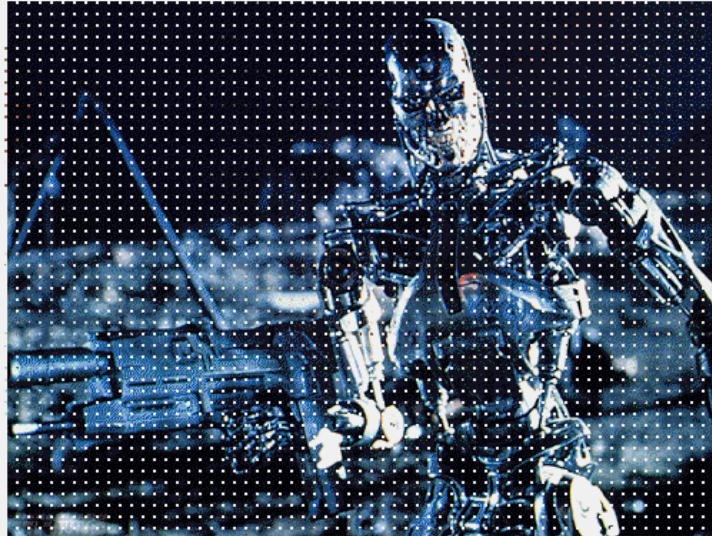


Artificial Intelligence

1



<http://personal.psu.edu/jsd222/>

ARTIFICIAL INTELLIGENCE (AI)
EXPERT SYSTEMS
INTELLIGENT MACHINES
ROBOTICS/ANDROIDS
DECISION MAKING MACHINES

SMART BOMBS

3



<http://personal.psu.edu/jsd222/>

Hughes Aerospace – Smart Weapons

4

- Programmed with Multiple Mission Objectives
 - AI Program already knows best ways to accomplish the objectives.
 - GPS gets munitions to target area.
 - At target area GIS mapping gets them to battlefield
 - Pattern Recognition Software determines target(s)
 - From position and angle of attack best mission objective is found
 - Mission is carried out

COM COM ENGINEERING

Constrained ICR

5

Medical History

Johnson Medical Clinic
37628 SW Eastern Avenue
Portland, OR 97222
Phone: 503-284-3976
Fax: 503-284-3979

Patient Barcode ID
2 03489 74382 2

Contact Information

First Name: STANLEY
MI: R
Last Name: SMITH
Street: 12345 ANYWHERE STREET
City: PORTLAND
State: OR
Zip Code: 97222-1234
Sex: Male Female
Date Of Birth: 05-01-60
Social Security Number: 544-12-3456
Height: 61
Weight: 185

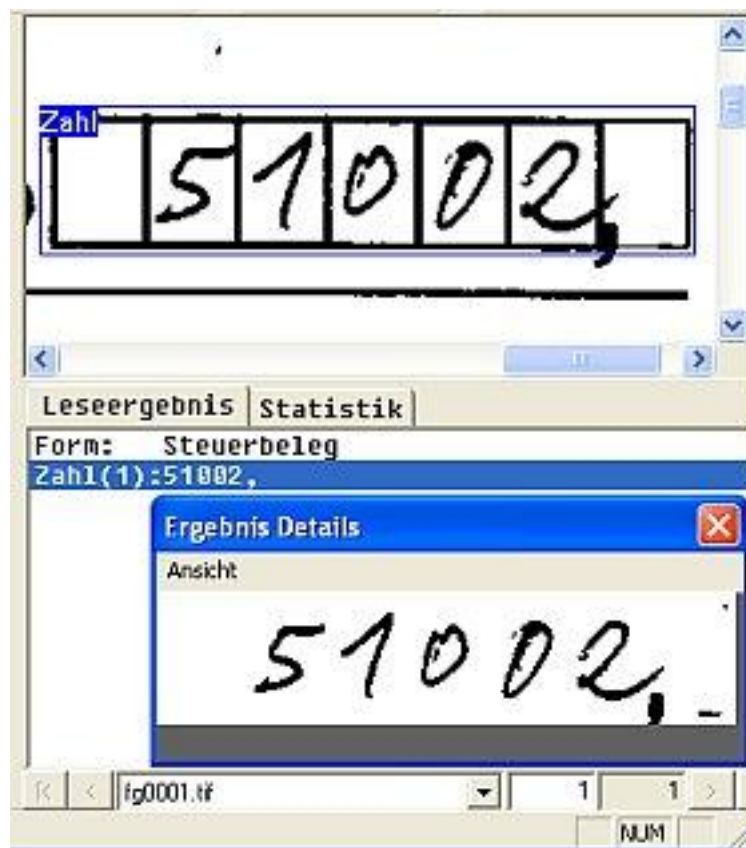
Do You Exercise? (Times/Week)

