

Organizational Structure, Exploration, and Exploitation on the ELICIT Experimental Platform



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Outline

- Exploration & Exploitation
- ELICIT overview
- Extensions to ELICIT
 - Capturing Exploration & Exploitation
 - Experimental Design Tweaks
- Experimental Summary
- Preliminary Results

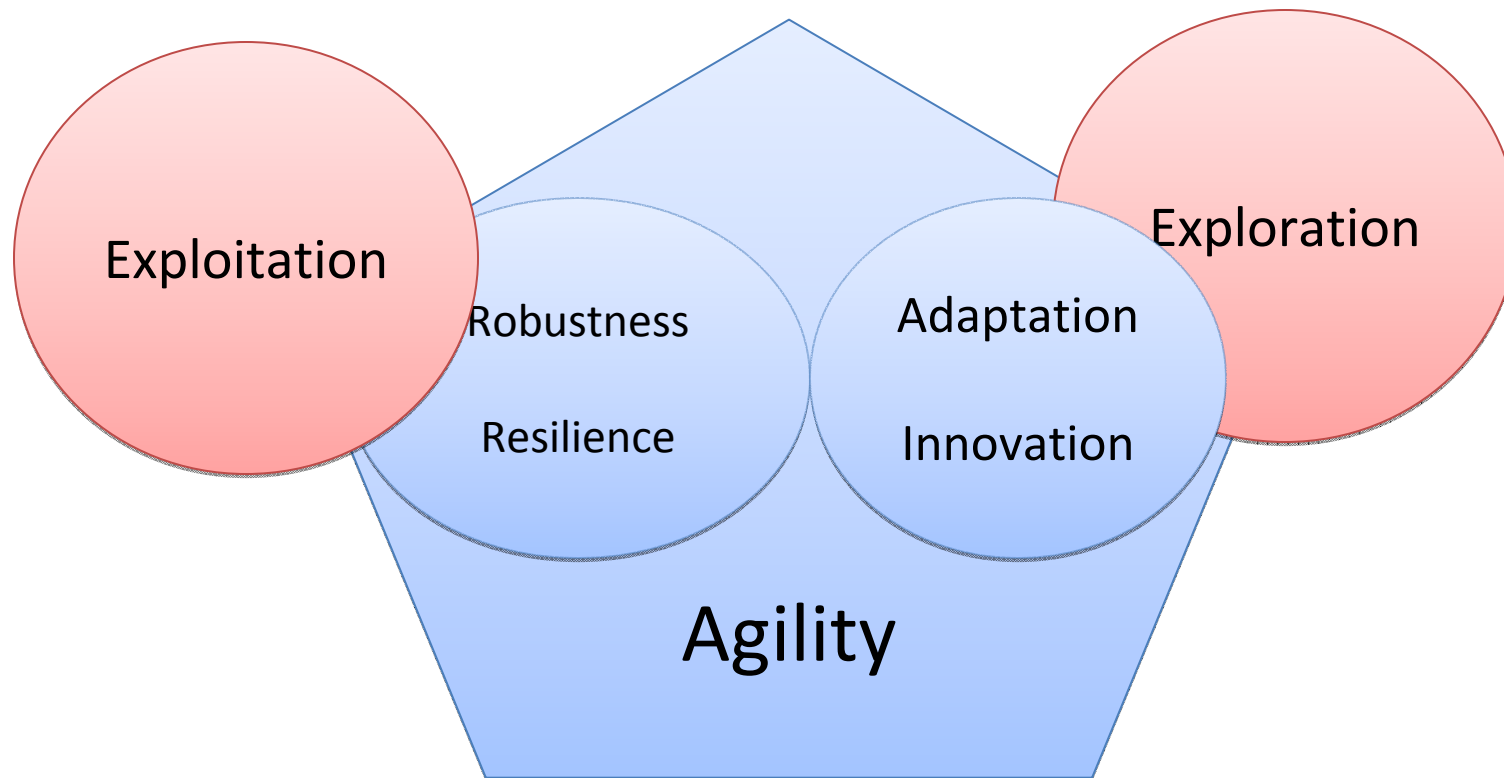


Exploration & Exploitation

- Defined by James March (1991)
 - Exploration: introduce new information
 - Exploitation: use existing information
- Ambidexterity – balancing the two



