Human-Information Interaction

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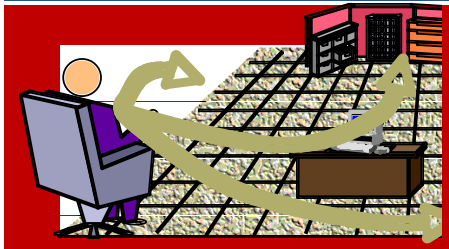
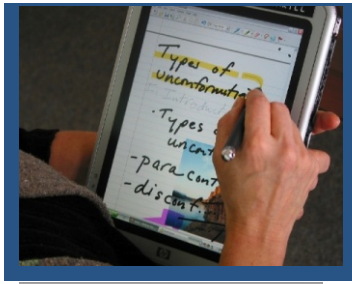
http://cs147.stanford.edu

Questions about the Project

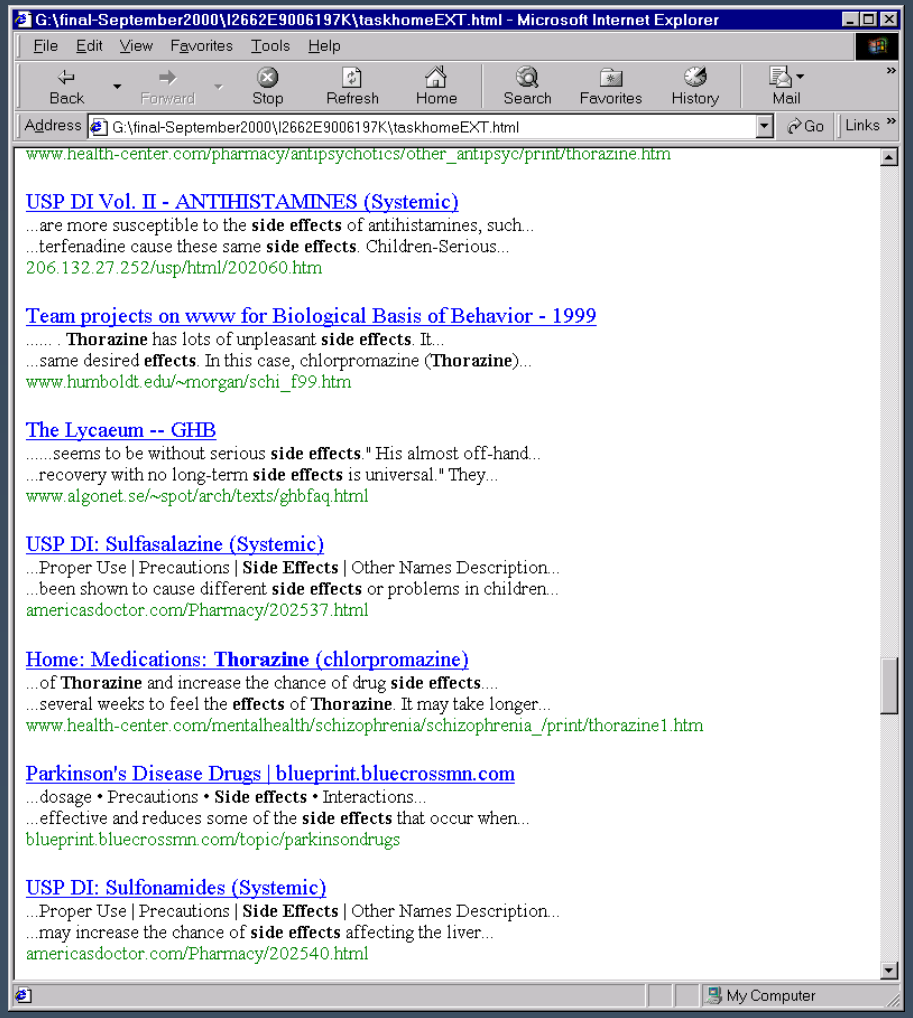
Engelbart Video

Form Me to You

ADAPTIVE BEHAVIOR

10^7 (months) 10^6 (weeks) 10^5 (days)	SOCIAL	Social Behavior	
10^4 (hours) 10^3 10^2 (minutes)	RATIONAL	Adaptive Behavior	
10^1 10^0 (seconds) 10^{-1}	COGNITIVE	Immediate Behavior	 Meg Stewart
10^{-2} 10^{-3} (msec) 10^{-4}	BIOLOGICAL		

HUMAN INFORMATION INTERACTION



GOMS

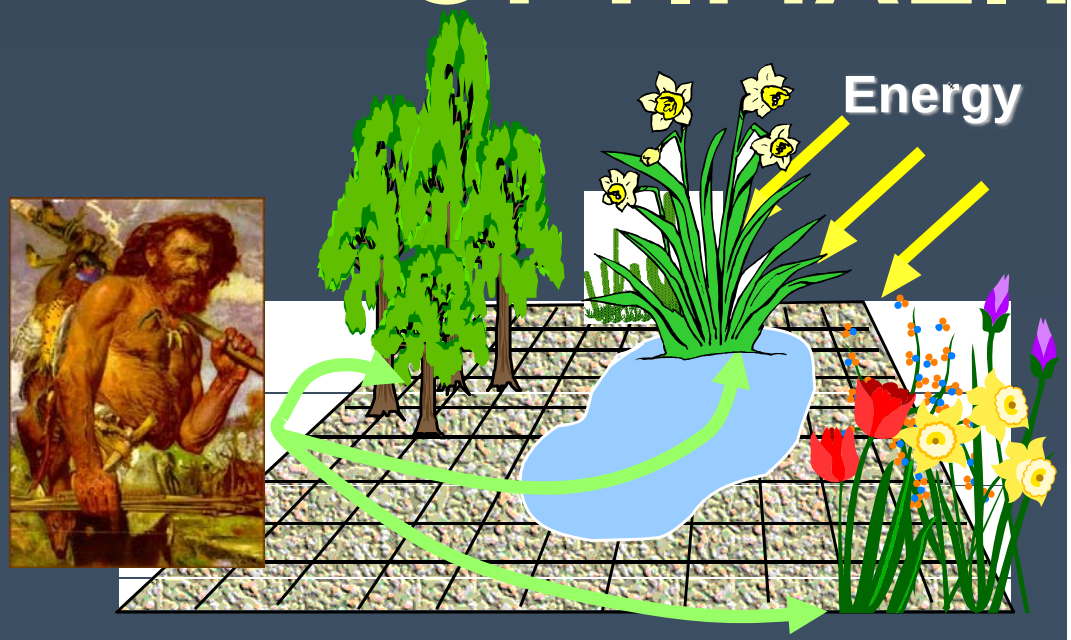
- Routine cognitive skill
- Well-known path

