

## Robot Learning

### Organizers & Chairs: Chris Atkeson, Stefan Schaal

#### Real-Time Robot Learning With Locally Weighted Learning

S. Schaal<sup>1</sup>, C. G. Atkeson<sup>2</sup> and S. Vijayakumar<sup>3</sup>

<sup>1</sup>University of Southern California, <sup>2</sup>Kwato Dynamic Brain Project (ERATO/JST) and <sup>3</sup>Riken Brain Research Institute

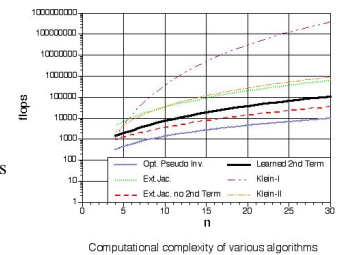
- How can we achieve real-time learning for high-dimensional robot systems?
- Spatially localized nonparametric neural networks offer a powerful approach to robot learning based on sound statistical principles, either as memory-based or non-memory-based algorithms
- Real-time learning was demonstrated for the task of devil-sticking, pole-balancing, and inverse dynamics learning with an anthropomorphic 7DOF robot arm
- Locally weighted learning offers one of the most powerful approaches to real-time robot learning

#### Inverse Kinematics for Humanoid Robots

G. Tevatia and S. Schaal

University of Southern California

- Existing Extended Jacobian Methods (EJM) computationally too expensive
- Most efficient version of EJM with comparable performance developed
- Compared with various algorithms for computational complexity
- Real time implementation on a 30 DOF humanoid robot feasible



#### Q2: Memory-based active learning for optimizing noisy continuous functions

Andrew W. Moore<sup>1, 2</sup>, Jeff G. Schneider<sup>1, 2</sup>, Justin A. Boyan<sup>1</sup> and Mary S. Lee<sup>2</sup>

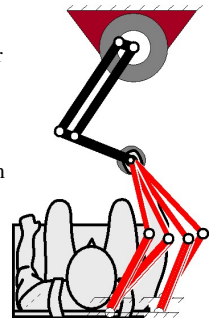
<sup>1</sup>Carnegie Mellon University and <sup>2</sup>Schenley Park Research Inc.

#### Robots can teach people how to move their arm

F. A. Mussa-Ivaldi and J. L. Patton

Northwestern University

- Model: linear combination of arm-&-controller primitives
- Calculates a subject-specific,
- The subject grips a planar, 2-degree-of-freedom robot
- Implicitly learns motions after the force field is removed



#### Towards Programming Tools for Robots That Integrate Probabilistic Computation and Learning

S. Thrun

Carnegie Mellon University

- Making robot programming easier
- Integrating learning and probabilistic computation into C++
- Enormous savings when developing robot software
- Learning can drastically speed up robot programming