Ambidexterity & Agility



Exploration & Exploitation

- Defined by James March (1991)
 - Exploration: introduce new information
 - Exploitation: use existing information
- Ambidexterity – balancing the two
- Structure and Exploration vs. Exploitation (Lazer & Friedman, 2007)
 - Finding: Structural barriers can promote exploration



ELICIT Overview

- Lab-based “whodunnit” game
- Computer mediated system
- Subjects receive “factoids”, have to work with each other to identify a terrorism plot
 - Who
 - What
 - Where
 - When



New Features to ELICIT



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New Features to ELICIT



(well, at least new)



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Search Functionality

ELICIT v2.2.1.1

Home

Share Post Message Identify Ready **Search**

Game

InBox

From	Message
Moderator	Assigned role=Team member, adms=Chris, country=NA
Moderator	http://www.parityinc.net/broctor/group-A2.htm
Moderator	TRIAL STARTING
<input type="radio"/> New Data	The Gray and Teal groups do not employ suicide bombers
<input type="radio"/> New Data	The schools in the coalition area are not well defended
<input type="radio"/> New Data	Attacking buildings when there are many people present increases casualties
<input type="radio"/> Alex	The Rosa group may be involved <i>This looks interesting?</i>
<input type="radio"/> New Data	Embassies in Piland were recently attacked and evidence of more attacks has been found
<input type="radio"/> New Data	No traces of members from the Blue group have been found in Sigmaland
<input checked="" type="radio"/> Search Result	The Rosa group does not attack on its Sabbath

Received Messages (10)

Progress Check

Enter a single word query to search for relevant factoids:

Factoid found:
"The Rosa group does not attack on its Sabbath"

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Model Number 53

- Subjects have the option of seeking out new information for the organization



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Myopic & Cooperative Search



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Myopic & Cooperative Search



- Red Herrings



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Myopic & Cooperative Search



- Red Herrings
- No Silver Bullets



Myopic & Cooperative Search



- Red Herrings
- No Silver Bullets
- Disintegrated Problems
- Multiple Factoids Required



Progress Check

ELICIT v2.2.1.1

Home: Share Post Message Identity Ready Search

Game: InBox

From: Message

Moderator: Assigned role=Team member, name=Chris, country=NA

Moderator: <http://www.gantvino.net/procter/group/A2.htm>

Enter your first and second choice answers (if you have two) and your percentage confidence in the answers (choose a number between 1 and 100). Also indicate percentage confidence in Other answers or Don't Know. Total of all percentages must sum to 100%.

	Who is involved (group)?	What is the target (target type)?	Where is the attack (country)?	When is the attack (month)?	When is the attack (day)?	When is the attack (hour)?	When is the attack (AM/PM)?
	%	%	%	%	%	%	%
First Choice	Red 70	Airport 30	Omegoland 50	February 40	8 70	2 30	AM 10
Second Choice			Chiland 20		16 20		
Don't know	30	70	30	60	10	10	90
Total	100	100	100	100	100	100	100

Send

Factoid found:
"The Rose group does not attack on its Sabbath"

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Build number: 29

- We periodically query the user for her best guess of the solution, as well as allowing her to enter it manually.



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Experimental Design

- Clear **incentives** for solving the problem
- Control information flow through **sharing** patterns
 - No websites
- Enable **annotation** to allow theory sharing
- **Pretest** to control for skill
- Visible **progress check** inside the network



Visible Progress Check

- Players may see their network neighbors' most recent progress check updates.
 - Strong tie / explicit theory sharing

<input type="radio"/>	New Data	The schools in the coalition area are not well defended.					
<input type="radio"/>	New Data	Attacking buildings when there are many people present increases casualties.					
<input type="radio"/>	Alex	The Rose group may be involved. <i>This looks interesting!</i>					
<input type="radio"/>	New Data	Embassies in Piland were recently attacked and evidence of more attacks has been found.					
<input type="radio"/>	New Data	No traces of members from the Blue group have been found in Sigmaland.					
<input type="radio"/>	Search Result	The Rose group does not attack on its Sabbath.					
Received Messages (10)							
Progress Check							
	Who	What	Where	Month	Day	Hour	AM/PM
Alex	Don't Know - 100%	Don't Know - 100%	alphaland - 30%	Don't Know - 100%	Don't Know - 100%	Don't Know - 100%	Don't Know - 100%
Chris	Red - 70%	Airport - 30%	Omegaland - 50%	February - 40%	8 - 70%	2 - 90%	AM - 10%
Answers (2)							