Information Search

- Problem solving
- Heuristic search
- Exponential if don't know what to do

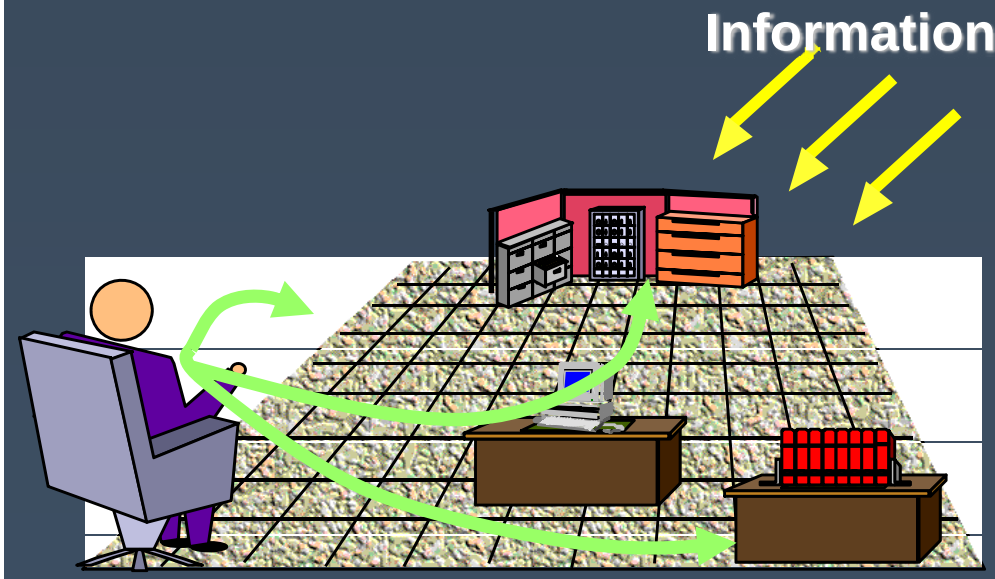
OPTIMALITY THEORY

Optimal Foraging Theory



$$\text{Max}\left[\frac{\text{Energy}}{\text{Time}}\right]$$

Information Foraging Theory



$$\text{Max}\left[\frac{\text{Useful info}}{\text{Time}}\right]$$

Information Foraging Theory:

Microeconomics of information access.

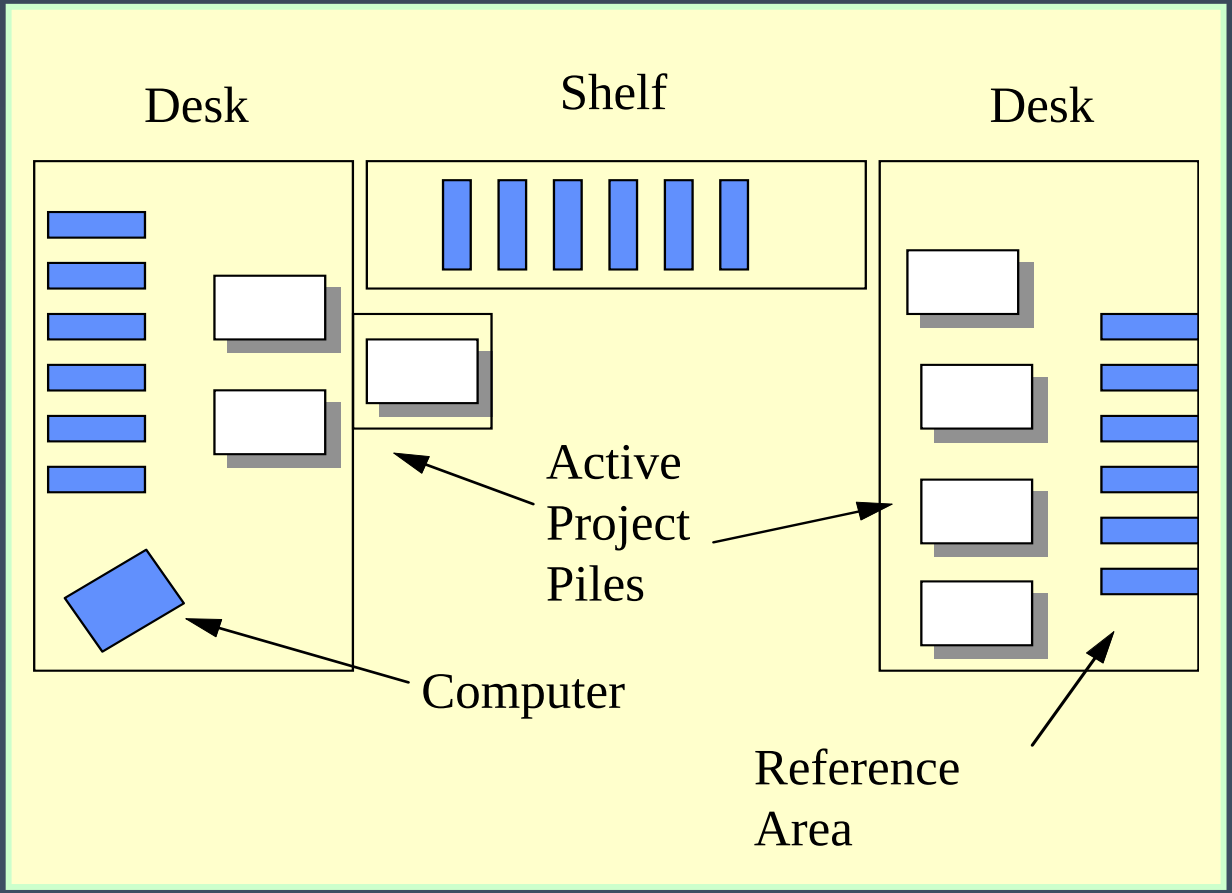
People are information rate maximizers of benefits/costs
Information has a cost structure

$$R = \frac{G}{T_B + T_W} = \frac{Gain}{T_{Between-patch} + T_{Within-patch}}$$

INFORMATION PATCHES

e.g. desk piles,
Alta vista search list

unlike animals foraging for food, humans can do patch construction



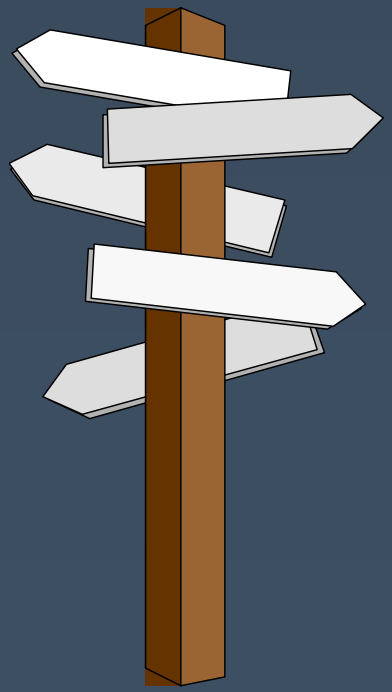
We'll stay in a patch longer...

