

# Spectrum Curricula for Measuring Teachability

**Jacob Beal**, Alice Leung, Robert Laddaga  
ALIHT @ AAMAS 2010

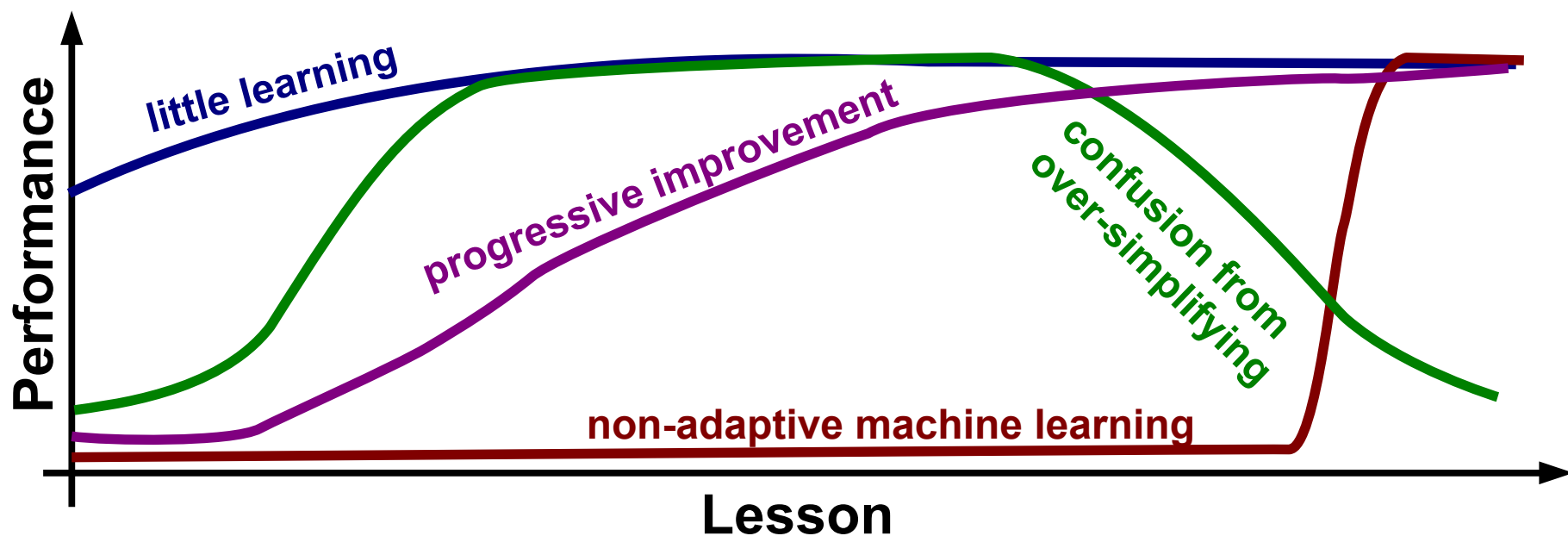
# Goal: Informal Learning



- Humans teach one another informally
- Teacher & student adapt to one another
- How can we quantify student teachability?