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Build Number: 39



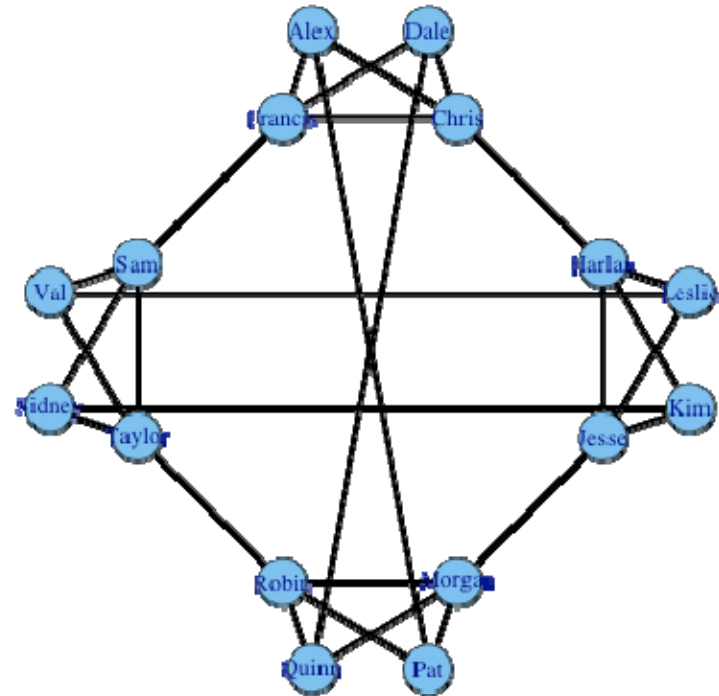
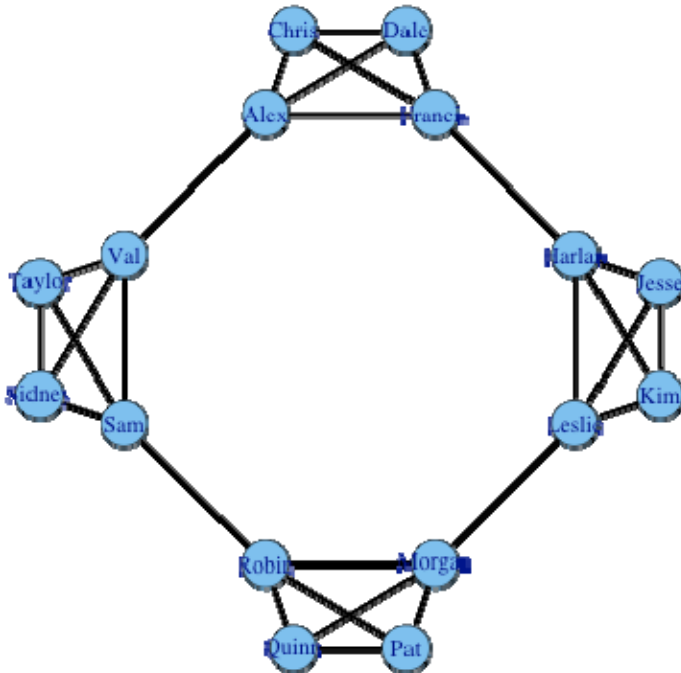
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Network Structures

- Goal: individual nodes are identical
 - Macrostructural variations
- Question: How do structural impediments to information flow change the exploration/exploitation dynamic?