Never Rarely 1 2 3 4 5 6 7

For Help, press F1 | Snap: 1 | 5,573, 0.125 | Record Number 0

HUGHES AEROSPACE PATTERN RECOGNITION UNCONSTRAINED ICR

6



Drug Interdiction Taskforce Data Anomaly

H Hig—Hof

48

555-1212
JON

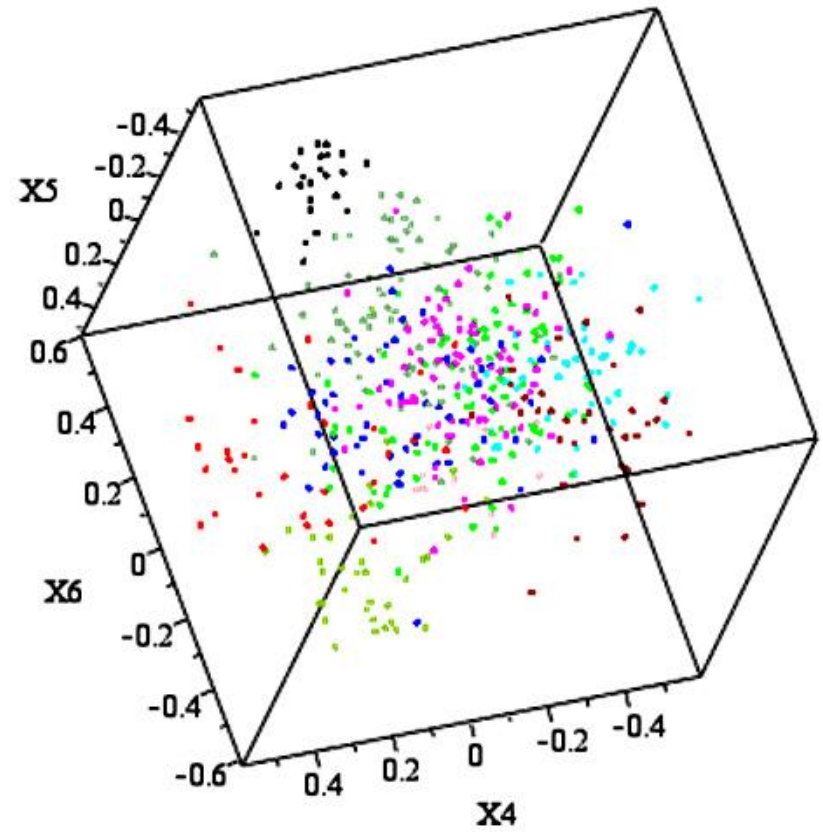
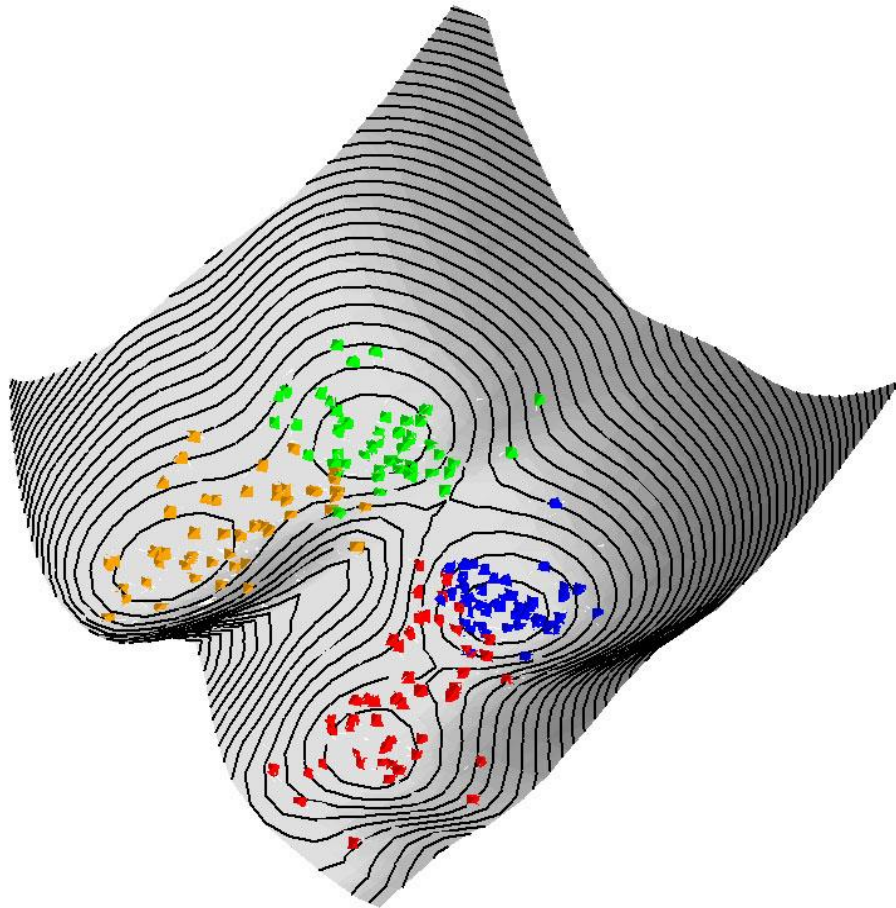
Continued - From previous page
HIGHMARK BLUE CROSS BLUE SHIELD
 Highmark Caring Foundation-Johnstown
 Highmark Caring Place Center for Grieving Children ----- 532-5431
 CHIP Of Pennsylvania
 Toll Free ----- 800 543-7105
 For Service Specific To Your Account Call The 800
 Number On The Back Of Your Member Identification C
TOLL FREE ----- 800 241-5704
Medicare Related Services
Customer Service
Group Enrolled Members
 SecurityBlue Members ----- Toll Free 800 935-2583
 SecurityBlue TTY Enrollment
 Toll Free ----- 800 862-0709
 KeystoneBlue HMO-Group Members
 Toll Free ----- 800 547-9378
For All Other Types Of Group-Enrolled Coverage
 Toll Free ----- 800 241-5704
 Hight Lawrence E 548 55 St Altoona ----- 946-0533
 Higley Cindy 420 Meade St Tyrn ----- 686-4985
 Hilbert Eric G 1231 Madison Av Altoona ----- 942-7564
 Hild Laurel E 305 Walnut Av Altoona ----- 942-4428
 Hildebrand Bryce 23 Majestic Cir Hollidaysburg --- 695-3524
 Charles R 1700 Hamilton Av Tyrone Boro ----- 684-1062
 Eugene V 225 E Lincoln Av Altoona ----- 943-2464
 Greg Decker Hollow Tyrn ----- 684-3267
 Harold W Spruce Creek ----- 632-3941
 Leslie E 431 E Logan Av Altoona ----- 946-4430
 Lynn D 2506 Broad Av Altoona ----- 946-9737
 Lynn P 537 53 St Altoona ----- 946-0054
 Ralph L 2500 Lark Av Altoona ----- 942-8586

