Cheryl Hung

Gesture-controlled robotics
using motion capture

Course structure

- Three year BA Computer Science
- Personal project in final year

About Me

- Computer Science finalist at King's College, University of Cambridge

Dissertation

- Main aim:
  - “Display a range of Computer Science skills involved in the design, implementation and testing of a significant computer system”
- Motivations:
  - Human-Computer Interaction
  - Artificial intelligence and machine learning
  - Consumer products vs robotics

Robotics

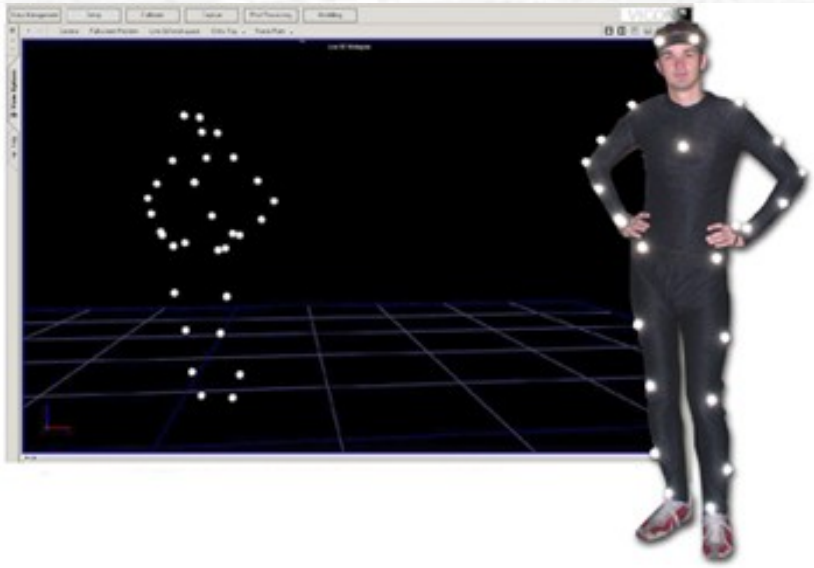
Lego Mindstorms — iRobot Roomba — iRobot Create

Custom built — With modification — Commodity hardware

- Multiple players each controlling one robot
- Requirements
  - Cheap, light, bump sensors
- OLPC XO laptop for wireless control

Motion capture

- Optical systems
  - Infra-red cameras with passive markers
- Provides 3D (x,y,z) positions and rotations



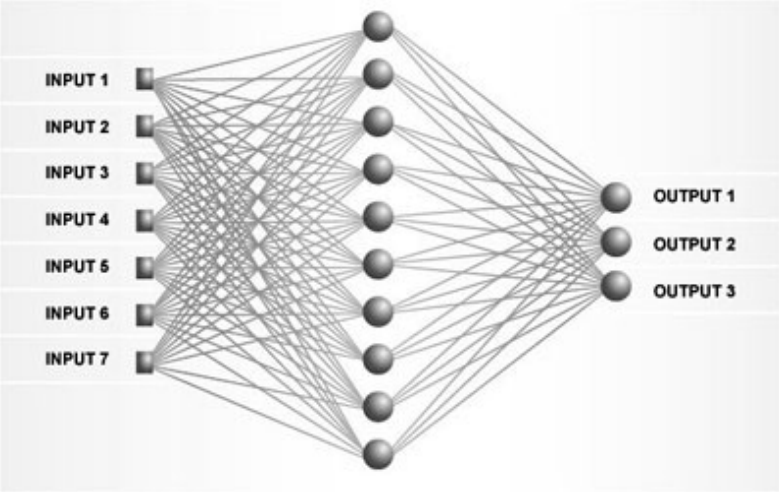
Computer Laboratory's Vicon system

Gesture recognition

- Five gestures
  - accelerate, decelerate, turn left, turn right, stop/start
- Each player described by a body and two arms
- Real-time performance is crucial for control
- Gestures are inherently ambiguous
- Solution: train the system on prerecorded examples

Artificial Neural Networks

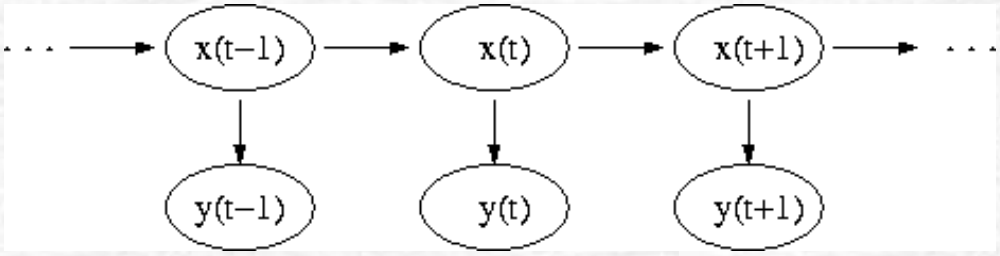
Neurobiology inspired "connectionist" approach