Caveman vs Rewired Caveman

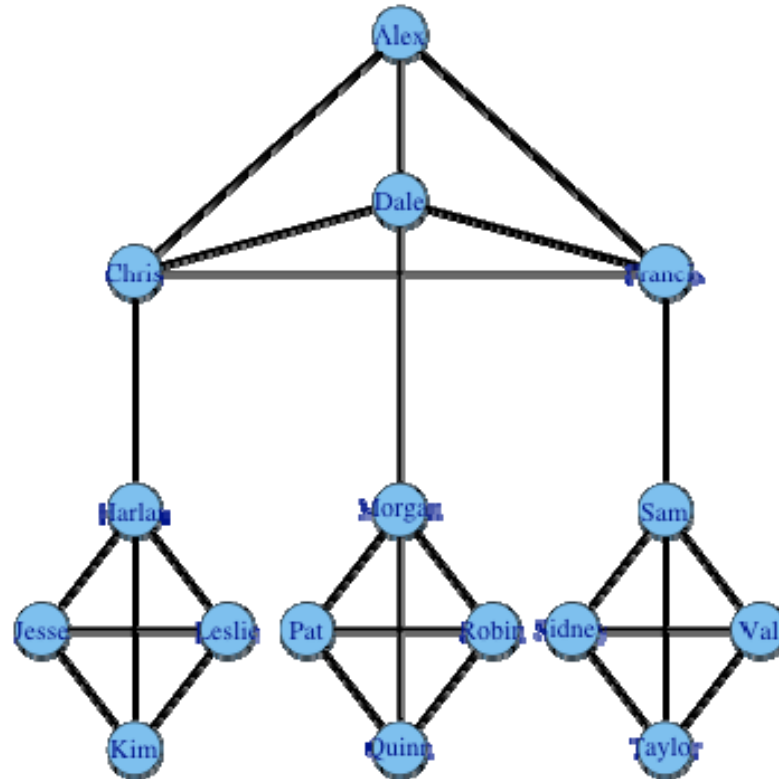


Motivated by Watts' Small Worlds (1998)

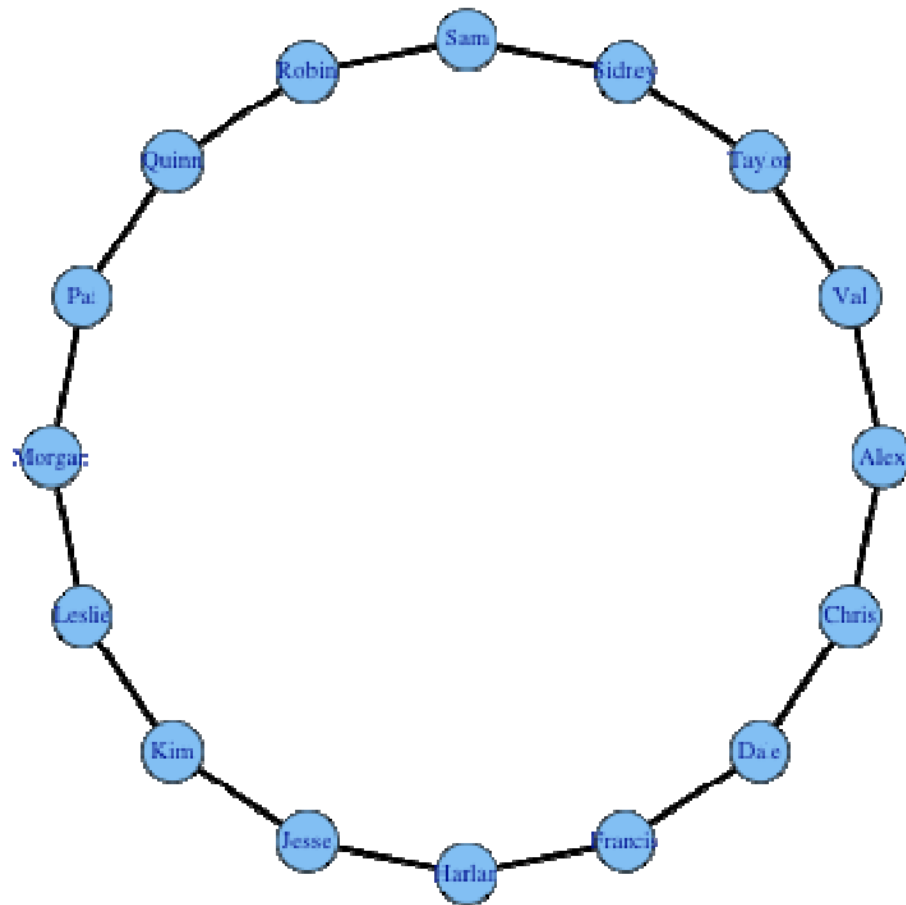


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Degree-Preserving Hierarchy



Simple Lattice



Summary of Experiments

- 18 Experimental Sessions
- 416 subjects
- 70 rounds of 25 minutes
 - 58: Network x Factoid x Round Order
 - 12 rounds testing Progress Check & AV capacity
- 1120 subject-round records → Quantitative Analysis