Hill Ralph Edwin 2720 6 Av Altoona ----- 942-7806
 Ralph Edwin 2720 6 Av Altoona ----- 949-1978
 Richard A Kelly Dr Freedom ----- 696-3665
 Robert HC 01 Spruce Creek ----- 632-5274
 Robert A Avalon Rd Altoona ----- 942-5298
 Rodney L 4 Maple Hollow Townhouse Duncansville - 693-9554
 Ronald A Eldorado Trailer Park Altoona ----- 946-3459
 Terry A RD 2 Tyrn ----- 742-7441
 Todd A 319 Raible Dr Allegheny ----- 696-0963
 Hillard Billie Joe 183 Willowbrook Vlg Duncansville - 317-7504
 Dana 129 E Maple Ct Altoona ----- 946-5009
 G L 1409 1 Av Altoona ----- 949-4045
 J I RD 4 Altoona ----- 942-2266
 James D 802 Broadway Juniata ----- 943-7161
 Jeremy 1113 22 Av Altoona ----- 942-1276
 John E 111 N 8 Av Juniata ----- 944-2781
 John J 507 W 15 Tyrn ----- 684-1507
 John L 1212 N Cambria St Bellwood ----- 742-7389
 John M RD 1 Altoona ----- 942-6357
 Joseph S 623 4 Alley Apt Av Juniata ----- 949-3715
 Joshua C 2310 12 St Altoona ----- 941-2346
 Kevin L 834 Washington Av Tyrn ----- 684-2134
 Renee 1409 1 Av Altoona ----- 949-4045
 Hillcrest Estates 501 S Dartmouth Lane Altna --- 942-7434
 Hilldale Robert 3517 Ft Roberdeau Ave Altoona --- 515-2510
 Hillegas R S ----- 941-7458
 Hillegass M 115 Zimmerman Ln Allegheny ----- 696-9040
 Hillendale Associates Homers Gap Rd Altna ----- 943-9099
 Hiller Deborah D RD 1 Tyrn ----- 684-5814
 J Scott RD 1 Tyrn ----- 684-5814
 John A Jr 3 Laurel Dr Tyrn ----- 684-2021
 Kinder RD 1 Tyrn ----- 684-1489
 Hiller W F Agency Inc The 970 Penna Av Tyrn ----- 684-3340
 Hilliard Susan 15 Cross Keys Village Allegheny ----- 695-1762

