# Teaching ACT-R

RICE

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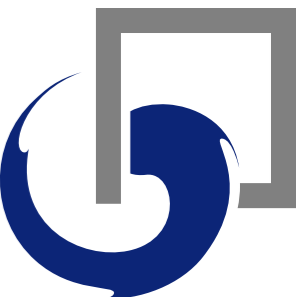
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THE COMPUTER-HUMAN
INTERACTION LABORATORY AT RICE UNIVERSITY

# Road Map

- A little history and background

- Individual perspectives:

  - Niels Taatgen

  - Mike Schoelles
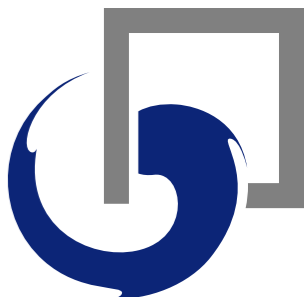
  - Frank Ritter

  - Me

- Discussion

# History: The Beginning

- 1994: First ACT-R Summer School
  - Maybe call this one a beta
- 1995: Second ACT-R Summer School
  - Taught primarily by John & Christian
  - ACT-R 2.0
    - Slow machines, bare Lisp
  - Students worked in pairs, not individually
  - Some of the students:
    - Niels Taatgen, Kevin Gluck, Mike Byrne
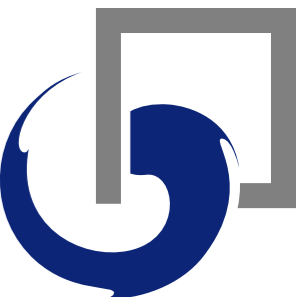  - Considered successful enough to continue as an annual event

# History: The Middle Years

- Late 1990s

  - Different units taught by different instructors at CMU

  - First ACT-R environment (with structured editor)

  - Formalization of tutorial units

  - Use of the 1998 book

- Early 2000s

  - Multiple courses based on ACT-R tutorial taught outside CMU

  - Continued improvement of tools

    - Tutorial text, environment, exercises

  - No updated book, however

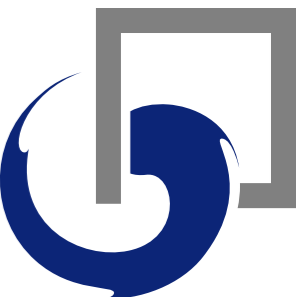    - 1998 book and 2004 Psych Review paper + other readings?

# Recent History

- Full ACT-R manual available (yay)

- 2007 book
  - Covers ACT-R 6 including new utility learning

- Frequent tweaking and updating of materials
  - Cross-platform environment
  - Tutorial text
  - Exercises

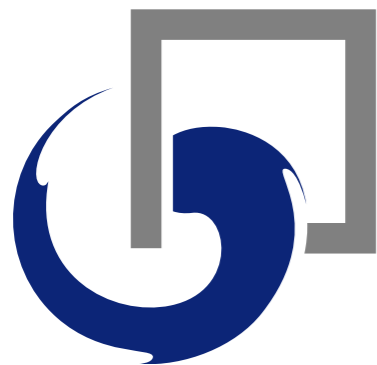- ACT-R now routinely taught at multiple institutions

# Perspectives

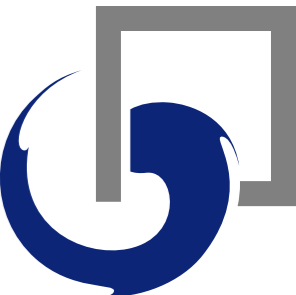- Niels Taatgen

- Mike Schoelles

- Frank Ritter

# ACT-R at Rice

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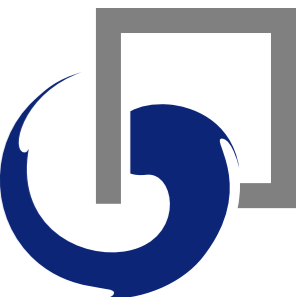INTERACTION LABORATORY AT RICE UNIVERSITY

# Course Background

- Titled "Computational Modeling of Human Cognitive Processes"

  - Inherited title

- Listed in Psychology

  - Not a requirement in either Psyc or CogSci majors

  - But an option that meets a requirement for both

- Mixed enrollment

  - Advanced undergraduates

  - 1st/2nd year graduate students

  - Must have had basic cognitive psych and at least some programming background
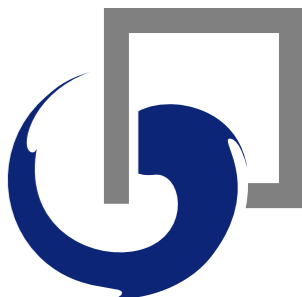
# Course Outline

- Start with "what is computation and modeling"

  - Pylyshyn, Newell-Simon

- Schools of modeling

  - Early Newell on architecture, Rumelhart on PDP

- Some coverage of PDP

  - Also cover some local connectionism (Thagard's ECHO)

- Then dive into ACT-R

  - 2007 book with supplemental readings

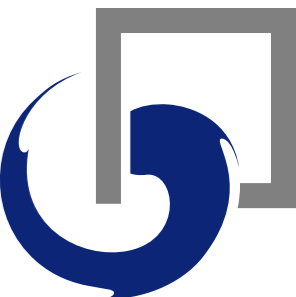  - ACT-R tutorial units through Unit 6 only

# Course Structure

- We have standard 15-week semesters

- 2 sessions per week

  - Generally one lecture/discussion, one lab

- 10 homework assignments

  - 1 essay on computation, 3 connectionist assignments, 6 ACT-R units

- Project

  - Pick a data set

  - Model it

  - Write it up

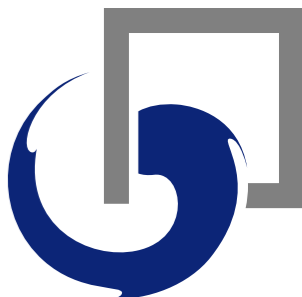  - Lots of assistance from the instructor at each step

# Successes

- Clear understanding of:

  - Limitations of one-off models

  - Pros and cons of architectural approaches

  - Why modeling is important and why it's hard

- Show clear progress in ACT-R

  - Lots of terminology becomes natural

  - Looking back at Unit 2, they can barely remember why it was hard

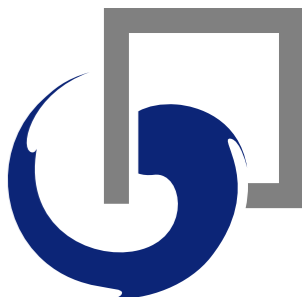  - But, still have misconceptions and limitations

# Issues: ACT-R

- Always software issues

  - Students want to use their own laptops, always flaky

  - Hard to push updates to standalones

- Limited tutorial coverage (e.g., noise)

- No tutorial coverage

  - Additional modules like EMMA and Temporal

- Bad tutorial assignment: Blackjack was a complete disaster

  - Underspecification in assignment

  - No data to match—what's the psychological content here?

- Mismatches between book and tutorial units

  - Ex: lots of BOLD stuff in book, little in tutorial units

# Other Issues

- Variance in students is always a challenge

- Grading models is time-consuming

  - I now have code for testing each tutorial model in a variety of conditions

- Projects are difficult, but can be valuable

  - Writing UI code for experiments is especially painful

# Discussion

- If you don't teach ACT-R, why not?

- If you do teach ACT-R

    - What works?

    - What doesn't work?

    - What tools/reading/exercises/etc. do you want?