Challenges with Data

- *Messy Data*
- What are the performance metrics?
 - 1 solution vs. 4 sub-problems
 - Time
 - Individual vs. group level
- What to control for?
- Challenges of understanding network-level data

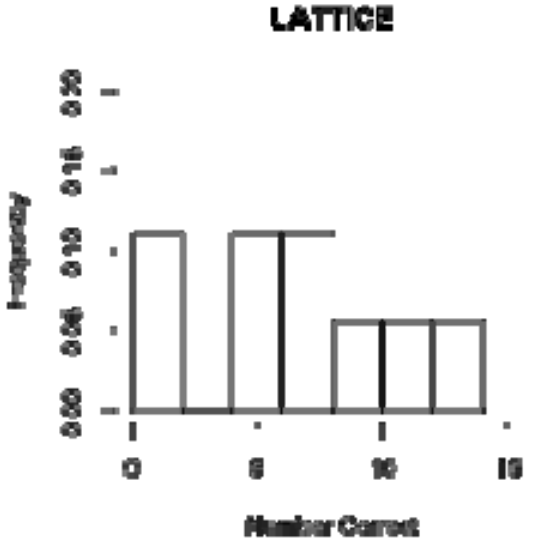
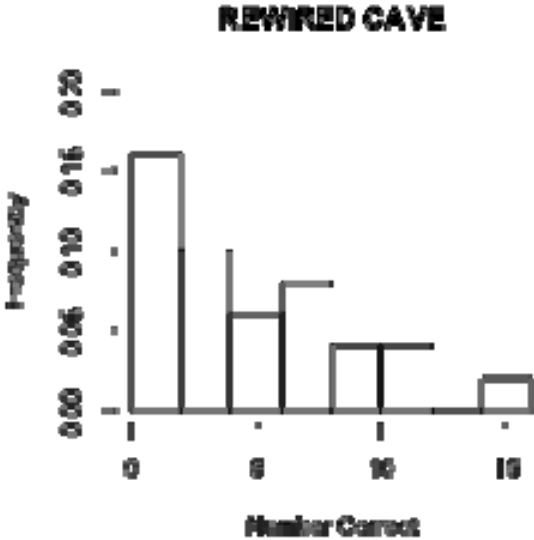
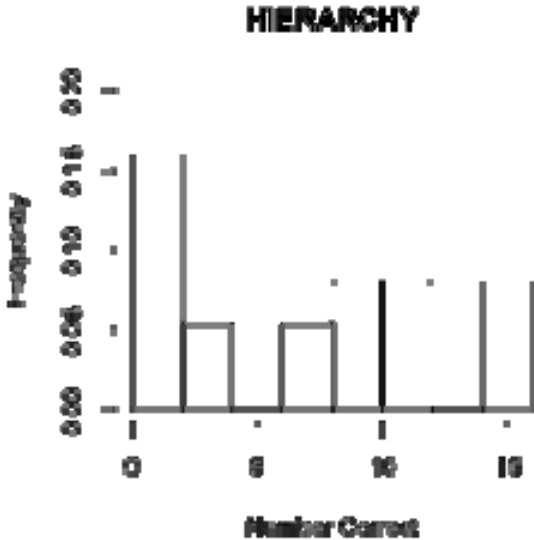
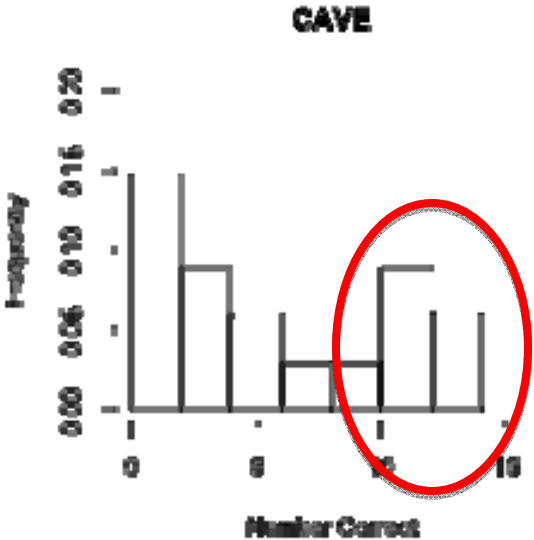