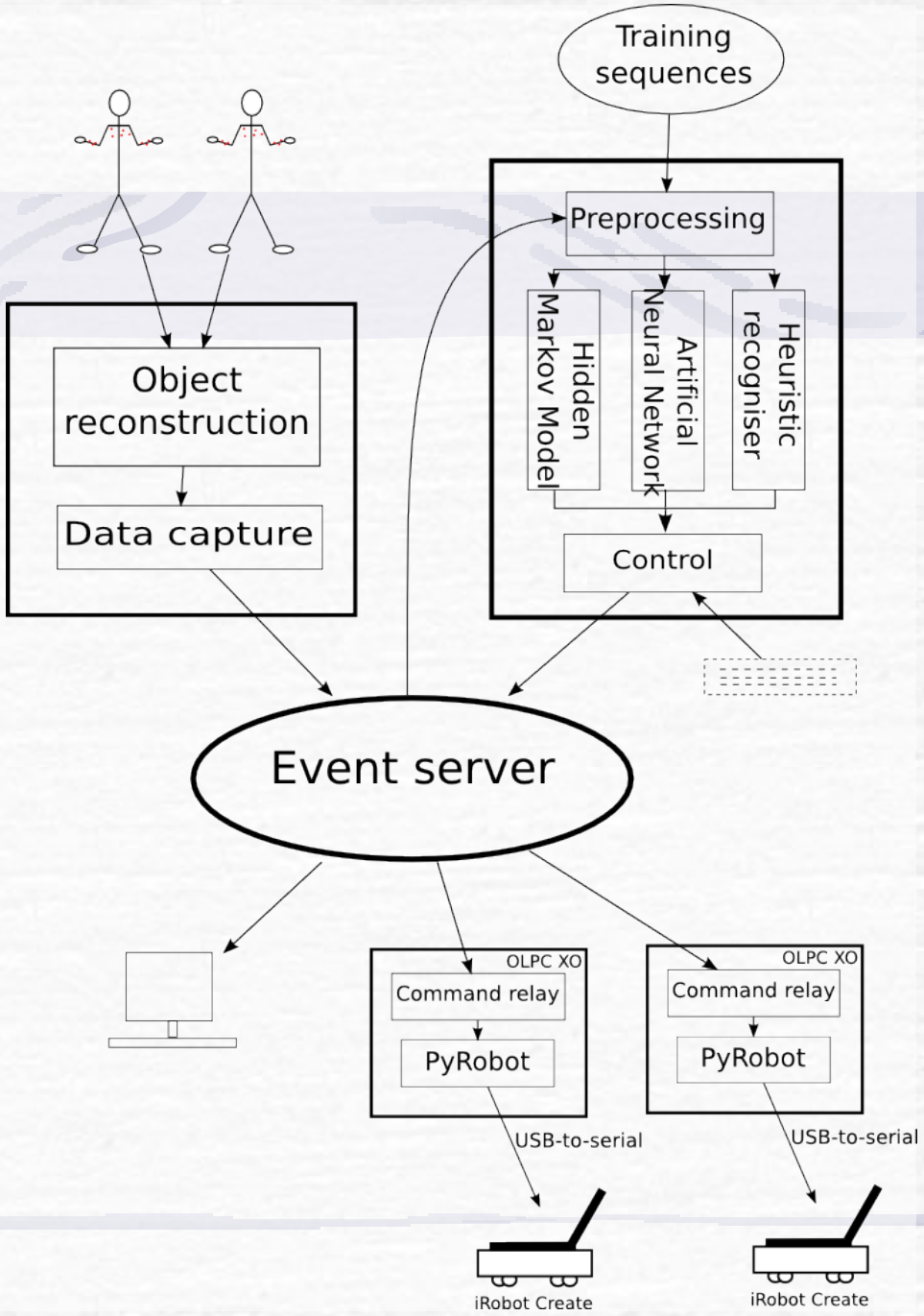
Used for data modelling, classification and data mining

Hidden Markov Models

Bayesian modelling
“stochastic" approach



Used for temporal recognition, bioinformatics and machine translation



Thank you

Questions