Intelligence Augmentation via Artificial Intelligence: IA Complements AI

PROFESSOR CHRIS DEDE
HARVARD GRADUATE SCHOOL OF EDUCATION

• Co-PI and Associate Director of Research
  National AI Institute on Adult Learning and Online Education

• Senior Researcher, Next Level Lab:
  Applied Learning Science for Access, Innovation, and Mastery

with thanks to Ashley Etemadi, researcher at the Next Level Lab
WHY ARE LLM AN IMPORTANT OPPORTUNITY FOR TEACHING, LEARNING, AND ASSESSMENT?

LLM solve the natural language processing problem (NLP)

- Paraphrase
- Idioms
- Implicit and tacit understandings
- Multiple languages

Fluent verbal and textual interaction
INTELLIGENCE AUGMENTATION

• Advances in machine learning are changing the division of labor

• “Intelligence” involves complementary roles of “judgment” and “reckoning”

• Hybrid machine and human teams will have machines providing reckoning, freeing people to focus more on judgment and decision making

• This complementarity between humans and AI leads to “intelligence augmentation,” but only if people upskill
Forecasts suggest that machines will be taking up more human task hours over the coming years.

- % of total task hours performed by machines
- % of total task hours performed by humans

Cann, 2018
Exhibit 8

With generative AI added to the picture, 30 percent of hours worked today could be automated by 2030.

Midpoint automation adoption\(^1\) by 2030 as a share of time spent on work activities, US, %

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Automation adoption without generative AI acceleration</th>
<th>Automation adoption with generative AI acceleration</th>
<th>XX — Percentage-point acceleration in automation adoption from generative AI</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM professionals</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Education and workforce training</td>
<td></td>
<td>16</td>
<td></td>
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<tr>
<td>Creatives and arts management</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Business and legal professionals</td>
<td></td>
<td>14</td>
<td></td>
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<tr>
<td>Managers</td>
<td></td>
<td>9</td>
<td></td>
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<tr>
<td>Community services</td>
<td></td>
<td>9</td>
<td></td>
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<tr>
<td>Office support</td>
<td></td>
<td></td>
<td>7</td>
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<tr>
<td>Health professionals</td>
<td></td>
<td>6</td>
<td></td>
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<tr>
<td>Builders</td>
<td></td>
<td></td>
<td>6</td>
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<tr>
<td>Property maintenance</td>
<td></td>
<td>6</td>
<td></td>
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<tr>
<td>Customer service and sales</td>
<td></td>
<td>6</td>
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<tr>
<td>Food services</td>
<td></td>
<td></td>
<td>5</td>
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<tr>
<td>Transportation services</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Mechanical installation and repair</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Production work</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Health aides, technicians, and wellness</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>All sectors(^2)</td>
<td></td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

\(^1\) Midpoint automation adoption is the average of early and late automation adoption scenarios as referenced in *The economic potential of generative AI: The next productivity frontier*, McKinsey & Company, June 2023.

\(^2\) Totals are weighted by 2022 employment in each occupation.

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RECKONING VERSUS JUDGMENT

Reckoning is calculative prediction

Programs that can estimate the life expectancy of a particular cancer patient, given their characteristics, the specific disease, and available treatments

Judgment is practical wisdom

Healthcare workers counseling cancer patients can help them choose treatment options, factoring in quality of life versus life expectancy, tolerance for pain, personal and cultural beliefs about death, family circumstances, spiritual beliefs
SENDING KIDS THE RIGHT MESSAGE ABOUT AI

Eating healthy food

Crossing a busy street

Having fun with friends at the playground
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A COORDINATED SUITE OF AI TECHNOLOGIES
(based on functional roles of human teachers)

- Formative Assessment TA
- Content Tutors
- Question Answering TA
- Literature Review RA
- Virtual Laboratory RA

Ashok Goel, Georgia Tech
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ML Does Well on High-Stakes Tests, including *Descriptive Writing* and *Art*
Intelligence Augmentation: Upskilling Humans to Complement AI

Applying Learning Sciences Research to Learning and Workforce Development for Next Level Learning Brief Series