Preliminary Regression Summary

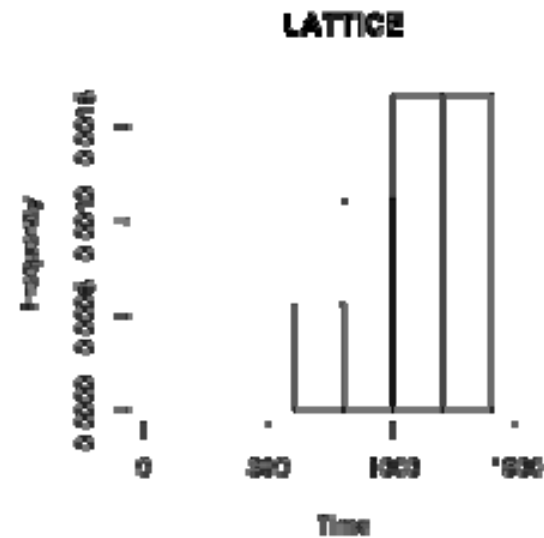
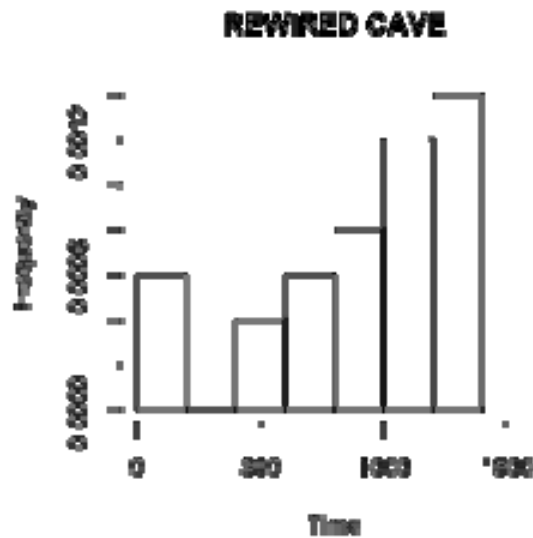
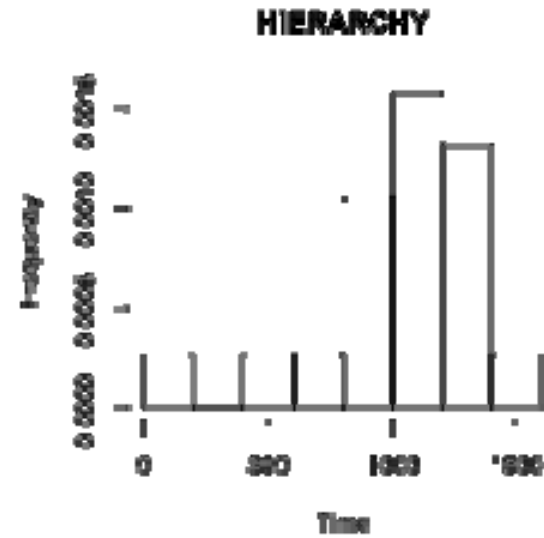
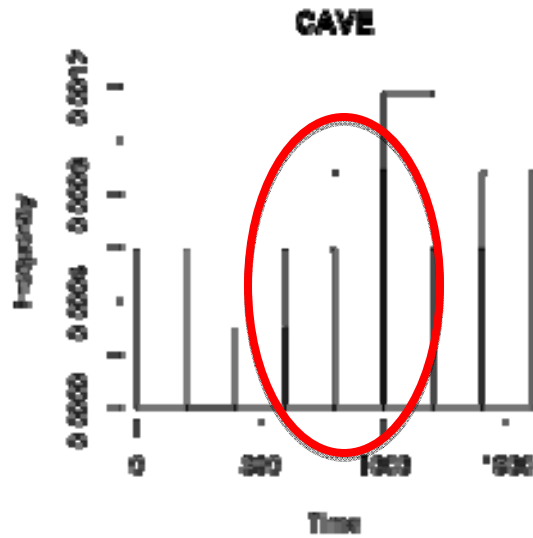
- Rewired Cave performs somewhat better
 - Other network treatments not significant
- Large learning effect
- Pretest is a strong predictor of performance
- Turning off visible progress check has a large effect