Himes Terry L 176 Sunrise Ct Altoona ----- 742-7087
 Thomas R D 1 Altoona ----- 943-8477
 William D 337 S 2 St Bellwood ----- 742-7013
 William J Rr 2 Box 361-A Tyrn ----- 742-8664
 Himmel Ronald 232 Woods Ln Antis ----- 949-4744
 Himmelein R A 2317 13 St Altoona ----- 943-1454
 Hincerick Henry J Ashville ----- 943-5377
 Hinderliter Evie I State Route 1017 Tyrn ----- 686-4996
 Harold State Route 1017 Tyrn ----- 686-4996
 Hindinger Joseph 3801 3 Av Altoona ----- 942-7813
 M 908 3 St Logan ----- 942-7478
 Hinds J 2004 Juniata Gap Rd Logan ----- 944-9567
 Hines Auto Care and Repair 501 4 Av Altna ----- 942-7101
 Hines B E RR 6 Box 1370 Altoona ----- 944-9248
 Bobby 210 1/2 Willow Av Altoona ----- 942-7807
 Hines Brothers Feed Mill 402 2 St Cresn ----- 886-4171
 Hines Christina RD 1 Ebensburg ----- 886-7771
 D P 1200 16 St Altoona ----- 942-5727
 Dennis E Munster ----- 886-8770
 Edward Jr 500 Powell Av Cresson ----- 886-2840
Hines Equipment
 Old Route 22 W Cresn ----- 886-4183
 Route 220 Belwd ----- 742-8171
 Hines Equipment Route 220 Bellwood ----- 742-7553
 Hines Equipment Route 22 W Cresn ----- 886-7549
 Hines Eugene D Webster Hill Cresson ----- 886-7239
HINES FEED STORE 210 S Juniata St
 Holdysbrg ----- 695-9771
 Hines J E 901 Maple Av Hollidaysburg ----- 695-2306
 James 911 Green Ave Altoona ----- 515-2556
 James D RR 2 Hollidaysburg ----- 695-0674
 Joseph RD 1 Loretto ----- 886-5887
 Joseph E 513 5 St Cresson Boro ----- 886-4186
 K E RR 6 Box 1370 Altoona ----- 944-9248

Data Mining

8



Turing Machine

9

- AI was described by Alan Turing in his 1950 paper "Computing Machinery and Intelligence,"
- Turing Machine
- Symbolic Linear Storage
- Basis of our computers today

Artificial Intelligence - Defined

10

- Artificial intelligence (AI) is a system that perceives its environment and takes actions which maximize its chances of success at completing an objective or defining an objective.
- John McCarthy, who coined the term in 1956, defines AI as "the science and engineering of making intelligent machines."

Turing Test of AI

11

- If a judge cannot reliably tell a machine from a human, the machine is said to have passed the test.

Features or Learning Based

12

□ 2 Types of Systems

▣ Learning AI System

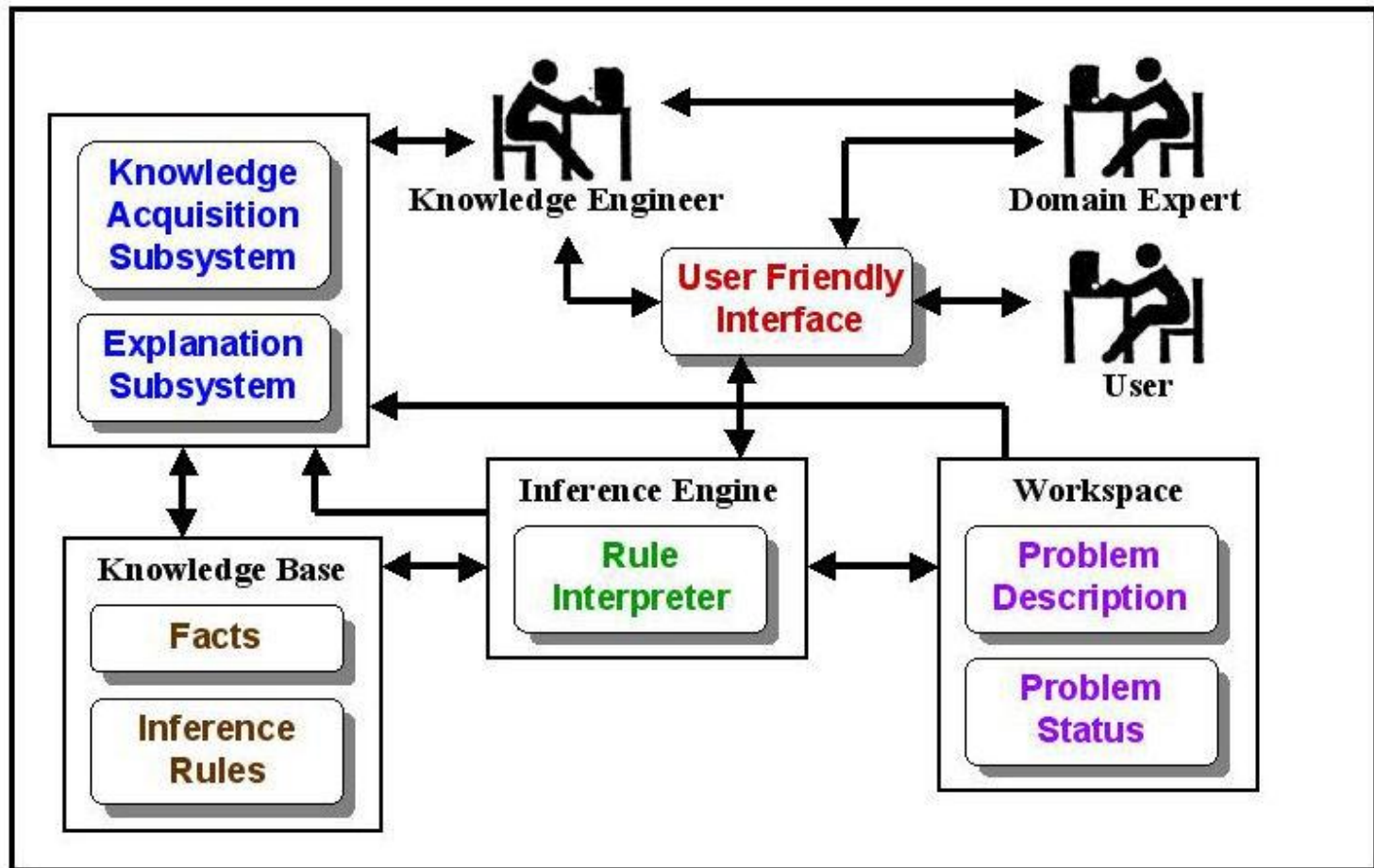
- Continues to learn through time as it processes more and more data and it is interpreted by humans and entered into is storage system.

