
111 0000	160	112	70	p
111 0001	161	113	71	q
111 0010	162	114	72	r
111 0011	163	115	73	s
111 0100	164	116	74	t
111 0101	165	117	75	u
111 0110	166	118	76	v
111 0111	167	119	77	w
111 1000	170	120	78	x
111 1001	171	121	79	y
111 1010	172	122	7A	z
111 1011	173	123	7B	{
111 1100	174	124	7C	
111 1101	175	125	7D	}
111 1110	176	126	7E	~

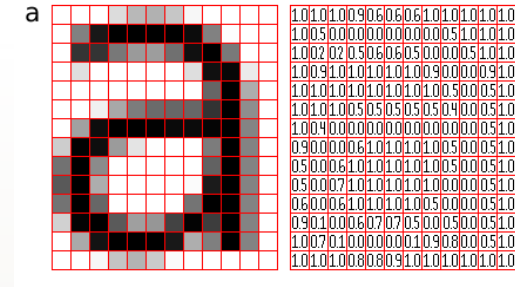
Coding Images

Digital image (raster images, or bitmap images): is a representation of a two-dimensional image using ones and zeros (binary).

Pixel = is the smallest item of information in an image

- Are normally arranged in a 2-dimensional grid
- Often represented using dots or squares
- The intensity of each pixel is variable; in color systems, each pixel has typically three or four components such as red, green, and blue, or cyan, magenta, yellow, and black.
- The word pixel is based on a contraction of *pix* ("pictures") and *el* (for "element"). Similar formations with *el* for "element" include the words: voxel (a volume element, three-dimensional space) and texel (fundamental unit of texture space - computer graphics).

Coding Images

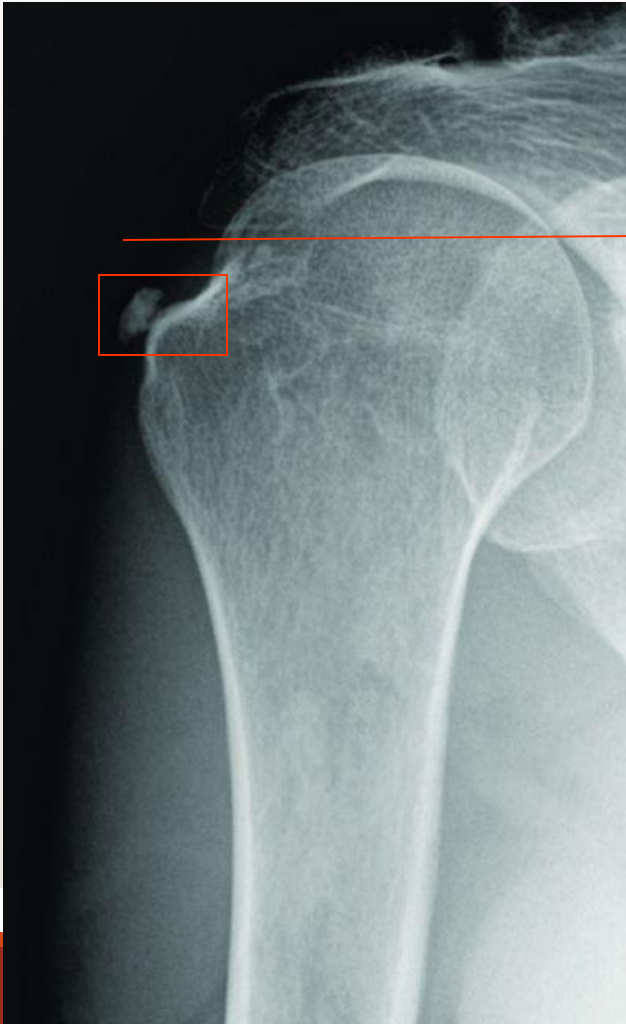


The number of distinct colors that can be represented by a pixel depending on the number of bits per pixel (bpp)

The maximum number of colors for a pixel is:

- 8 bpp, $2^8 = 256$ hues
- 16 bpp, $2^{16} = 65536$ hues – High Color
- 24 bpp, $2^{24} = 16777216$ hues – True Color
- 48 bpp: continuous space of colors

Coding Images



Coding Medical Data

The process of transforming descriptions of medical diagnoses and procedures into universal medical code numbers

Medical classification systems are used for a variety of applications in medicine and medical informatics:

- Statistical analysis of diseases and therapeutic actions
- Reimbursement; e.g., based on DRGs (Diagnosis-related group)
- Knowledge-based and decision support systems
- Direct surveillance of epidemic or pandemic outbreaks

Coding Medical Data

Diagnostic codes

Procedural codes

Pharmaceutical codes

Topographical codes

Reference Classifications

- International Statistical Classification of Diseases and Related Health Problems: ICD-10
- International Classification of Functioning, Disability and Health: ICF
- International Classification of Health Interventions: ICHI

Coding Medical Data

Related Classifications

International Classification of Primary Care (ICPC-2)

International Classification of External Causes of Injury (ICECI)

Anatomical Therapeutic Chemical Classification System (ATC/DDD)

Technical aids for persons with disabilities: Classification and terminology (ISO9999)

Coding Medical Data: Why?

1. Improves the effectiveness of communication in health care systems
2. Facilitates the integration of different systems
3. Cuts the cost defined in terms of time, resources, etc..
4. Supports health care quality management
5. Supports medical research

Internet

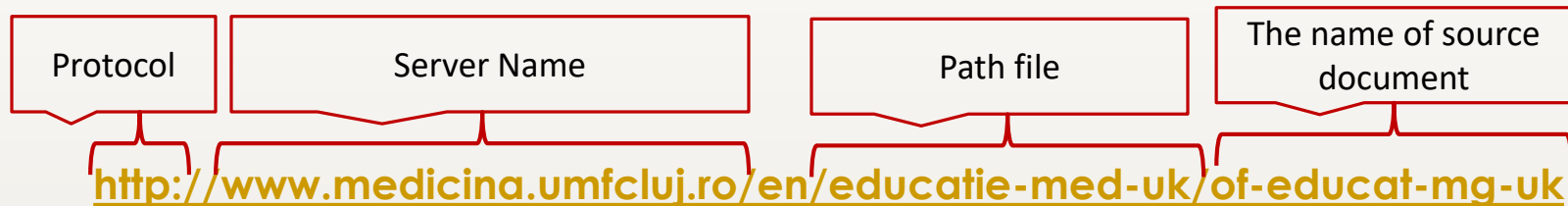
Internet

Global network of interconnected computer networks that use Transmission Control Protocol (TCP/IP) to connect billions of devices around the world.

It can be considered that the Internet is a motorway of information.