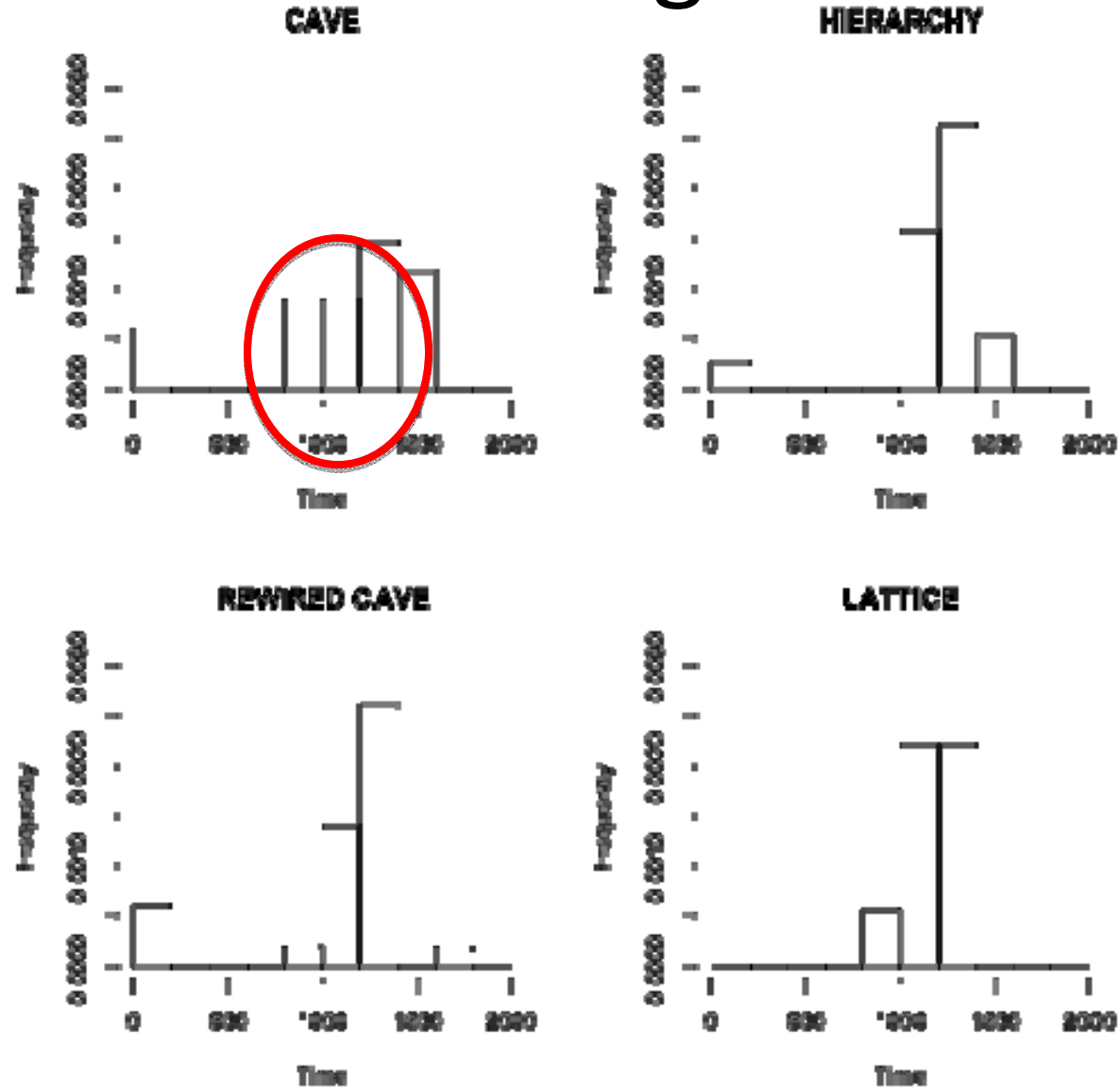
Distribution of Fully Correct Answers



Distribution of Time of 1st Correct ID



Distribution of Average ID time



Ongoing Data Analysis

- Multi-level Models
- Knowledge Sharing Patterns
- Coming soon:
 - Controlling for dependencies in WWW
 - Understanding the mezzo-level effects of network neighbors
 - Isomorphic network roles



Conclusions

- Integrate Exploration & Exploitation into Agility research
- Extend ELICIT to capture search in a complex space
- Some evidence that structural barriers to communication can improve performance in some cases
- Group experimental data requires careful statistical analysis.



Questions?



Thanks to the ELICIT team, especially
Mary Ruddy and Szymon Letowski



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