▣ Features Based

- At a certain point of learning a program is spun off that knows everything the learning system does but it doesn't continue to learn.
- This saves processing power and storage space and allows the features to be applied to most any machine

Teaching your AI System

13



An AI Training Problem

14

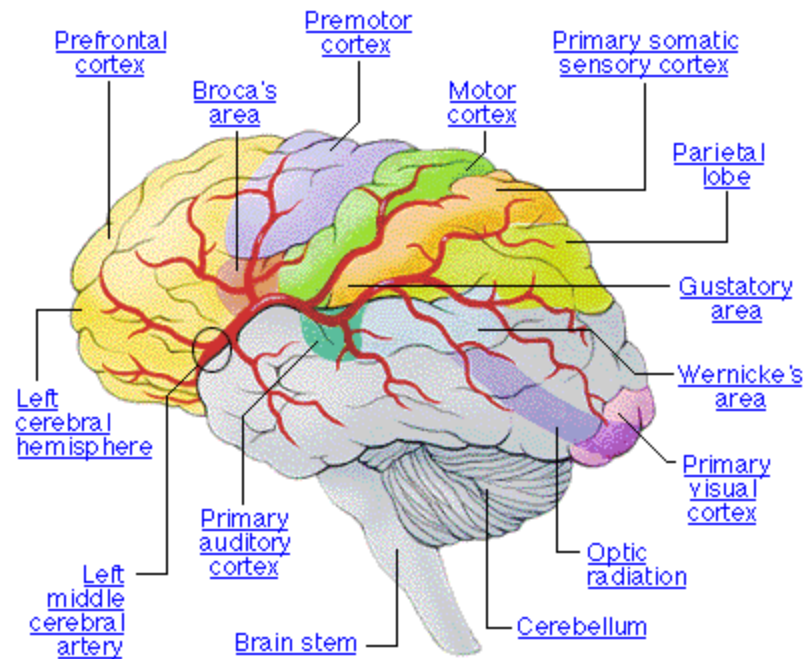
- Jeff Hawkins <http://www.numenta.com/> The inventor of the palm pilot. Now a neuroscientist and founder of [numenta](http://www.numenta.com/) proposed this AI training problem during a recent public appearance.

