What is matter, never mind
What is mind, doesn't matter.

Or Does it !!??

John Connor:

So can learn stuff you haven't been programmed with,
so that you can be more….
u know …
…more Human ! ! ?

The Terminator:

My CPU is a neural net processor, a learning computer. The more contact I have with humans the more I learn.

Learning Machines
(No longer Science Fiction, but a scientific reality)

Imagine an artificial "intelligent" system, which operates beyond the realms of conventional programming.

It operates just as humans do, by learning and through experience.

Such systems are not mere figments of science fiction but, can actually be realized using Neural Networks Systems.

So What are Neural Networks !??

Artificial Neural networks are mathematical models that emulate some of the observed properties of biological nervous systems and draw on the analogies of adaptive biological learning.

WHOA !!

Well its basically simulation of the characteristics observed in the brain, by an artificial model.

Quantum Leap in thinking

Conventional Programming

- Code is Rigid, "hardwired", and non adaptive
  It does not "learn" and "evolve".
- Not "intelligent"
  (Does not make decisions and conclusions on its own)

The Neural Network Approach

- *Learning Systems:*
  System can learn beyond its conventional programming
- *Neurobiological Analogy :*
  Better models the human brain
- *Fault tolerant:*
  Performance degrades gracefully under adverse operating conditions

Current Applications of Neural Networks

Science
- Robotic Movements
- Learning Machines

Medical
- Breast Cancer
- Heat Attack Diagnosis
- ER Test Ordering

Pattern Reconition
- Speech Recognition
- Article Classification

Stocks
- Corporate Bonds
- Stock Price Prediction
- Natural Gas Prediction

Work Currently being carried out by the department

Olfaction: The Sense of Smell

Hmmm…
It smells good ! ! !

We receive odor at the nose

Brain process odor signals

Our goal is to develop mathematical models of olfactory bulb, which processes the odor signals

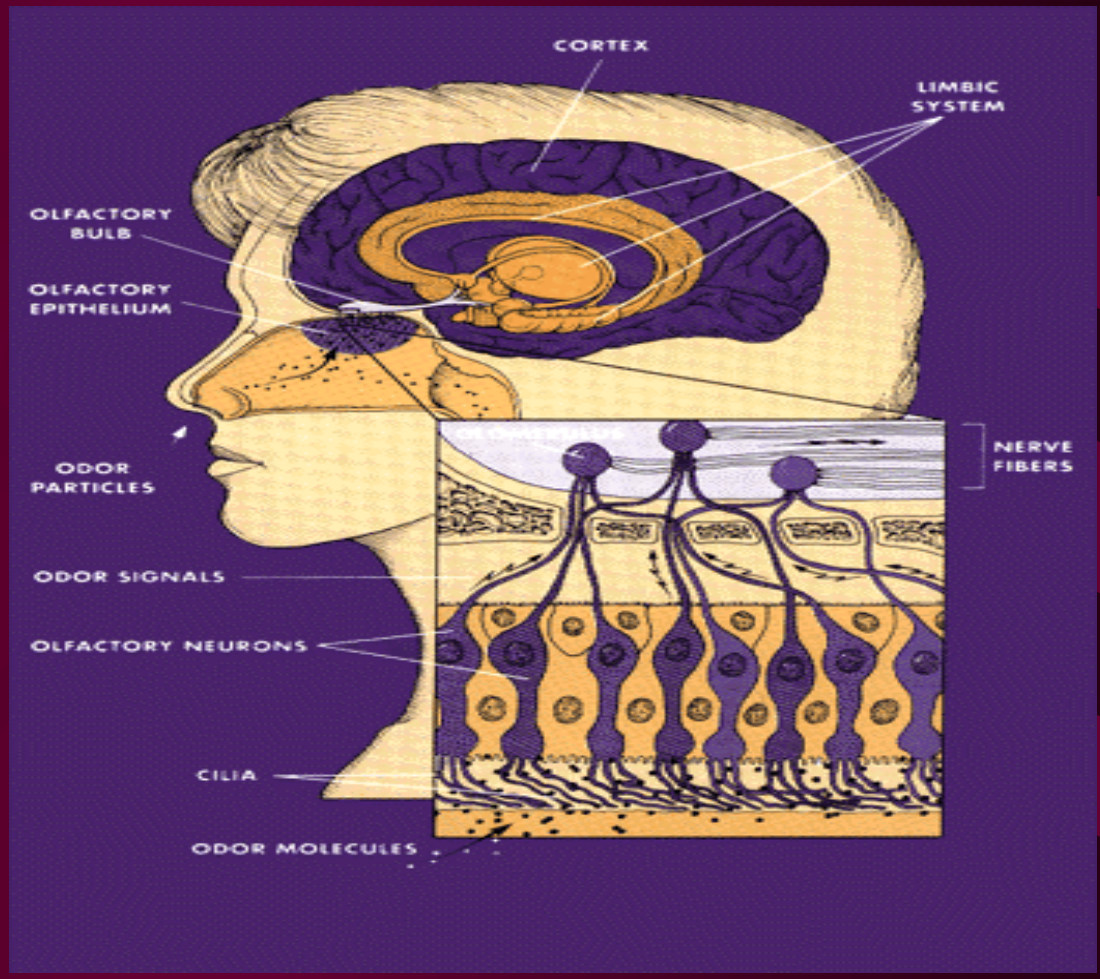
Pathways of sense of smell :