Internet

URL (Uniform Resource Locator) address



Periodic Table of the Internet

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
<div>Yahoo.com</div> <div>Y!</div> <div>1</div>																	<div>Wikipedia.org</div> <div>Wk</div> <div>10</div>
<div>Google.com</div> <div>Go</div> <div>2</div>	<div>Firefox</div> <div>Fx</div> <div>1,512</div>											<div>Briggs.com</div> <div>Br</div> <div>27</div>	<div>MySpace.com</div> <div>Me</div> <div>6</div>	<div>David Ramsey.com</div> <div>Dr</div> <div>6,853</div>	<div>ThisLife.org</div> <div>Al</div> <div>77,930</div>	<div>HomeStar Business.com</div> <div>Hs</div> <div>7,215</div>	<div>em.com</div> <div>Cn</div> <div>35</div>
<div>Live.com</div> <div>Li</div> <div>7</div>	<div>Skype.com</div> <div>Sk</div> <div>2,378</div>											<div>BangBang.net</div> <div>Bb</div> <div>8,043</div>	<div>Facebook.com</div> <div>Fb</div> <div>29</div>	<div>OnPointRadio.org</div> <div>Pr</div> <div>110,962</div>	<div>RadioOpenSource.org</div> <div>Os</div> <div>134,097</div>	<div>ZaFrank.com</div> <div>Ze</div> <div>23,593</div>	<div>nytimes.com</div> <div>Nt</div> <div>152</div>
<div>Ask.com</div> <div>Ak</div> <div>16</div>	<div>Blogger.com</div> <div>Tt</div> <div>8,127</div>	<div>TechCrunch.com</div> <div>Tc</div> <div>453</div>	<div>Digg.com</div> <div>Gg</div> <div>24</div>	<div>Penny Arcade.com</div> <div>Pa</div> <div>20,671</div>	<div>LifeHacker.com</div> <div>Lh</div> <div>3,670</div>	<div>eBags.com</div> <div>Eb</div> <div>3</div>	<div>iStockphoto.com</div> <div>Ms</div> <div>11</div>	<div>Amazon.com</div> <div>Az</div> <div>9</div>	<div>YouTube.com</div> <div>Ut</div> <div>12</div>	<div>Flickr.com</div> <div>Fr</div> <div>40</div>	<div>IMDb.com</div> <div>Md</div> <div>49</div>	<div>Mash2Go.com</div> <div>Mk</div> <div>8,544</div>	<div>LiveJournal.com</div> <div>Jo</div> <div>470</div>	<div>Hudson River Park.org</div> <div>Ya</div> <div>146,195</div>	<div>Grommet.com</div> <div>Gr</div> <div>149,876</div>	<div>AskaNinja.com</div> <div>An</div> <div>39,033</div>	<div>www.bbc.co.uk</div> <div>Bc</div> <div>177</div>
<div>Lycos.com</div> <div>Lc</div> <div>99</div>	<div>FreeWire.com</div> <div>Fw</div> <div>13,386</div>	<div>Compete.com</div> <div>Cm</div> <div>11,403</div>	<div>Reddit.com</div> <div>Dd</div> <div>1,866</div>	<div>xbox.com</div> <div>Xk</div> <div>25,769</div>	<div>43folders.com</div> <div>43</div> <div>75,907</div>	<div>Craigslist.org</div> <div>Cl</div> <div>28</div>	<div>Apple.com</div> <div>Ae</div> <div>48</div>	<div>Sneakers.com</div> <div>Sn</div> <div>333</div>	<div>DeviantArt.com</div> <div>Dv</div> <div>703</div>	<div>ArtStation.com</div> <div>Ar</div> <div>1,620</div>	<div>StumbleUpon.com</div> <div>Su</div> <div>2,932</div>	<div>Food Magazine.com</div> <div>Fo</div> <div>99,425</div>	<div>iStock.com</div> <div>Be</div> <div>486</div>	<div>OnYourMark.org</div> <div>Tm</div> <div>201,413</div>	<div>Longnow.org</div> <div>Ln</div> <div>494,134</div>	<div>Ted.com</div> <div>Td</div> <div>62,488</div>	<div>Wired.com</div> <div>Wd</div> <div>3,015</div>
<div>iStockphoto.com</div> <div>Av</div> <div>499</div>	<div>Gimp.org</div> <div>Gi</div> <div>23,184</div>		<div>DeLiaze.com</div> <div>Us</div> <div>1,930</div>	<div>p4f.com</div> <div>Pb</div> <div>69,472</div>	<div>WebMuseum.com</div> <div>Wb</div> <div>107,118</div>	<div>FreeCycle.org</div> <div>Fc</div> <div>6,201</div>	<div>Urbanspoon.com</div> <div>Ub</div> <div>34,899</div>	<div>iStockphoto.com</div> <div>/.</div> <div>6,081</div>	<div>Creative Commons.org</div> <div>Co</div> <div>6,131</div>	<div>Creative Commons.org</div> <div>Cc</div> <div>7,834</div>	<div>Something Awful.com</div> <div>Sa</div> <div>16,675</div>	<div>MindHacks.com</div> <div>Mh</div> <div>81,664</div>	<div>Friendster.com</div> <div>Fd</div> <div>1,303</div>	<div>In Our Time</div> <div>It</div> <div>1,000,000+</div>	<div>weekendradio.com</div> <div>Pz</div> <div>931,905</div>	<div>TheMerlin Show.com</div> <div>Mr</div> <div>1,000,000+</div>	<div>Examiner.com</div> <div>Ec</div> <div>10,372</div>
<div>Examiner.com</div> <div>Ex</div> <div>916</div>	<div>Leakage.org</div> <div>Ik</div> <div>195,541</div>		<div>Park.com</div> <div>Fk</div> <div>9,999</div>	<div>www.bbc.co.uk</div> <div>Wh</div> <div>250,607</div>	<div>UsefulStuff.com</div> <div>Uc</div> <div>505,029</div>	<div>Book Crossing.com</div> <div>Bk</div> <div>39,254</div>	<div>Free888.org</div> <div>Bd</div> <div>51,037</div>	<div>Twitter.com</div> <div>Tx</div> <div>25,651</div>	<div>art.org</div> <div>Ff</div> <div>30,140</div>	<div>Megamix.com</div> <div>Cr</div> <div>55,869</div>	<div>Vengas.com</div> <div>Gk</div> <div>75,367</div>	<div>GrubLuv.net</div> <div>Gk</div> <div>338,403</div>	<div>Orkut.com</div> <div>Or</div> <div>4,600</div>	<div>Escapepod.org</div> <div>Ep</div> <div>1,000,000+</div>	<div>Radio Lab</div> <div>Rl</div> <div>1,000,000+</div>	<div>www.radiotime.com</div> <div>St</div> <div>1,000,000+</div>	<div>Loadstar.com</div> <div>Ld</div> <div>188,488</div>