**Mary saw a puppy in the window.
She wanted it.**

Biological Intelligence

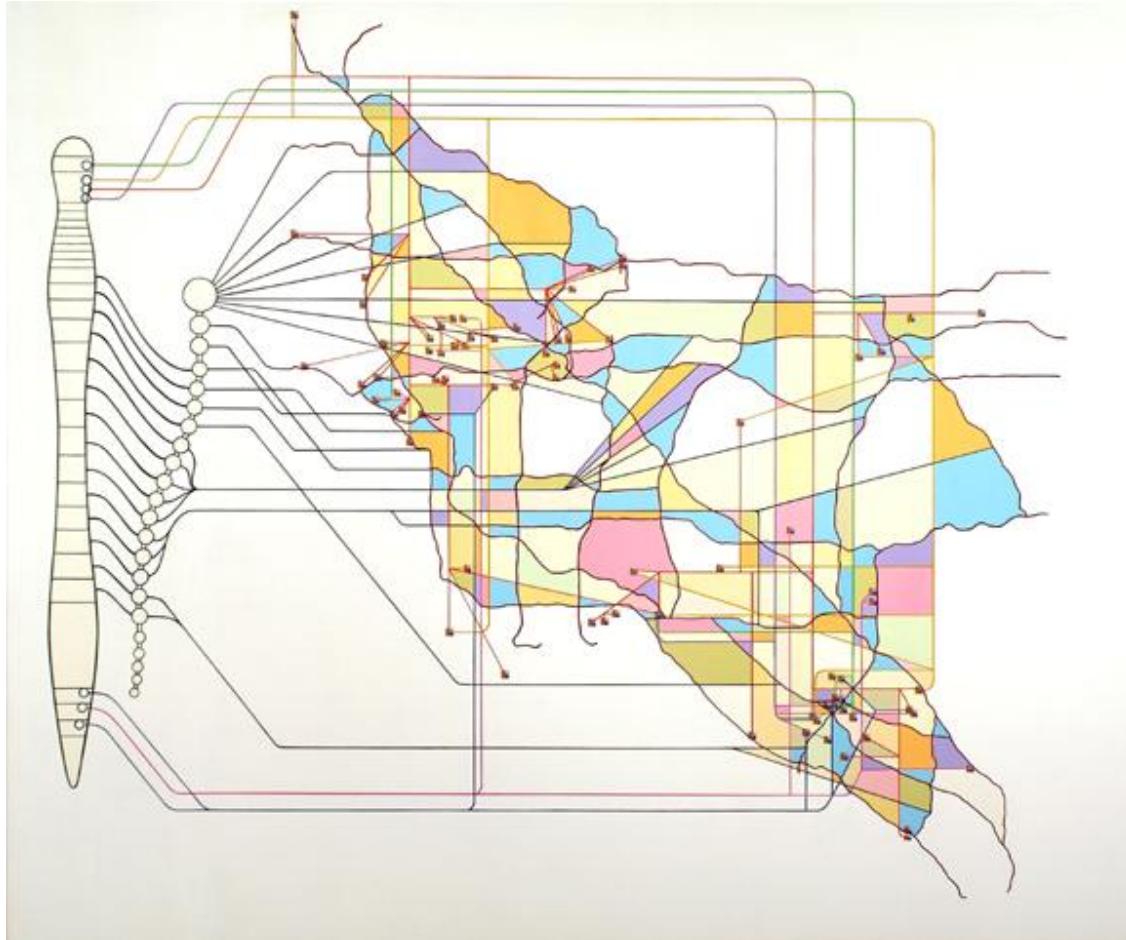
15

- We can map the biological brain and duplicate it.



Mapping the Brain

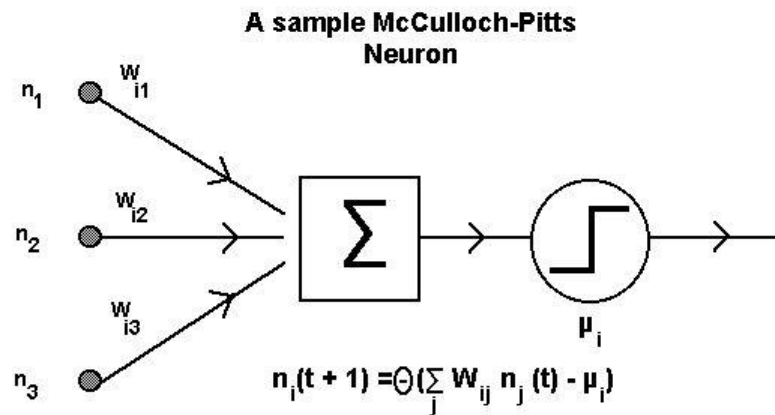
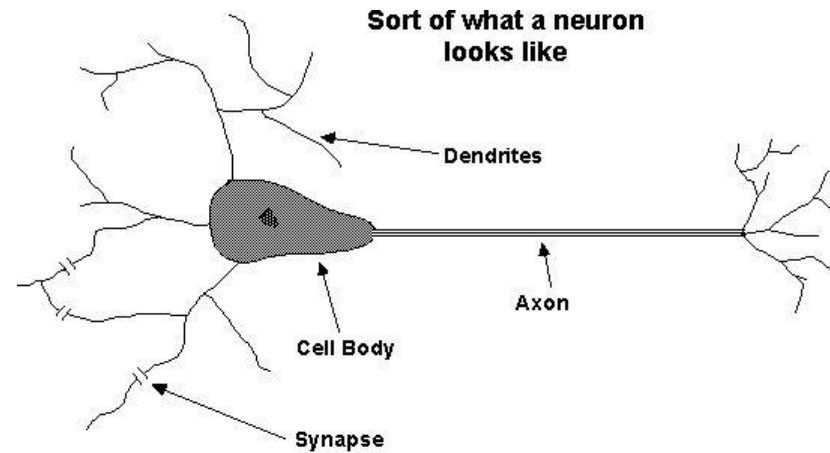
16



