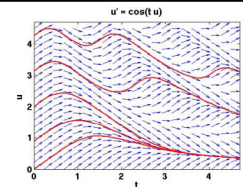


# Course G: Basic neurosciences 2

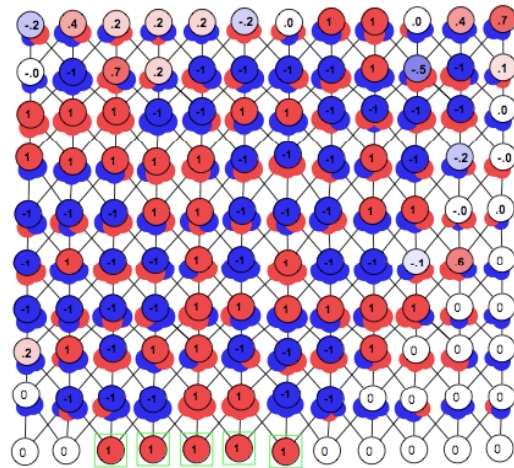
## Computational neuroscience

Tutorial  
Emil Ratko-Dehnert  
Summer term 2011

### Last time



- Differential equations as mathematical models of dynamical systems
  - Deriving the leaky integrator
- Matrix notation and operations
  - Applications to linear associators



## Session 2



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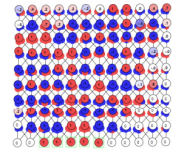
## What is ?



- Simbrain is an open source, java-based neural network simulator programmed by Jeff Yoshimi (Merced, Univ. of CA)
- It consists of three main components:
  - Network window (setting up neural networks)
  - World window (agents acting in a virtual environment)
  - High Dimension Visualisation (of state space vectors)

4

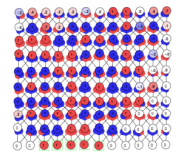
# Why ?



1. Suggestive, easy to use interface yet offering potent functionality and back-end
2. Ideal for educational purposes
3. Coupling of agents in virtual worlds to learning networks
4. Graphical representation of network state spaces

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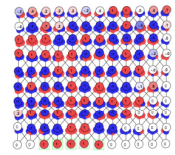
## What will we do?



- Short introduction to interface
- Laboratories on
  1. Propagation of activation
  2. Vectors in NN; OR vs XOR
  3. Node rules and weights
  4. Hebbian Learning
  5. Linear Associators
  6. Sensori-motor control

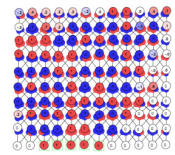
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# Workspace



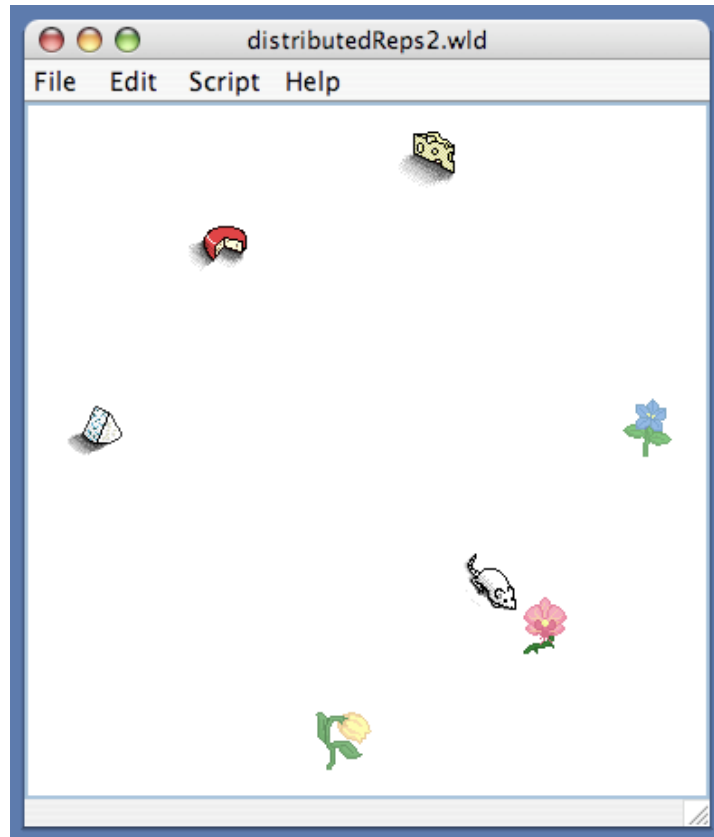
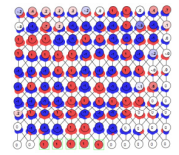
The screenshot shows a workspace with several windows. The main window, titled "3-2-3.net", displays a neural network diagram with nodes labeled with values: .0, .9, .0, .8, .8, 0, .3, 0. Below the diagram are labels for "Center 1", "Center 2", and "Center 3", and a note "490 Iterations". To the right, a window titled "three-Objects.wld" shows a 3D scene with a car and a cone. In the foreground, a window titled "Gauge 1" shows a PCA plot with 33 datapoints in 8 dimensions, forming a Y-shape.