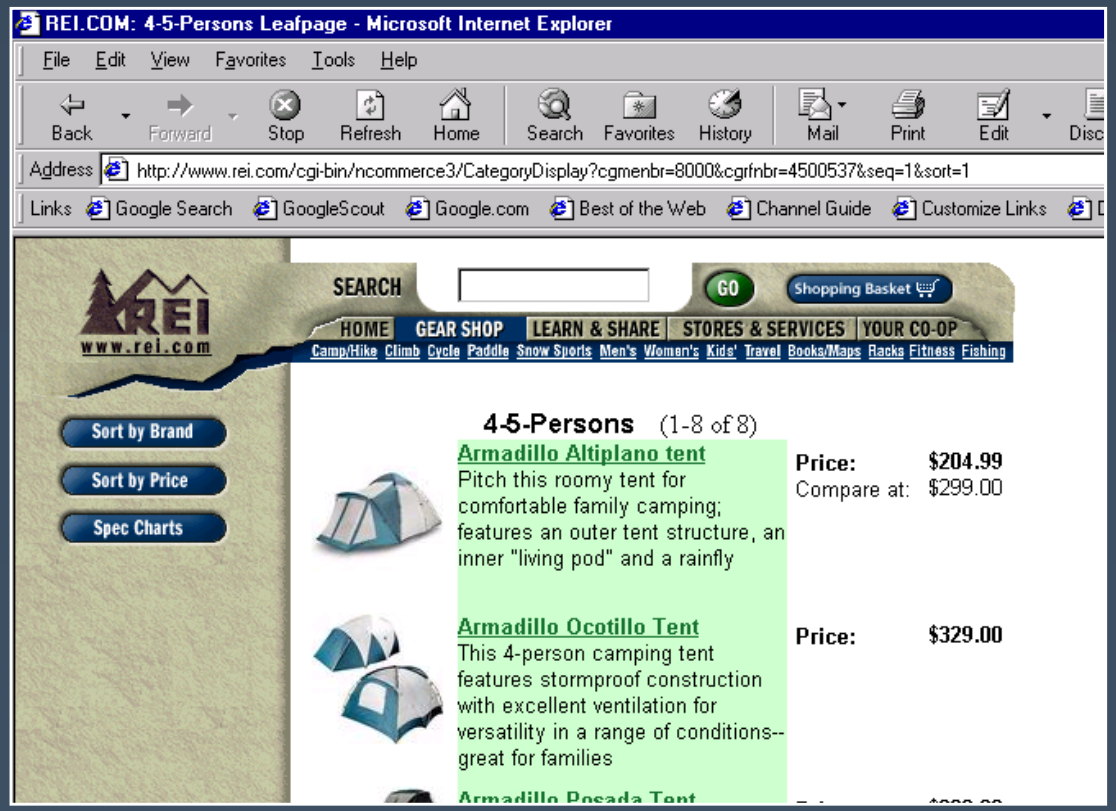
- When a patch is highly profitable
- As distance between patches increases
- When the environment as a whole is less profitable

perception of value and cost of a path to a source based on proximal cues

WITHIN-PATCH ENRICHMENT:

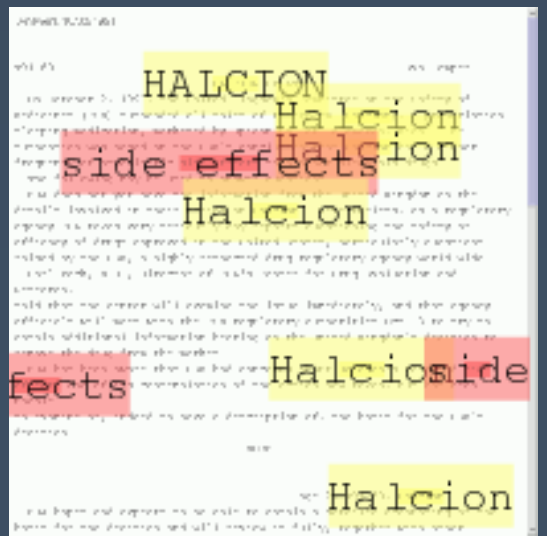
INFORMATION SCENT

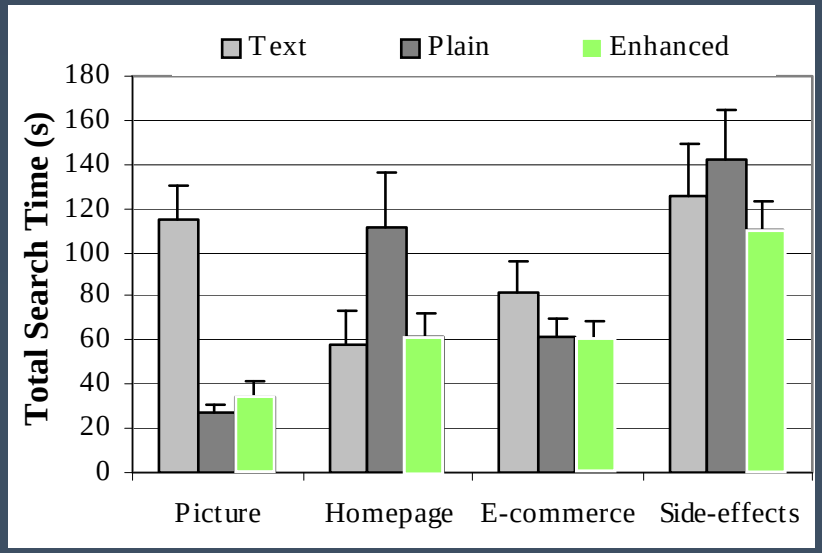




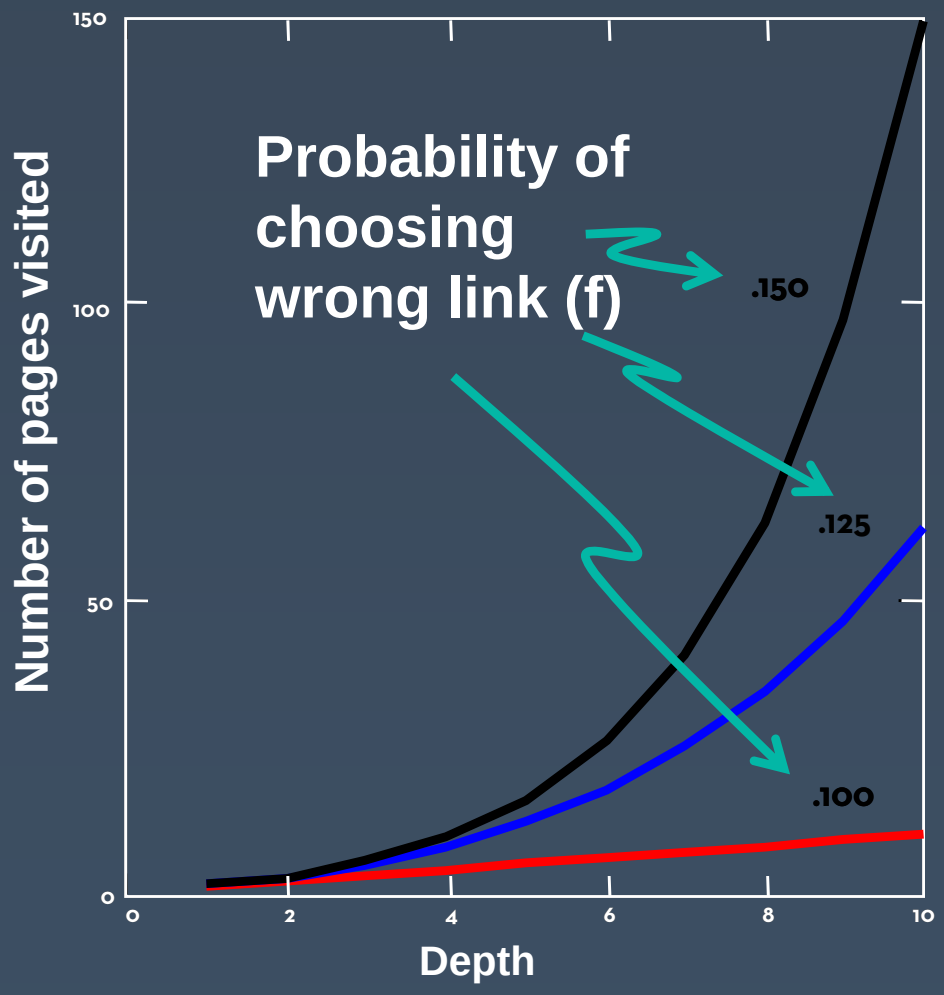
Relevance-Enhanced Thumbnails

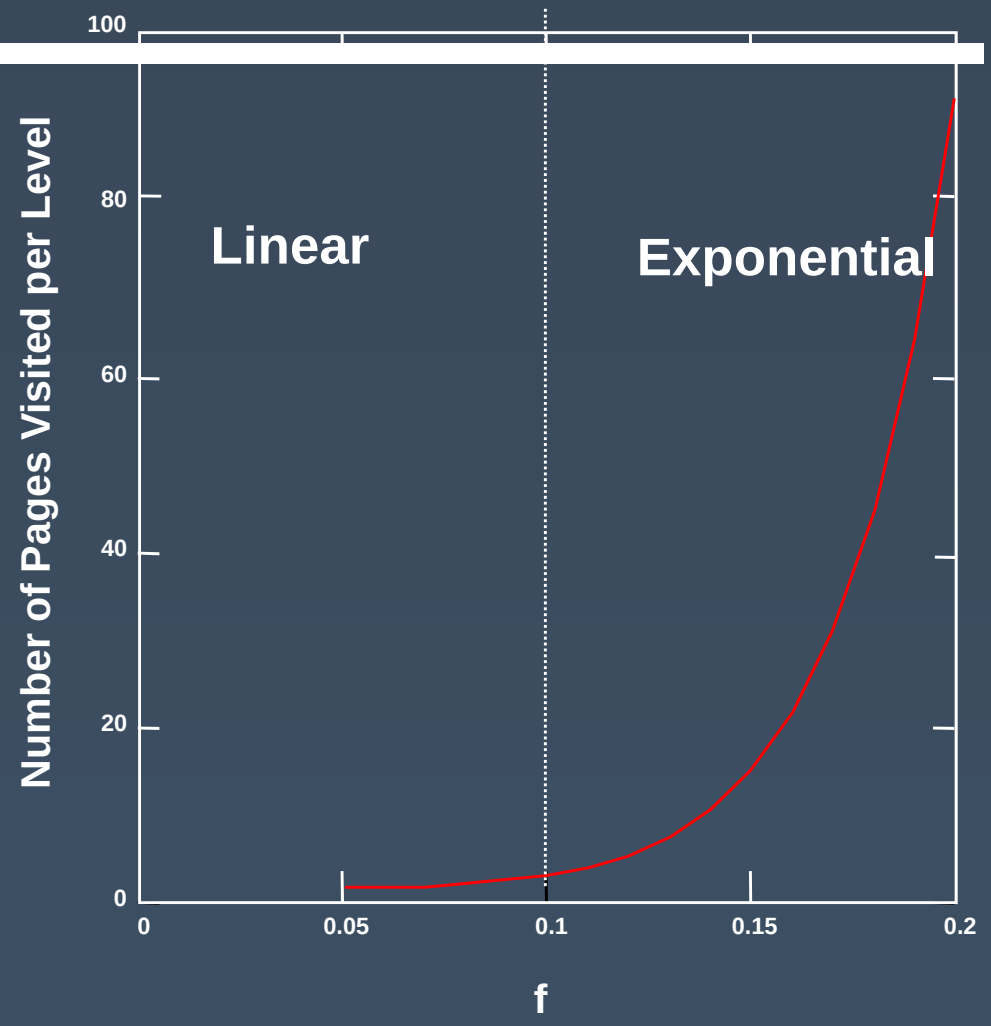
- Within-patch enrichment
- Emphasize text that is relevant to query
  - Text callouts