<http://personal.psu.edu/jsd222/>

Mapping the Brain

17

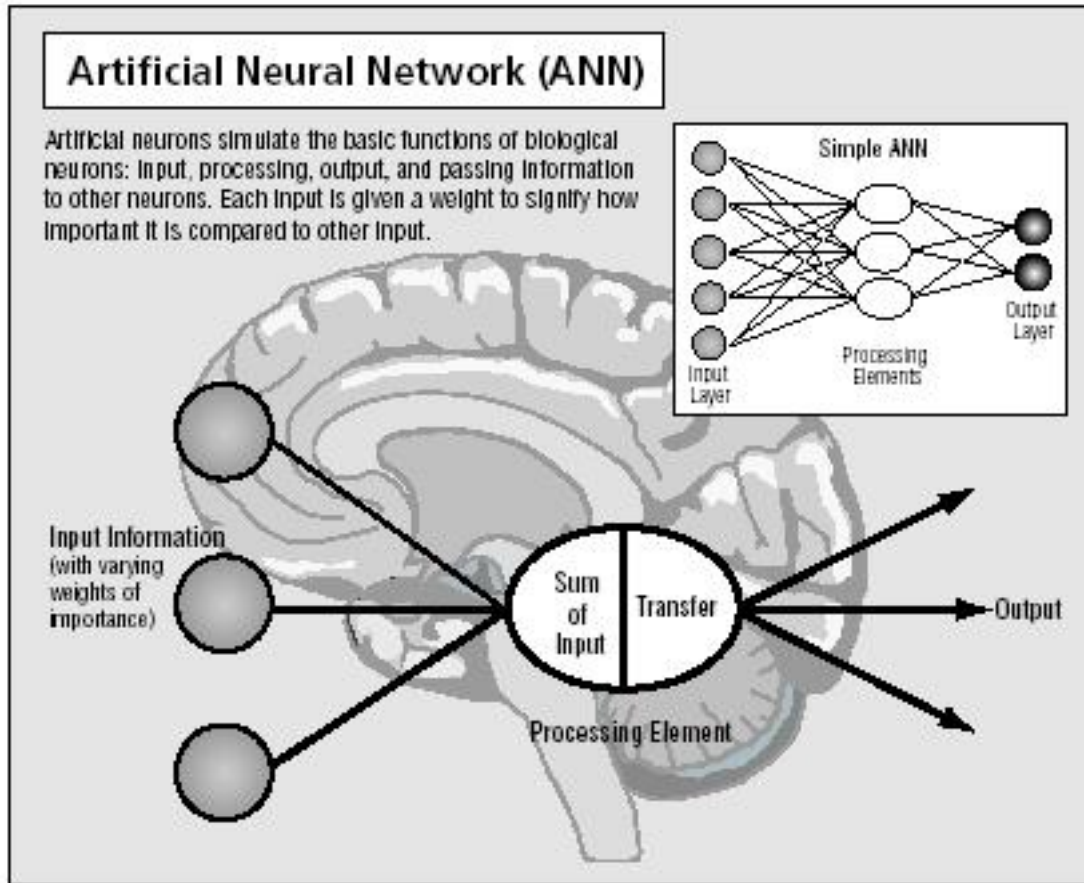


$$\Theta(x) = \begin{cases} 1 & \text{if } x \geq 0; \\ 0 & \text{otherwise.} \end{cases}$$