# Networks



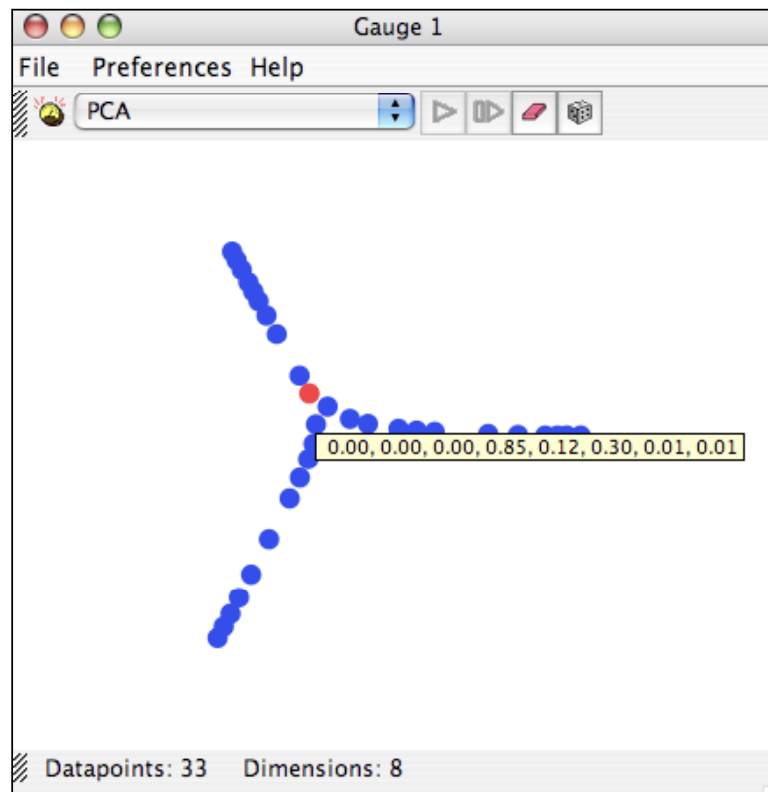
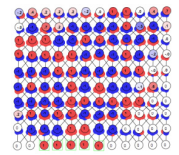
This is a close-up view of the neural network diagram from the workspace. It shows a network with 8 nodes. The top row has nodes with values .0, .9, and .0. The middle row has nodes with values .8 and .8. The bottom row has nodes with values 0, .3, and 0. Below the bottom row are labels for "Center 1", "Center 2", and "Center 3". The text "490 Iterations" is visible at the bottom left of the diagram area.

# Worlds



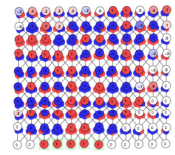
9

# State space representation



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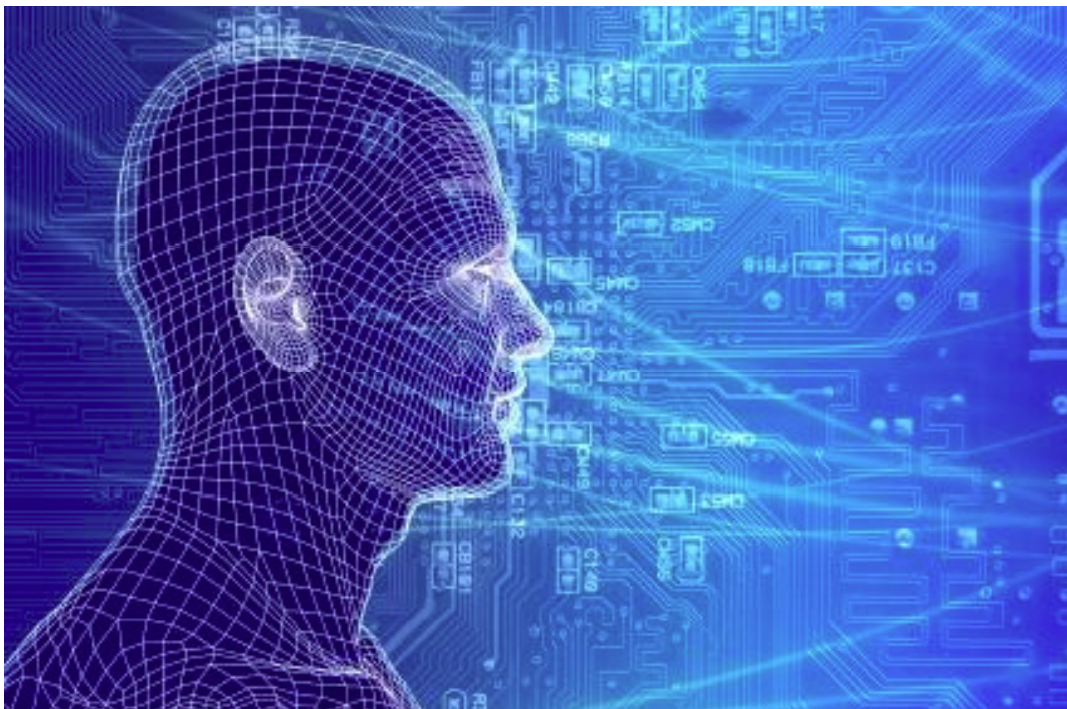
# Installation instructions



1. Log in to your computer
2. Open up the [Application Explorer](#) and install [Java 6 Update 24](#)
3. Go to the tutorial homepage and download [Simbrain.zip](#) from the materials page
4. Extract the zip-file and double-click [Simbrain.jar](#)

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## And now to the labs!



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