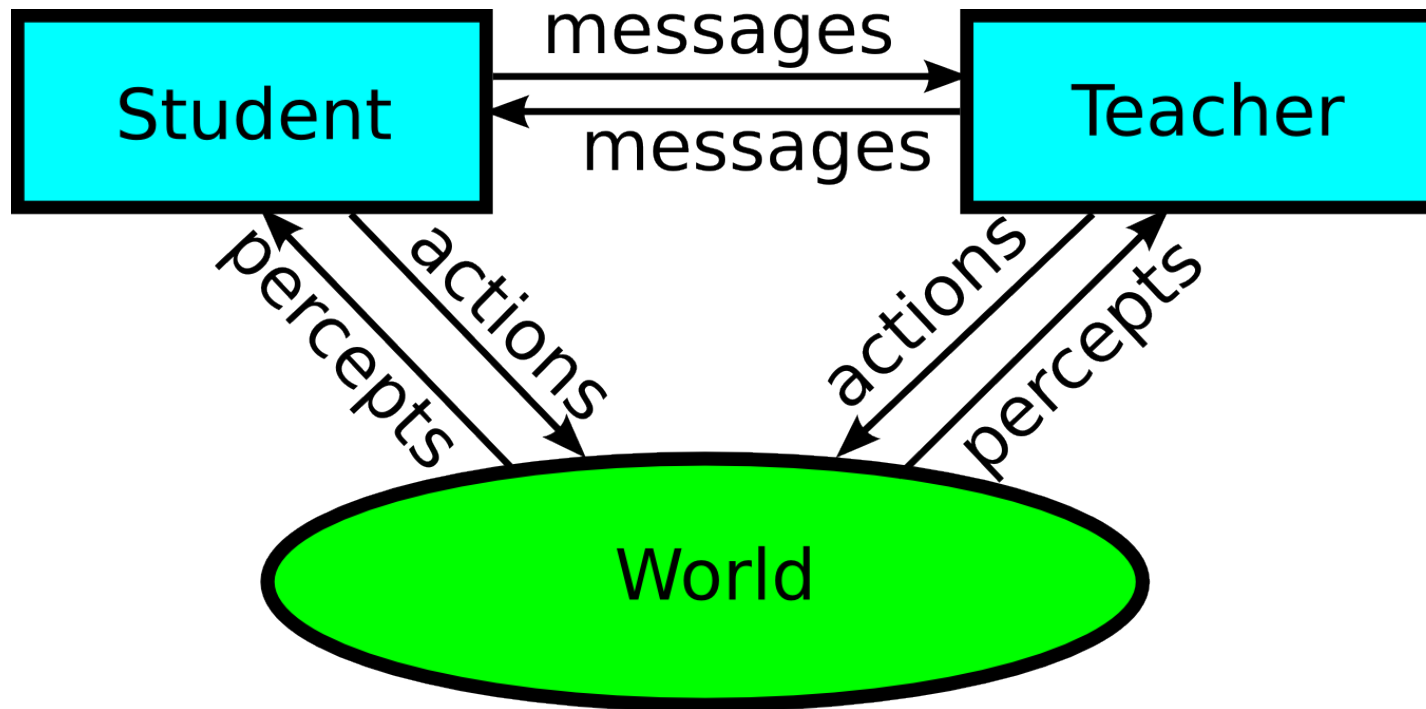
# Spectrum Curriculum

- Pick one dimension to focus on
- Sequence of lessons along dimension
  - Incrementally move from hard to easy
- Test before first lesson, after each lesson



# Instructional Framework

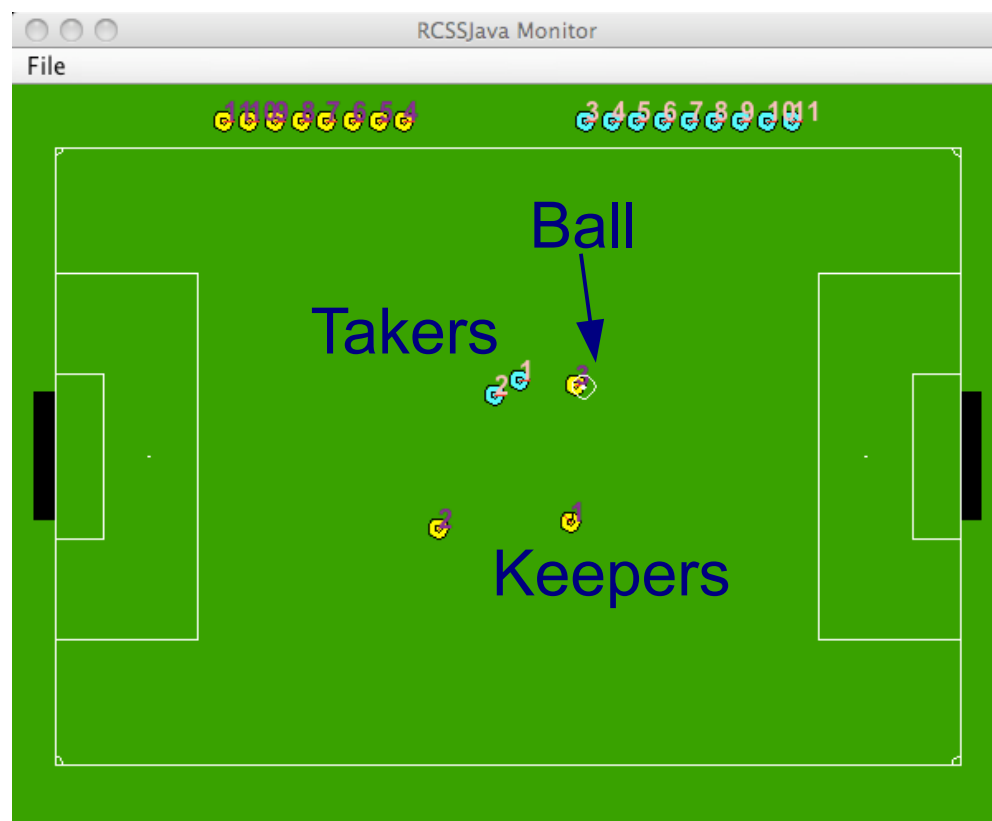
- Scripted curriculum
- Agents exchange symbolic messages:



*Implemented by BAE for DARPA BL program*

# BBN RoboCup Keepaway Curricula

- 3-on-2 KeepAway in standard RoboCup simulator
- Base player with gaps for learning 7 binary strategic decisions

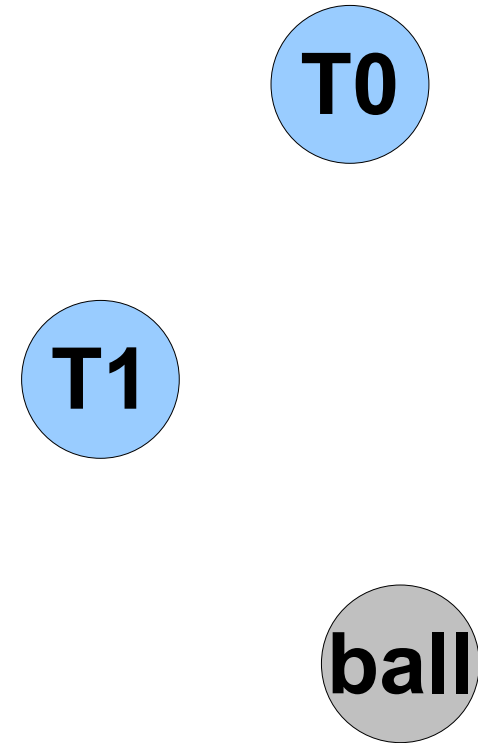


# Seven Curricula:

<b>Curriculum</b>	<b>Spectrum</b>	<b>Modality</b>	<b>Side</b>	<b>Lessons</b>
Out of Bounds	Mutual Assumptions	Examples	Both	7
Where to guard	Mutual Assumptions	Examples	Taker	6
Where to pass	Transfer Distance	Examples	Keeper	6
Who to guard	Transfer Distance	Examples	Taker	6
Where to move	Transfer Distance	Feedback & Examples	Keeper	8
Guard vs. take	Detail of Instruction	Telling & Examples	Taker	7
When to pass	Detail of Instruction	Telling & Feedback	Keeper	10

