Human Intelligence: A networks and systems view

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1. Knowledge in pieces
2. Intelligence in systems and networks
3. Minds and ways of knowing
4. Integration
5. It’s a systems problem
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Universities are misaligned with what is being done with information and how knowledge is created and generated at the human-machine nexus.
Information fragmentation...
loss of narratives of coherence
The problem:
Once we’ve fragmented content and conversation, we need to stitch them together again so we can act meaningfully.
A system where individuals have far greater control over their learning than ever before

Which produces:
- Knowledge fragmentation
- Lack of coherence in understanding
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Learning in relationship to knowledge and mind

Distributed –
  • Hutchins – Not “in skull”
  • Spivey et. al. – “not always inside brain”
  • Bereiter – “knowing outside the mind”

Externalization – Wittgenstein, Vygotsky

Socialization – Papert, Piaget, Bruner, Bandura

Ethical/moral obligations…structures – Freire, Illich, Papert, Dewey

Connectivism: networked, connected: biological, conceptual, social
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We are intelligent in networks and systems

“animals can no longer be considered individuals in any sense of classical biology: anatomical, developmental, physiological, immunological, genetic, or evolutionary. Our bodies must be understood as holobionts whose anatomical, physiological, immunological, and developmental functions evolved in shared relationships of different species.”

Knowledge is a pattern of connections

New knowledge builds on (relates to) what is already known

Innovation requires openness for new connection forming, new creations, new mashups
“a thousand threads that lead from the locomotive to the very beginning of the modern world”

Rosen, 2010
“The process may be more like stitching together known parts than pioneering a complete route from scratch”

W. Bryan Arthur, 2006
in order for us to truly create and contribute to the world, we have to be able to connect countless dots, to cross-pollinate ideas from a wealth of disciplines, to combine and recombine these pieces and build new castles.
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Latest version of ChatGPT aces bar exam with score nearing 90th percentile

BY DEBRA CASSENS WEISS

MARCH 16, 2023, 1:59 PM CDT

The newest version of ChatGPT passed the US medical licensing exam with flying colors — and diagnosed a 1 in 100,000 condition in seconds

Figure 1: The universe of possible minds [54, 55].
Figure 3. Morphospace of consciousness. Autonomous, computational and social complexity constitute the three axes of the consciousness morphospace. Human consciousness is used as a reference in one corner of the space. Current AI implementations cluster together in the high computation, low autonomy and low social complexity regime, while multi-agent cognitive robotics cluster around low computational, but moderate autonomous and social complexities. Abbreviated legends: MADeep (multi-agent deep reinforcement system) [89]; TalkH (talking heads) [88]; DQN (deep Q-learning) [67]; DAC-X (distributed adaptive control) [62].
FIG. 2 The cognitive space of H-R interactions under the two-agent perspective taken here. Non-robotic systems (such as Alexa, Siri) and game-playing robots (such as Asimo) compete in the same space. The combination of emotional engagement and artificial cognitive complexity determines the level of human-robot interaction.
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Science advances within in a framework or model (paradigm).

When that changes, everything changes.
Now facing a world of human/machine distributed cognition

The algorithms and robots are part of our cognitive system.

They are agents who think with us, not entities that we use to think.
Artificial and human cognition: integration

Distributed technological cognition: human and technological agents.

“Society’s techno-social systems are becoming ever faster and more computer-oriented... can generate a new behavioral regime as humans lose the ability to intervene in real time”

Johnson et al., 2013 (Nature)
Theories of human-machine interaction and coordination

Fig. 4 | Scale of inquiry in the machine behaviour ecosystem. AI systems

Finally, the external systems that we are a part of also impacts our learning and knowledge.

Knowledge in organizations flows between people, not departments.

What organizations formally provide for employees is not necessarily what is needed for knowledge work.

How is this age of AI different from traditional technology advancements?

The transition from a tool to a quasi-colleague
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The problem is a systems problem
UNBUNDLING HARVARD
Companies targeting the traditional university

Source: cbinsights.com
Our institutions are not preparing students for a future of AI/human co-thinking
“Punctuated equilibrium holds that the great majority of species originate in geological moments (punctuations) and persist in stasis.”

“The history of evolution is not one of stately unfolding, but a story of homeostatic equilibria, disturbed only “rarely” (i.e., rather often in the fullness of time) by rapid and episodic events of speciation.”

Pace mismatch

Change in biological systems fails to keep pace with change in technological systems

Our cultural values are now expressed in different ways by different groups (age, location, affinity)

Information pace exceeds humanity’s ability to apprehend
Data collected in a learning environment (we are exploring the same architecture within Boeing)

Student Information System
- Student profile/Demographics
- Lesson planning
- Scheduling
- Enrolment
- Assignments
- Campus attendance
- Academic data

Learning Environment
- Trace data
- Simulation data
- Assessment
- Social interaction
- Content interaction
- Intelligent tutoring system
- Educational context data

Library Management System
- Library attendance
- Lesson Library use (loan reports)
- Library helpdesk

Instruments
- Video
- Audio
- Gesture
- Gaze
- Psychophysiological data
- EEG
- fMRI

Multimodal
- Twitter
- Facebook
- Blog

Social Media
- e-book journals applications

Third-party
- Survey
- Questionnaire
- Interview
- Focus groups
- Ethnography

Srecko Joksimovic, 2018
What should we know about AI?

- It’s backward facing (generally)
- It uses us as much as we use it
- AI favours the aggregate - at the scale of big tech
- It is a threat to existing systems
- It is a positive that can raise the quality of life
- It is needed to engage with complexity
What is unique to the human?

Our competition cognitively is not only with one another or with other countries:

it now involves artificial cognition.
What should be taught

- AI and Data literacy
- The interconnectedness of things
- The future
- How systems change
- Beingness: states and ways of being
- Navigating complexity
- Collaborating with non-human intelligence
- Cultural knowledge
Sensemaking Lectures

AI hype is driving interest in longer term impacts in all sectors of society. Education is not immune. For academics, administrators, and staff, the rapid pace of development of generative AI, coupled with industry driven declarations of how education will change, requires a thoughtful, nuanced, research-informed response.

GRAILE is launching a 12-month speaker series: Sensemaking Lectures. Each month, a speaker will frame a theme of discussion and conversation. Following the lecture, discussions will be held reviewing important literature and exploring implications in educational settings. These discussions will happen asynchronously, with periodic Zoom discussions, with a global community of interested researchers.