I Search Engines IV Aggregators VII Get Stuff XIII Blogs XVII Videos
 II Internet Tools V Webcomics VIII Operating Systems XIV Social Networking XVIII News
 III Site Ranking VI Productivity IX-XII Miscellaneous XV-XVI Podcasts

 ← Site URL
 ← Symbol
 ← Rank

Periodic Table of Internet

I												II												III												IV												V												VI												VII												VIII												IX												X												XI												XII												XIII												XIV												XV												XVI												XVII												XVIII																																															

Search Engines	I
Calls & Communication	II
Social Networks	III
Webdesign Basics	IV
Blogging Platform	V
Web browsers	VI

Download Managers	VII
Online Payment Gateways	VIII
Operating Systems	IX
Popular Sites - 1	X
Popular Sites - 2	XI
Popular Sites - 3	XII

Social Sharing	XIII
Popular Flash Games	XIV
AIO Information	XV
File Sharing Sites	XVI
Buy Sell Rent Lease	XVII
Latest News Portal	XVIII

All logo, Images and Trademark are subjected to copyright by their respective owners. This table is meant for educational Purpose only.

Periodic Table of Internet - Designed by Abhinab Choudhury | www.webmasterfacts.com | No part of this design, concept may be reproduced without the prior agreement of the designer.