# Example: Guard or Take?

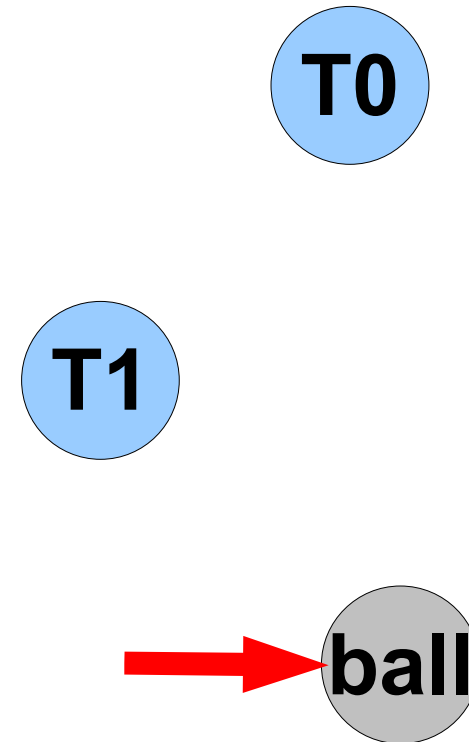
- **Example only**



**GoTake(T1) = True**  
**GoTake(T0) = False**

# Example: Guard or Take?

- Example only
- **Hint: ball position**

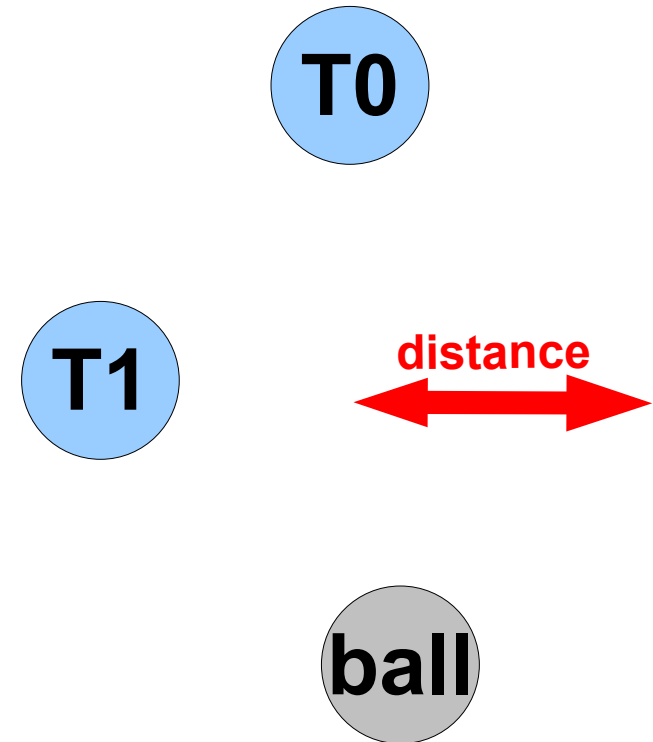


**GoTake(T1) = True**  
**GoTake(T0) = False**



# Example: Guard or Take?

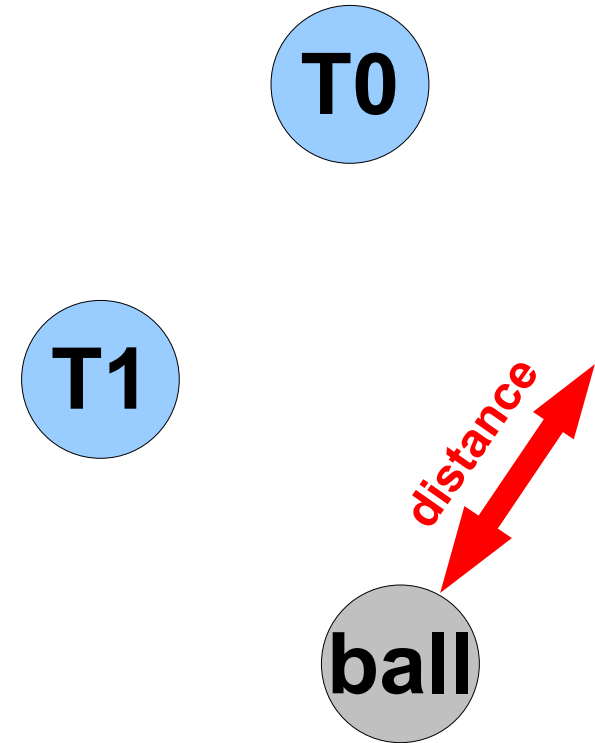
- Example only
- Hint: ball position
- **Hint: distance fn**



**GoTake(T1) = True**  
**GoTake(T0) = False**

# Example: Guard or Take?

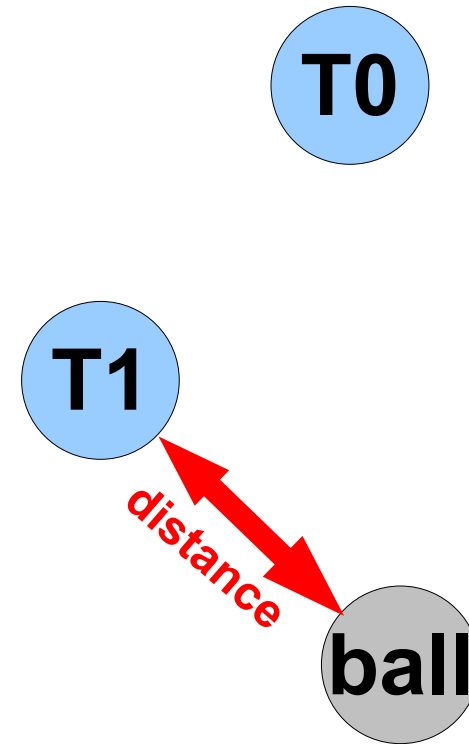
- Example only
- Hint: ball position
- Hint: distance fn
- **Hint: distance(?,ball)**



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# Example: Guard or Take?