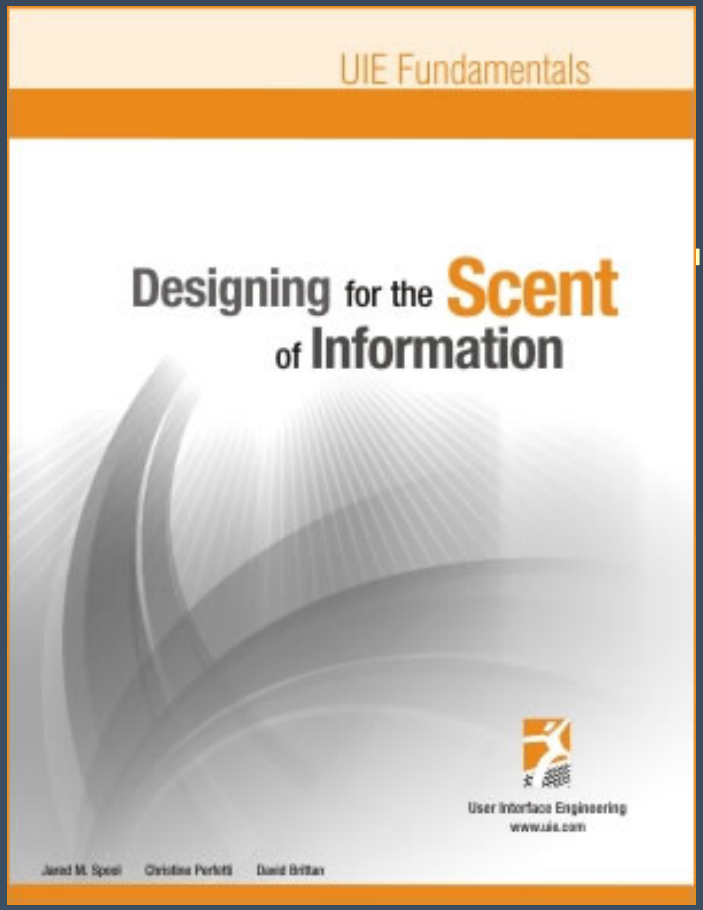


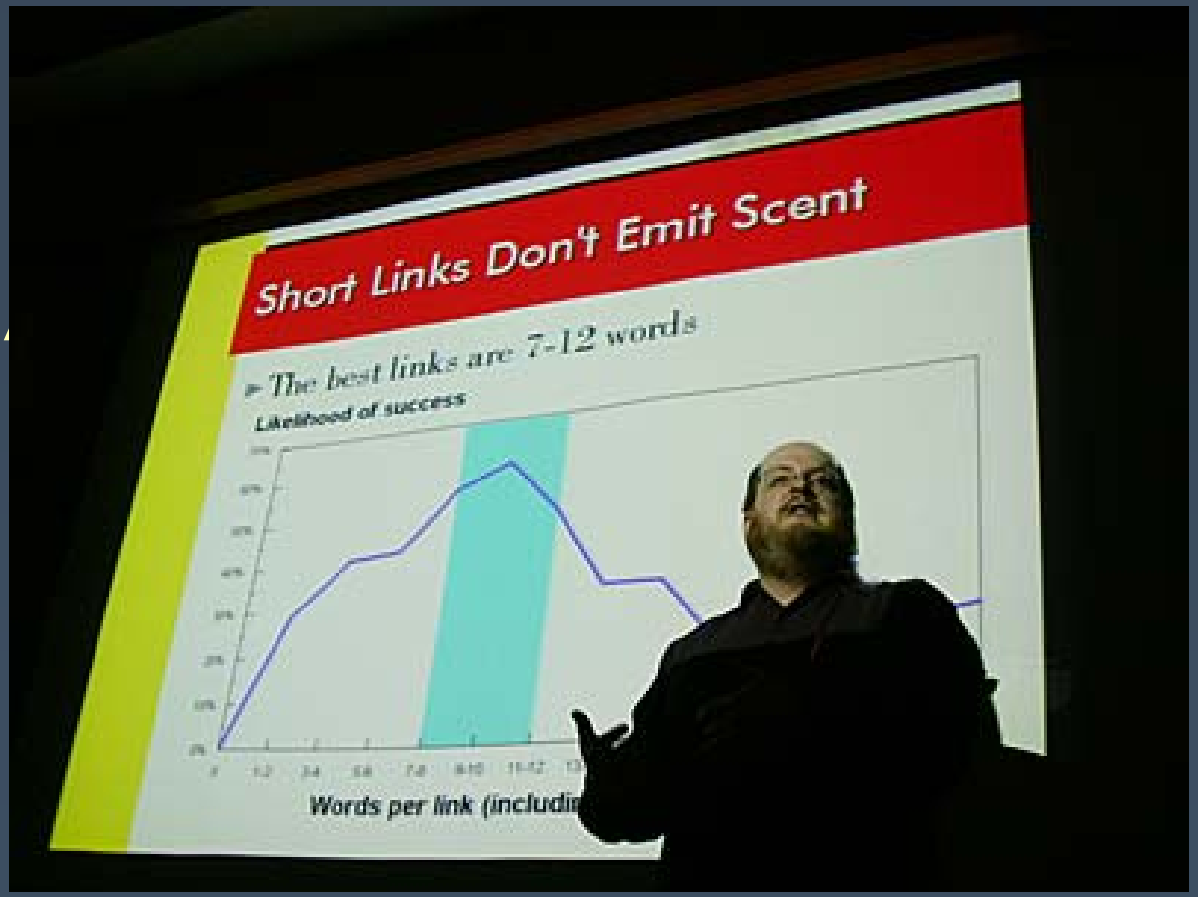
PHASE TRANSITION IN NAVIGATION COSTS AS FUNCTION OF INFORMATION SCENT



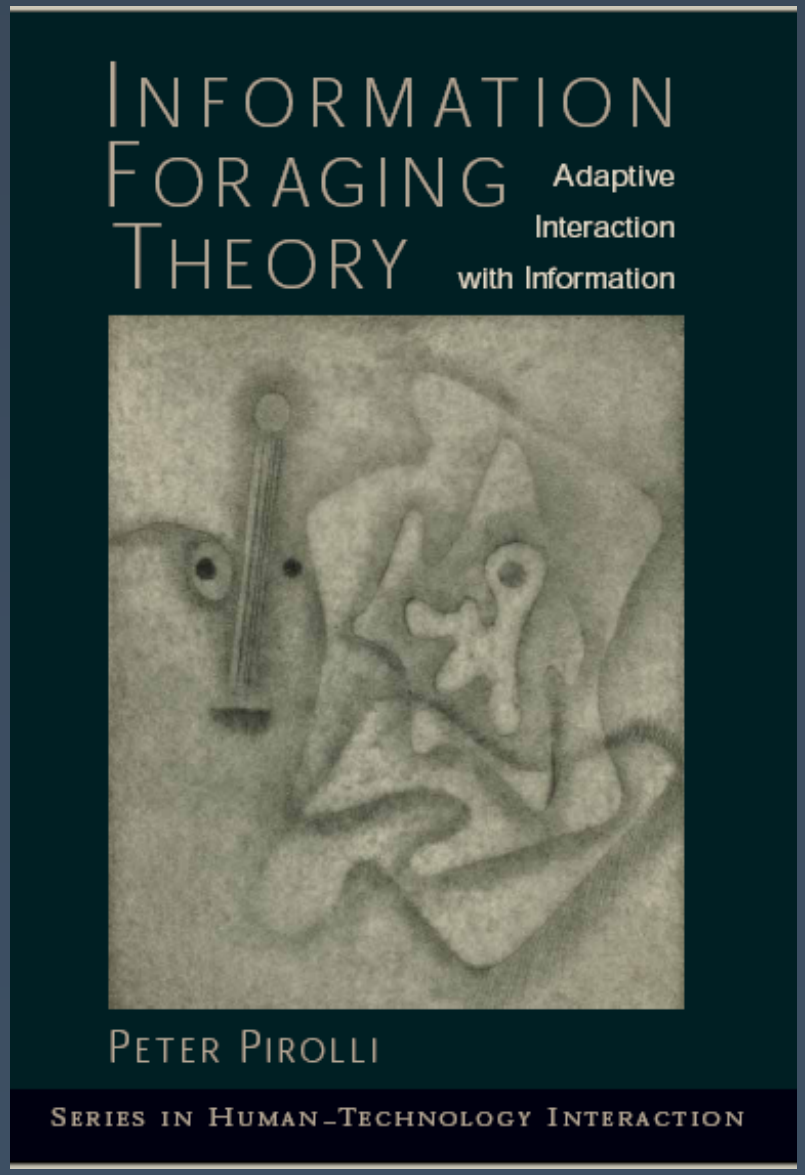


Notes: Average branching factor = 10
Depth = 10



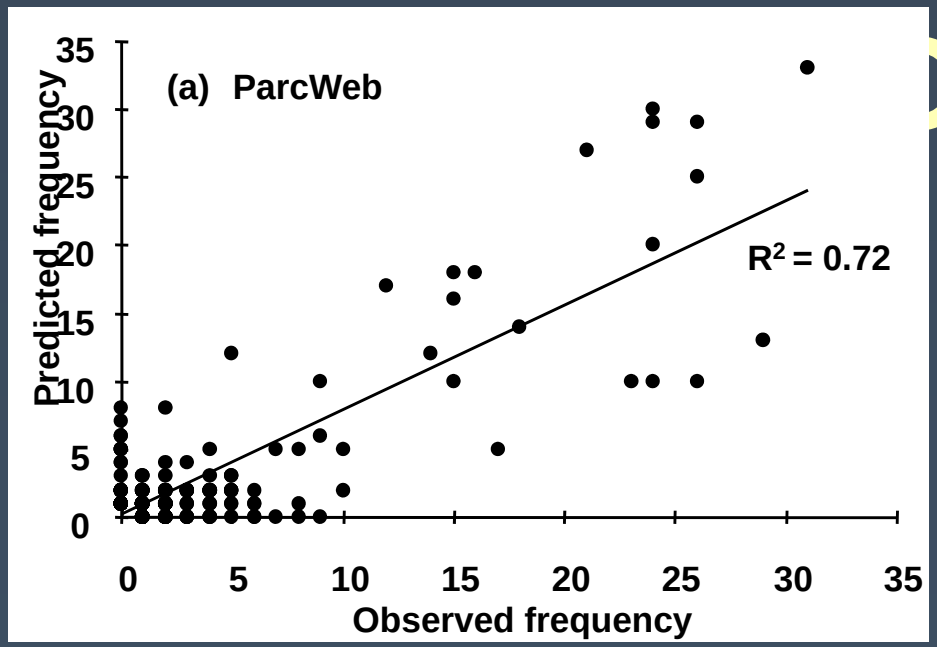


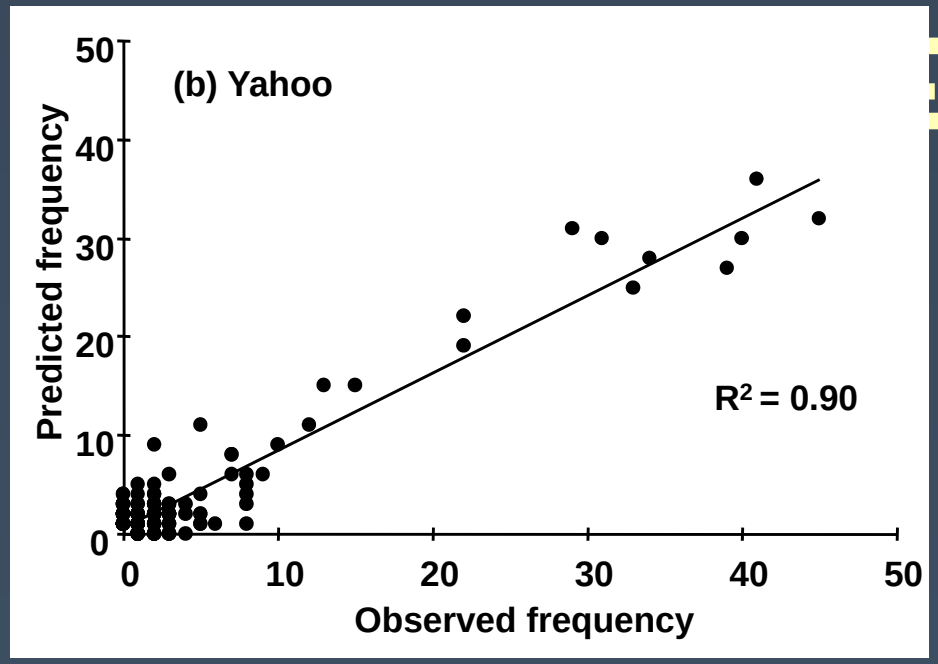