eHealth

Definition

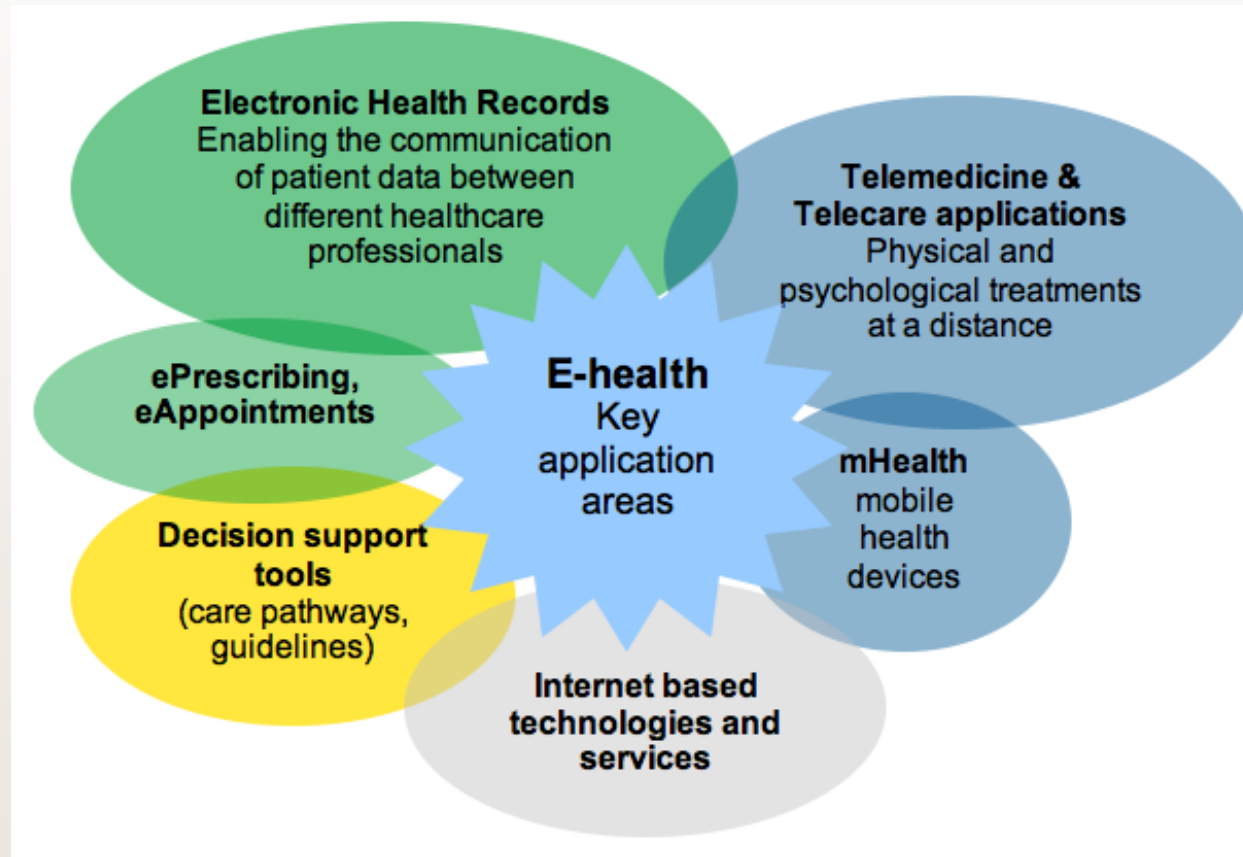
E-health refers to the use of modern information and communication technologies to meet the needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers.

eHealth

Why e-health?