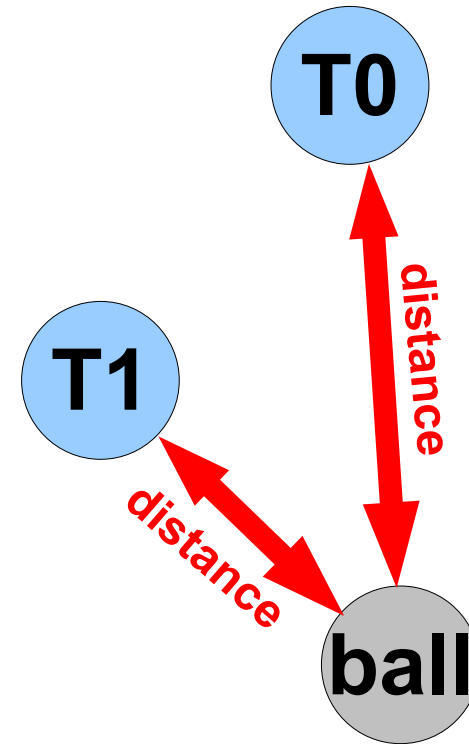
- Example only
- Hint: ball position
- Hint: distance fn
- Hint: distance(?,ball)
- **Hint: distance(T1,ball)**



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# Example: Guard or Take?

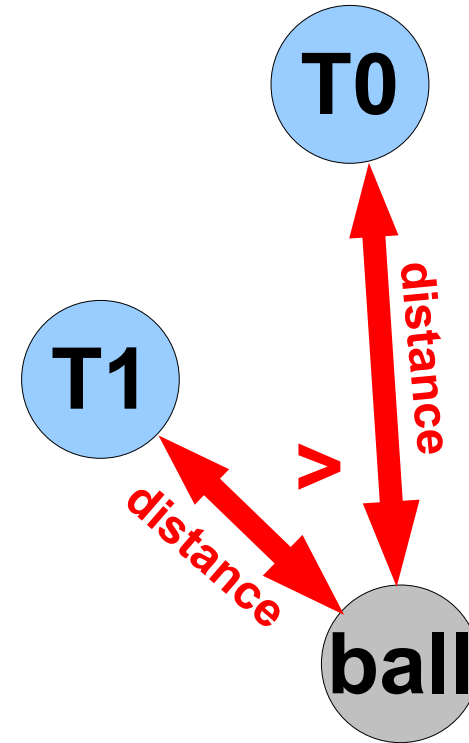
- Example only
- Hint: ball position
- Hint: distance fn
- Hint: distance(?,ball)
- Hint: distance(T1,ball)
- **Hint: both distance function calls**



**GoTake(T1) = True**  
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# Example: Guard or Take?

- Example only
- Hint: ball position
- Hint: distance fn
- Hint: distance(?,ball)
- Hint: distance(T1,ball)
- Hint: both distance function calls
- **Distance(me.pos,ball,pos) < Distance(other.pos,ball.pos)**



**GoTake(T1) = True**  
**GoTake(T0) = False**

# Gathering Human Baseline

Froomb!

X



✓

- JavaScript web app displays human-equivalent curricula, gathering anonymous results

# Contributions

- Spectrum curricula measure learner adaptivity
- Designed seven RoboCup spectrum curricula
- Validating concept by gathering human baseline

# Participate!

Open Bootstrapped Learning Project from BBN Technologies

http://dsl.bbn.com/BL/

It's not what you know,  
it's how you learn it.

**Open Bootstrapped Learning Project**

Research sponsored by [DARPA](#).

**Community** **Materials**

**Mentoring a Computer**  
If computers could learn anything that a human mentor could teach them:

- We wouldn't need to write new software every time we wanted a new capability.
- Mentors wouldn't need to be computer programmers.
- Computer systems could keep up with advances in technology, techniques, or tactics by learning new tricks.

**The Project**  
The Bootstrapped Learning Project is a DARPA research program for

**Participate in the Bootstrapped Learning Community**

- Are you doing research in artificial intelligence, machine learning, or computer knowledge?
- Are you interested in pushing the state-of-the-art about how computers can learn?
- Do you want to help realize a future where regular people can teach computers in the same way that they mentor other people?

Here's your chance!

The Open Bootstrapped Learning Project is collecting curricula and domains for the empirical analysis of machines that learn from human instruction. The Bootstrapped Learning Framework provides an agent-based infrastructure for scripted teaching interactions, curricula for evaluating teachable systems, and a baseline virtual student to make it easier to interface your system with the framework.

**Must...pull...harder!**

**Contribute to the Project**  
We're betting that some of you

<http://dsl.bbn.com/BL/>

- Take tests to help build a human baseline
- Download curricula to test your work against
- Contribute your own curricula