Jarad Spool, UIE



Peter Pirolli

MACHINE MODELING OF INFORMATION SCENT


(a) ParcWeb
Predicted frequency
Observed frequency
$R^2 = 0.72$
0
5
10
15
20
25
30
35


(b) Yahoo
Predicted frequency
Observed frequency
$R^2 = 0.90$
0
10
20
30
40
50

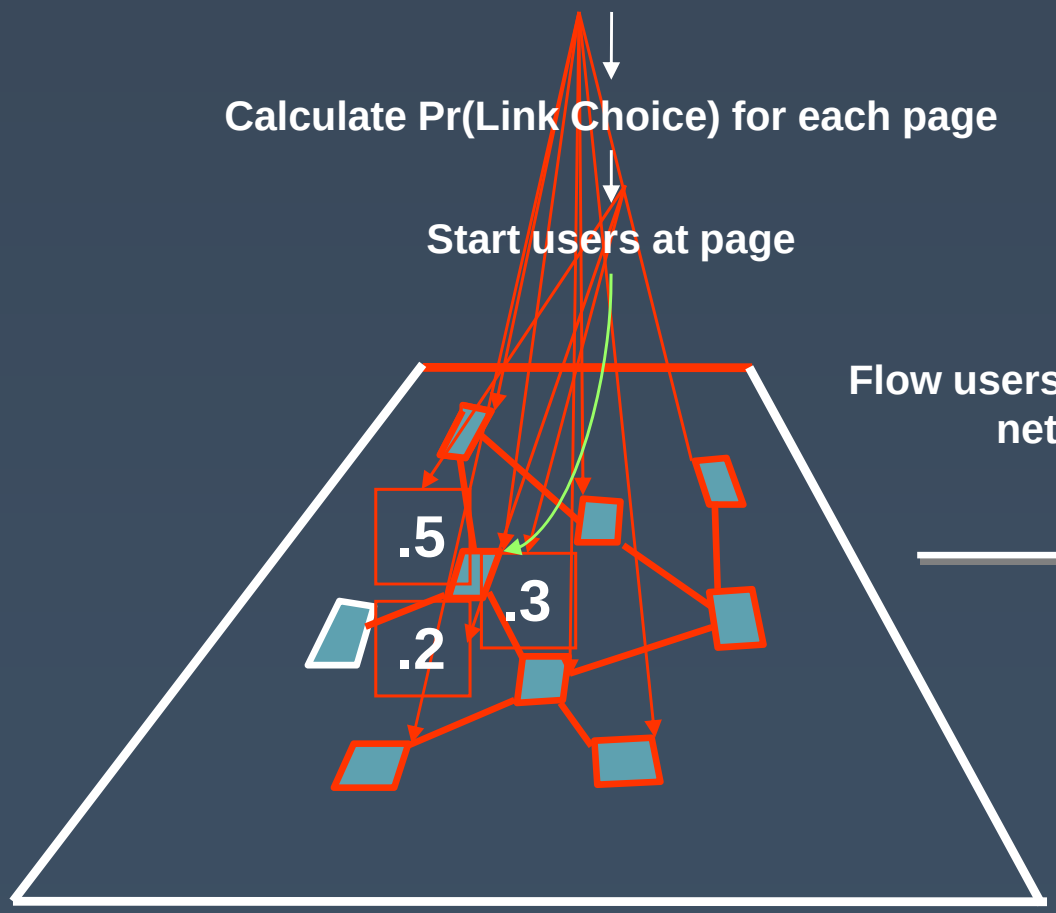
USER FLOW MODEL

User need (vector of goal concepts)