<http://personal.psu.edu/jsd222/>

Mapping the Brain

18



Hierarchical Temporal Memory

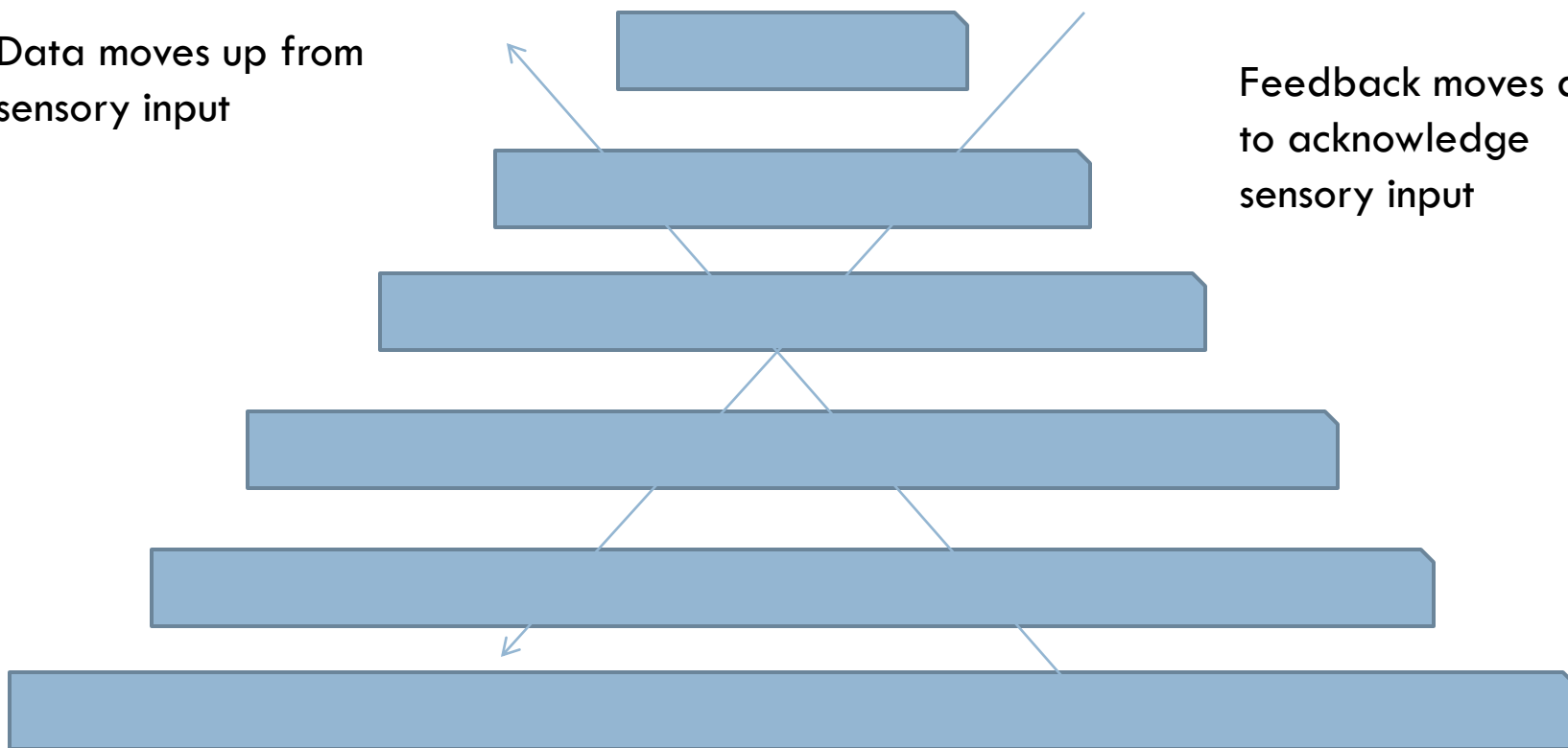
All sensory input is time sensitive

19

Sensory input at bottom – Processing at top

Data moves up from
sensory input

Feedback moves down
to acknowledge
sensory input



No Free Lunch Theory

20

- No one single learning algorithm can be better than all other algorithms for all problems.
- This means we need to fine tune each of our algorithms or create new ones for each of our specific applications.

Not Limited to Biological Senses

21

- ❑ Will allow for Foreign Sensory Input
- ❑ Infrared inputs
- ❑ Direct Data Interchange
- ❑ Sensors from Cars and Traffic Cameras
- ❑ Video Inputs on all spectrums
- ❑ X-rays
- ❑ Can accept feed from anything that can be digitized as sensory input

BIGGER FASTER STRONGER

22

- Biological neurons are slow. The fastest they can do anything is about 5ms
- We can make computer memory at least a million times faster than this
- We can make memories much bigger than biological memories and even widen the nodes of the hierarchies
- This means we will be able to process real time data much faster than a human ever could.

USES FOR ARTIFICIAL INTELLIGENCE

23

Financial Applications

Stock Market Analysis

Intelligence Gathering

Problem Solving - Decision Making

Medical Diagnosis

Robotics

Computer Modeling

Nano Technology

Data Discovery

We are only limited by our own minds...

for now.....

The Future

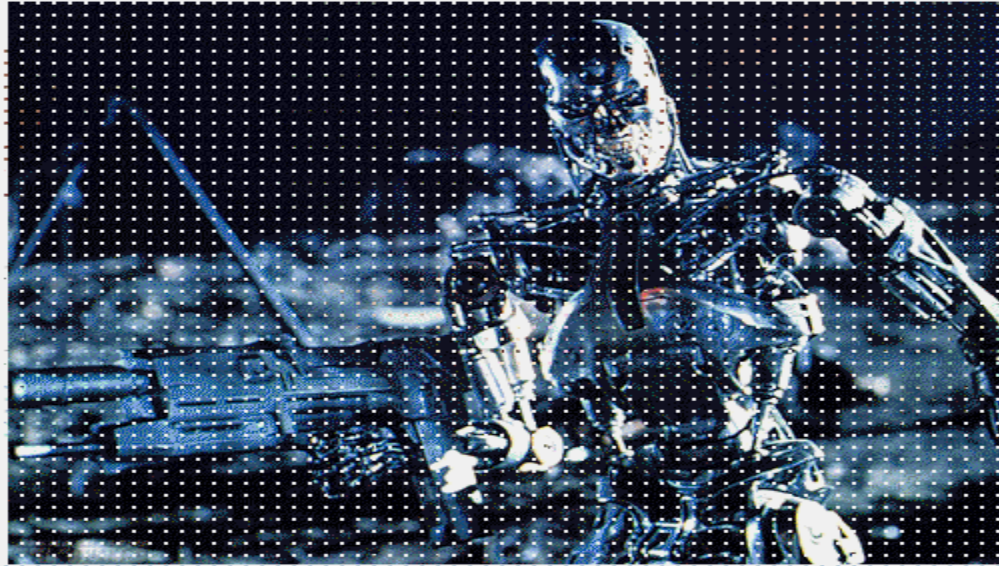
25



<http://personal.psu.edu/jsd222/>

Questions and Discussion

26



<http://personal.psu.edu/jsd222/>