The Olfactory Bulb

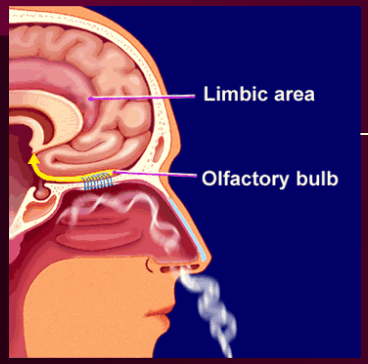
The **Olfactory Bulb** specializes in processing the molecular signals that give rise to the sense of smell.

It is located in the anterior region of the brain just above the nasal cavity.

The olfactory bulb receives input from the olfactory sensory neurons and sends its output directly to the olfactory cortex.

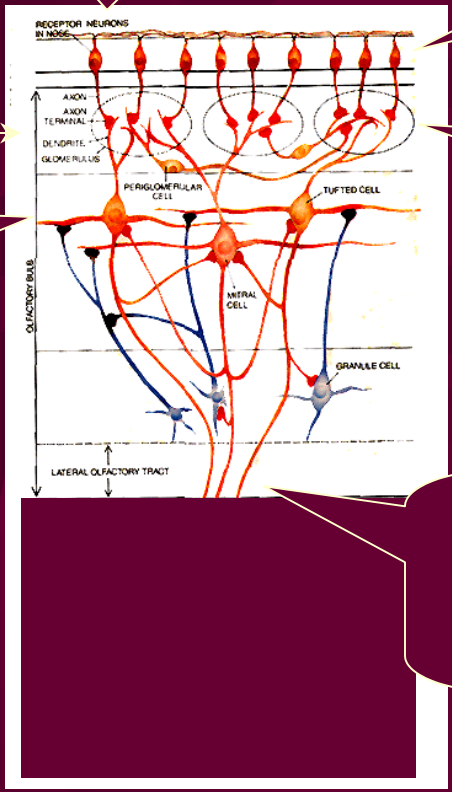


Olfactory Bulb: Sequence of Events



1. Odors are first received on olfactory epithelium, where 1000 different types of receptors are present

2. Each olfactory sensory neuron expresses only a single type of receptor



3. Neurons expressing a given receptor project their axons to common glomeruli within olfactory bulb

4. Signals from glomeruli are then processed by Mitral & Granule cells

5. The output of the olfactory bulb is then sent to higher brain for further processing, by mitral cell

Modelling of the Olfactory System

- The current research aims at developing mathematical models of the olfactory system which simulate the Olfactory Bulb per se. Such a model will enable one to mathematically define and capture the processes of Olfaction

- Focus is on developing a Neural Network which will both biologically and characteristically simulate the Olfactory System

CONTACT INFORMATION

Iren Valova, PhD

Assistant Professor Dion 302D, Computer and Information Sciences Dept.
University of Massachusetts Dartmouth
285 Old Westport Rd.
North Dartmouth, MA 02747

tel: (508) 999 8502

fax: (508) 999 9144
ivalova@umassd.edu

Homepage: http://www.cis.umassd.edu/~ivalova/index.html

Ahmed Ilyas

Research Assistant
Neural and Adaptive Systems Lab
Dion 303,
Computer and Information Sciences Dept.
University of Massachusetts Dartmouth
285 Old Westport Rd.
North Dartmouth, MA 02747

tel: (508) 997 0155

G_SIlyas@umassd.edu

Prashant Ram

Research Assistant
Neural and Adaptive Systems Lab
Dion 303,
Computer and Information Sciences Dept.
University of Massachusetts Dartmouth
285 Old Westport Rd.
North Dartmouth, MA 02747

tel: (508) 991 2499

G_PRam@umassd.edu