Determine relevance of documents

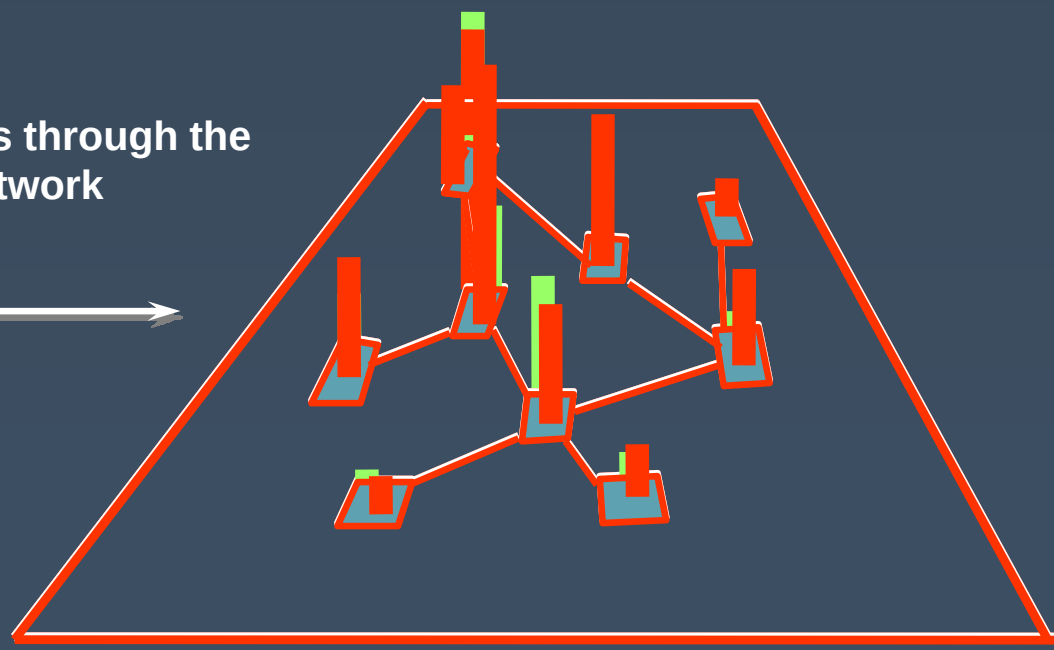
Calculate Pr(Link Choice) for each page

Start users at page



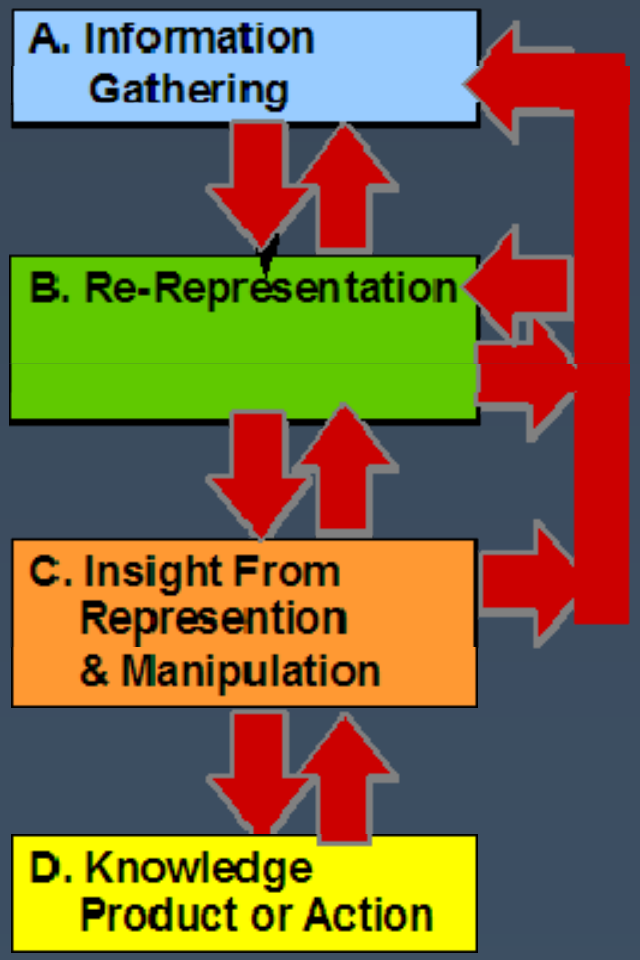
Flow users through the network

Examine user patterns



SENSE MAKING TASKS

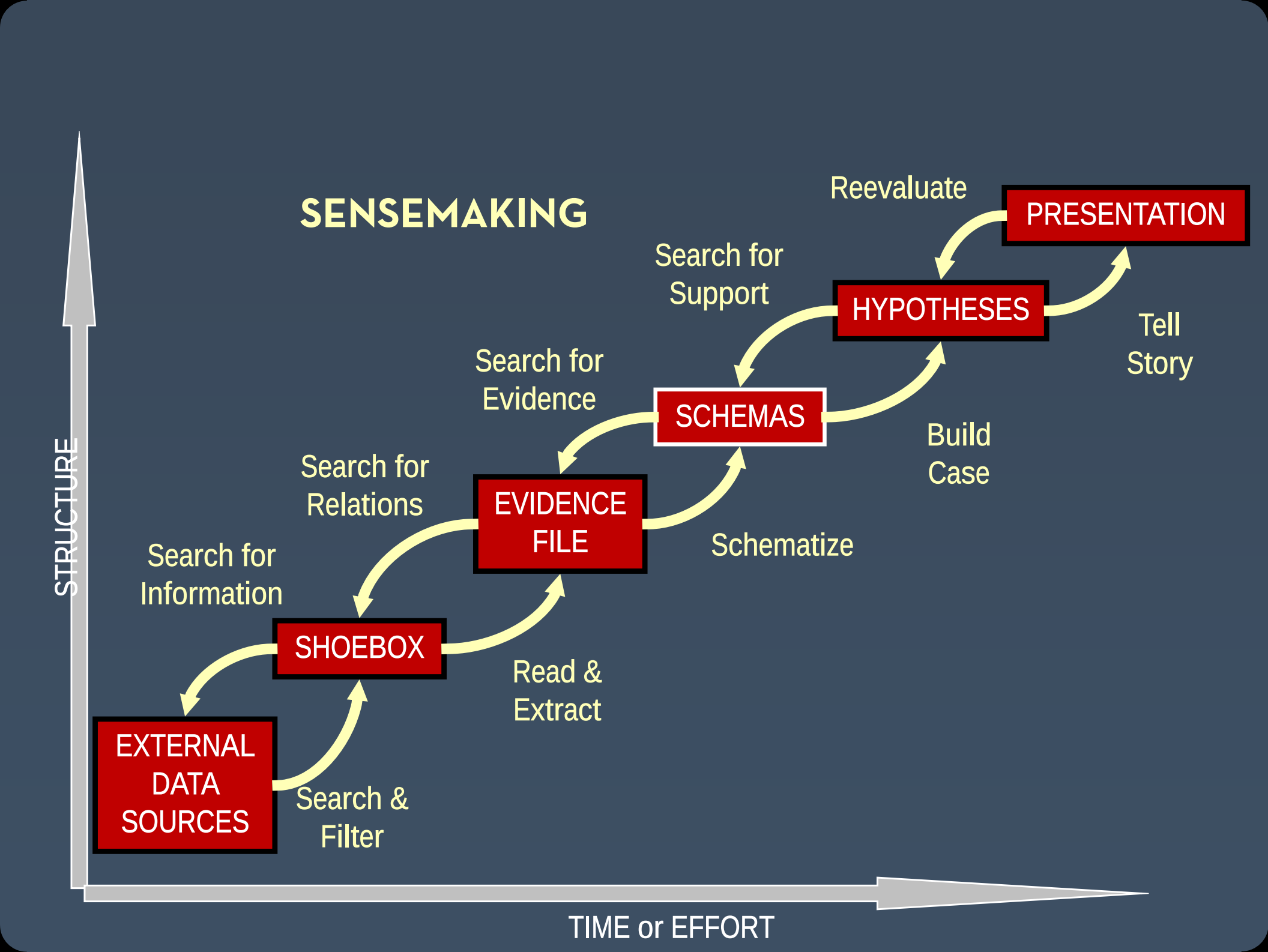
- Characteristics
  - Massive amounts of data
  - Ill-structured task
  - Organization, interpretation, insight needed
  - Output, decision, solution required
- Examples
  - Understanding a health problem and making a medical decision
  - Buying a new laptop
  - Weather forecasting
  - Producing an intelligence report