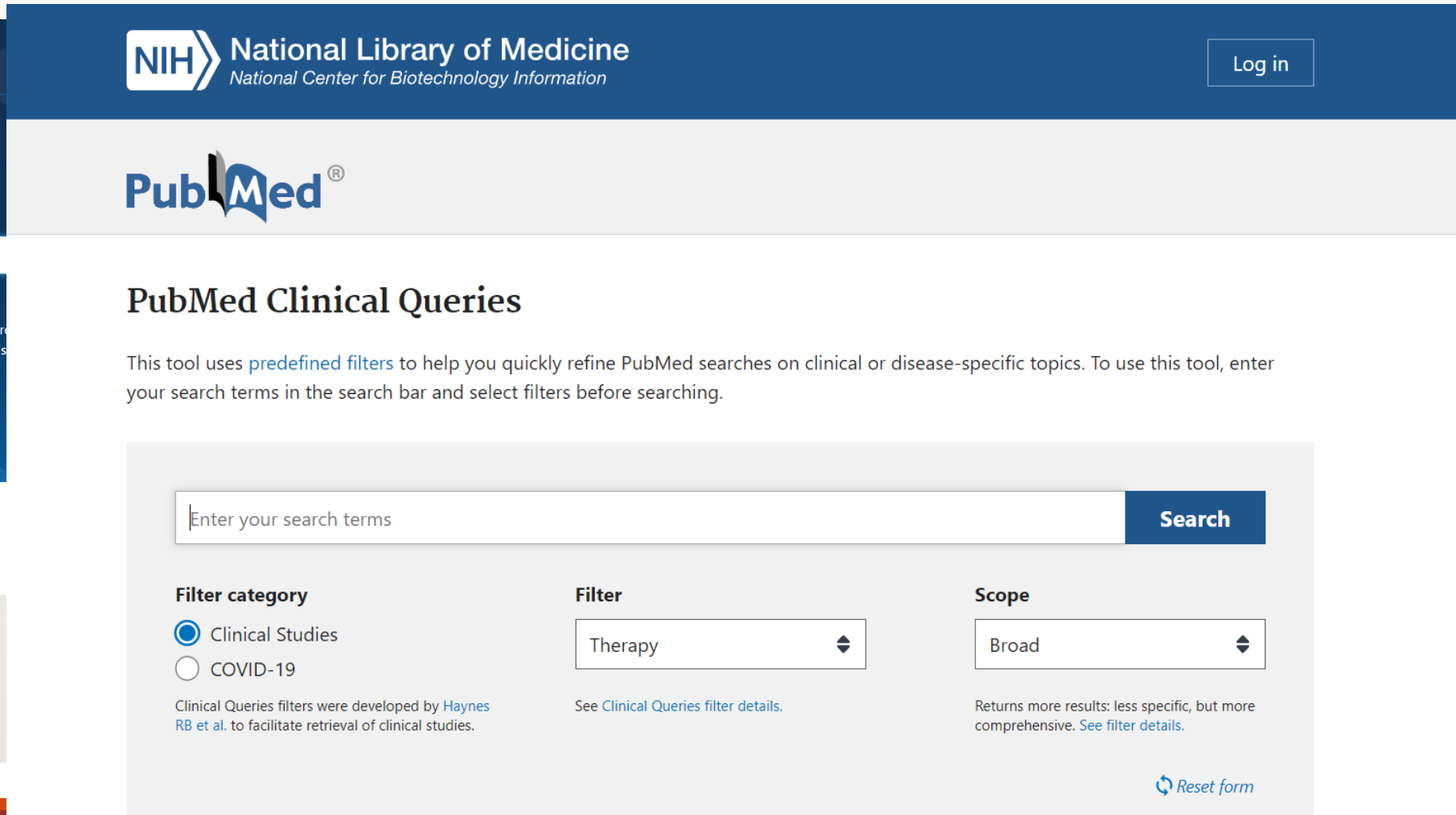
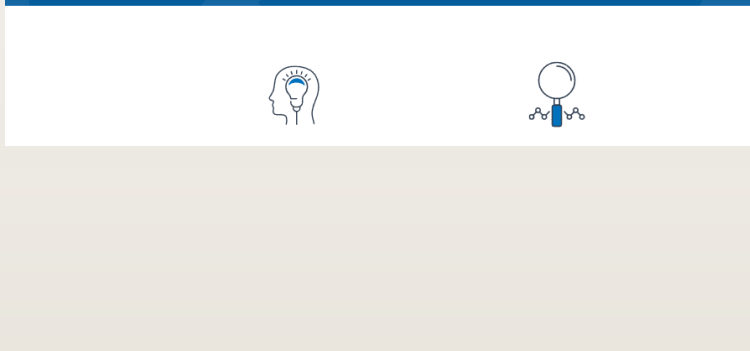
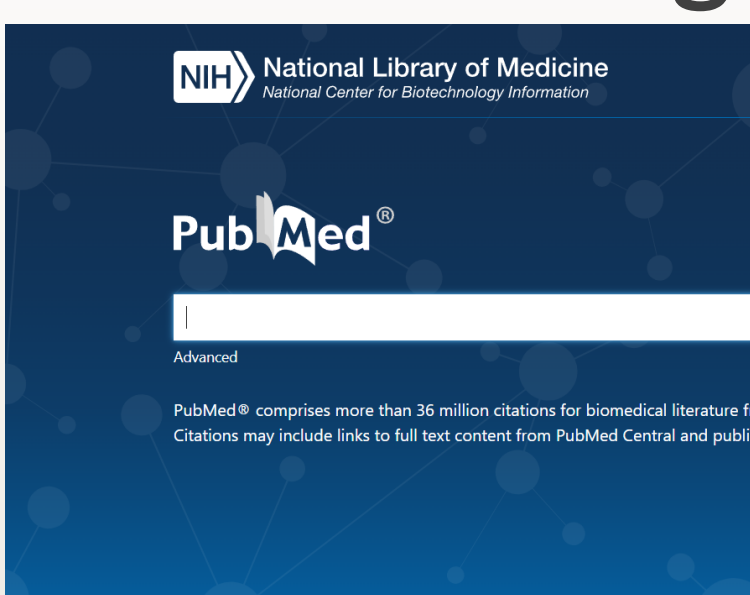
- ➡ Facilitating access to healthcare, whatever the geographical location
- ➡ Breaking down the barriers, enabling health service providers from different regions to work more closely together
- ➡ Higher quality of medical services
- ➡ Increased transparency in healthcare
- ➡ Save time and money
- ➡ More reliable diagnosis and treatment
- ➡ Especially adapted to the needs of an ageing society