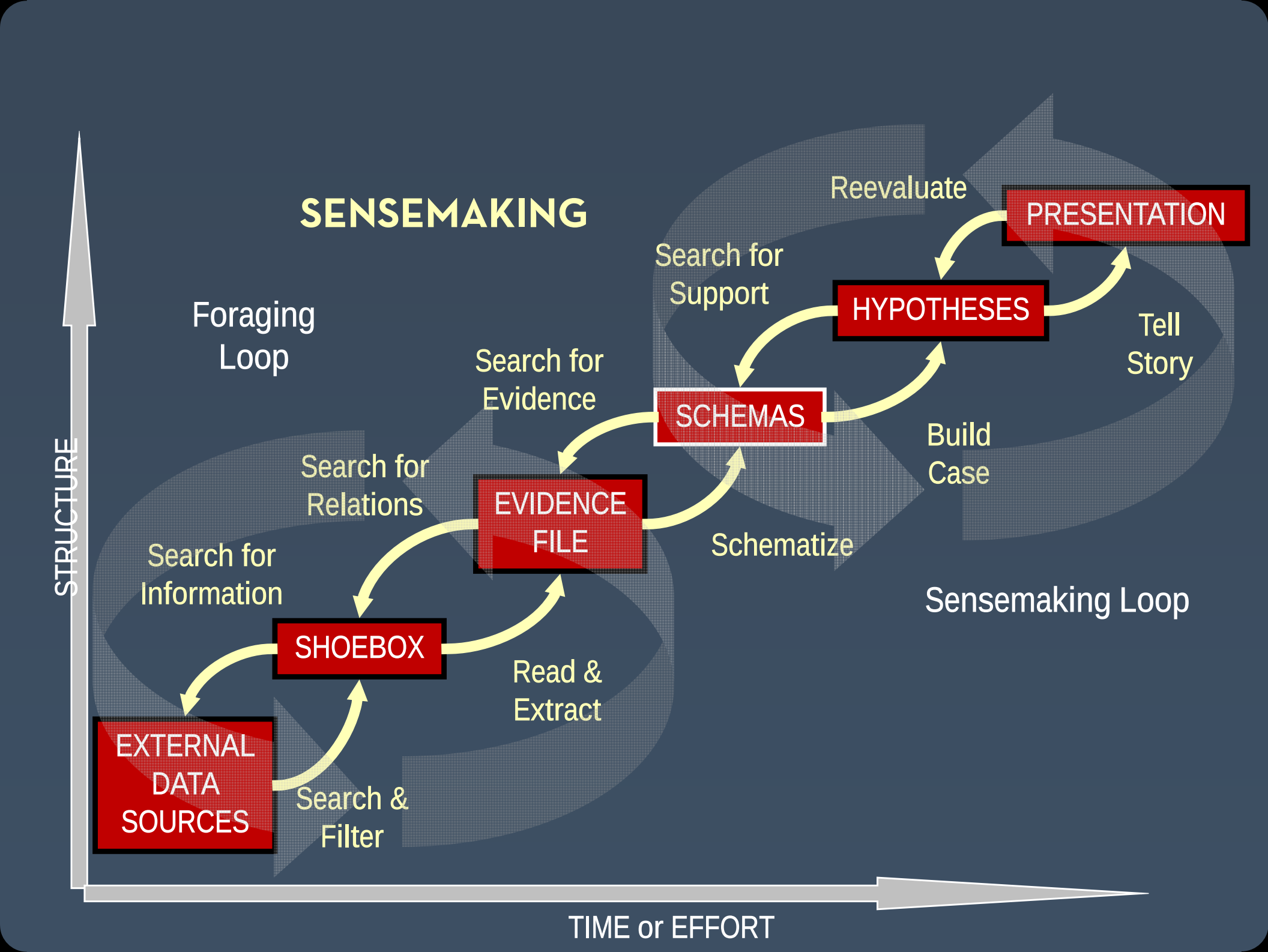


Importance of Sensemaking

- 75% of "significant tasks" on the Web are more than simple "finding" of information (Morrison et al., 2001)
  - Understanding a topic (e.g., about health)
  - Comparing/choosing products

- Information retrieval does not support these tasks (Bhavnani et al., 2002)
  - E.g., Estimated that one must visit 25 Web pages in order to read about 12 basic concepts about skin cancer


SENSEMAKING
STRUCTURE
TIME or EFFORT
EXTERNAL DATA SOURCES
SHOEBOX
EVIDENCE FILE
SCHEMAS
HYPOTHESES
PRESENTATION
Search for Information
Search & Filter
Search for Relations
Read & Extract
Search for Evidence
Schematize
Search for Support
Build Case
Reevaluate
Tell Story


SENSEMAKING
Foraging Loop
Sensemaking Loop
STRUCTURE
TIME or EFFORT
EXTERNAL DATA SOURCES
SHOEBOX
EVIDENCE FILE
SCHEMAS
HYPOTHESES
PRESENTATION
Search & Filter
Read & Extract
Schematize
Build Case
Tell Story
Search for Information
Search for Relations
Search for Evidence
Search for Support
Reevaluate

Credits & Further Reading

- This lecture draws heavily on Stu Card's slides on HII
- Peter Pirolli, Information Foraging