eHealth



NLM has been indexing the biomedical literature since 1879
>5,600 biomedical journals published in the United States and in other countries

Searching Medical Information



Searching Medical Information

1. Check the significance of the terms you are looking for: use [MeSH \(Medical Subject Headings\)](#) database
 - Correct search terms is mandatory
 - Use Boolean operators to combine search terms:
 - AND: used to retrieve manuscript that contains *all* search terms
 - OR: retrieve articles that include *at least one* of the search terms
 - use '*' to extend the search: *acquir* infection* → **106916** results

Keywords	Results
(hospital-acquired infection)="hospital-acquired infection"	128124
(hand washing) = "hand washing"	8901
(hospital-acquired infection) OR (hand washing)	134370
(hospital-acquired infection) AND (hand washing)	2655
(hospital-acquired infection) AND (hand washing) AND (Clostridium difficile)	109

Searching Medical Information

1. Check the significance of the terms you are looking for: use [MeSH](#) ([Medical Subject Headings](#)) database
2. Use dedicated medical resources:
 - Books ([National Center for Biotechnology Information](#) (free) | [FreeBookCenter](#) | [FreeBooks4Doctors](#) | [AccessMedicine](#) (access fee) | etc.)
 - Guidelines: [ACOG](#) – Physician Guidelines & Reports, [EAU](#) – European Association of Urology, [ESC Clinical Practice Guidelines](#) – European Society of Cardiology, [ESMO Clinical Practice Guidelines](#) – European Society for Medical Oncology, [NCCN Guidelines® & Clinical Resources](#) – National Comprehensive Cancer Network, [John Hopkins Guide](#), [NGC](#) – National Guideline Clearinghouse

Searching Medical Information

2. Use dedicated medical resources:

- Studies communicated to scientific congresses and meetings
- Articles published in the scientific journals: Lancet, New England Journal of Medicine, JAMA, BMJ, BMC
- Bibliographic databases: [PubMed](#) & MEDLINE (available via PubMed), [ScienceDirect](#), [Wiley](#), [Google Scholar](#), [Web of Science](#), etc.
- Pubmed – building a search:
<https://www.youtube.com/watch?v=xGYFDrORpzA>

Summary!

- Data ≠ Information ≠ Knowledge
- Information theory lead to the quantity of Information.
- Coding Information is important.
- Internet Protocols do the hidden job.
- Knowing the correct term of interest is a MUST in searching medical information --- MeSH database



“Data isn’t information. ... Information, unlike data, is useful. While there’s a gulf between data and information, there’s a wide ocean between information and knowledge. What turns the gears in our brains isn’t information, but ideas, inventions, and inspiration. Knowledge-not information-implies understanding. And beyond knowledge lies what we should be seeking: wisdom.”

~CLIFFORD STOLL