Chris Dede, Ashley Etemadi, and Tessa Forshaw

Navigating a World of Generative AI: Suggestions for Educators

Lydia Cao and Chris Dede

Next Level Lab: Applied Learning Sciences for Access, Innovation, and Mastery (AIM) Harvard Graduate School of Education
IN LEARNING, THE DESTINATION IS THE JOURNEY

Your written essay is not the goal, but a means to learning the skill of expressing your original thoughts in words.
National AI Institute: Adult Learning and Online Education

Feedback loops among Coaches, Learners, and AI Performance Simulators

Theories of human cognition & learning
Constraints and affordances of immersive virtual simulations
AI-powered immersive virtual simulations with embedded coaching
Coach/Mentor
Learners

Learning assessments and behaviors
Data mining and learning analytics

https://aialoe.org/
SMART for Enhancing Concept Learning

- Deployed in 17 English and Biology classes with 350 learners at TCSG.

- **Learners demonstrated a significant improvement in their knowledge structure.**

- SMART-supported concept learning significantly influenced learners’ positive perceptions of AI technology and their classroom performance.

<table>
<thead>
<tr>
<th>Similarity Change Heat Map (Final Model – Initial Model)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface</strong></td>
</tr>
<tr>
<td>S-Number of Concepts</td>
</tr>
<tr>
<td>S-Number of Relations</td>
</tr>
<tr>
<td>S-Density</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
</tr>
<tr>
<td>S-Average Degree</td>
</tr>
<tr>
<td>S-Mean Distance</td>
</tr>
<tr>
<td>S-Diameter</td>
</tr>
<tr>
<td><strong>Semantic</strong></td>
</tr>
<tr>
<td>Concept Matching</td>
</tr>
<tr>
<td>Propositional Matching</td>
</tr>
<tr>
<td>Recall-C</td>
</tr>
<tr>
<td>Recall-P</td>
</tr>
</tbody>
</table>

Note: Significant F values are included in the cells.
VERA for Enhancing Model Learning

- Deployed VERA in classes on natural resource management at North Georgia Technical College.
- Instructors of these courses unexpectedly used VERA as an assessment tool on the final exam.
- 88% of students had model complexities higher than the 6 required on the exam, with the average being around 15.
BEGINNING FRENCH II CURRICULUM

• What does it mean to be Parisian?
  • Discussions of the diversity of Paris

• Lodging and housing in Paris

• Famous love stories in Paris (love during Covid19, cliches of Paris as the city of love, etc.)

• Quarters of Paris
  • Marais, Montmartre, Latin Quarter, Belleville, Goutte d’Or, 11e/la République

• Les Beaux-Arts (Fine Arts): **
  Music: Fête de la Musique in Paris
  Theater: Comédie Française (Le Malade Imaginaire)
  Art: Surrealism and modern art at the Centre Pompidou /Graffiti in Paris

• Media: Representations of Paris in Media (Gilets Jaunes/Covid19)
DAY 6: SURREALIST CRIME AT THE CENTRE POMPIDOU

- **Linguistic function:** Express opinion, emotion, doubt, and certitude

- **Theme:** Who committed the surrealist crime at the Centre Pompidou?

- **Grammar review:** Subjunctive
https://www.wondavr.com/case-studies/ai-mystery
Increased Human Accomplishments with IA

- Evidence-based Modeling for Localized Decisions
  - Predicting natural phenomena well, but limited in forecasting human-controlled phenomena

- Higher Threshold for Human Creation
  - Beyond descriptive writing to narrative
  - Beyond formulaic art to differentiated representations

- Better Understanding of Self and Others
  - AI-enhanced simulations for human interaction
  - Practice, perspective taking, and the Proteus Effect
Advance use-inspired artificial intelligence (AI) technologies to scale the availability of SLPs for universal screening and individualized ability-based interventions.
POPULAR DEPICTIONS OF ARTIFICIAL INTELLIGENCE
A LARGE LANGUAGE MODEL (LLM) IS LIKE A DIGITAL PARROT

It can express combinations of sounds/symbols without any understanding of these mean or any capacity to explain how it arrived at what it is articulating.
A LLM IS LIKE A BRAIN WITHOUT A MIND

No consciousness, metacognition, agency, senses, experiences, or implicit knowledge of what it is like to have a biological body, a family and friends, a culture, and an ethical system with moral values.
A LLM IS LIKE A DISTORTED MIRROR

In reflecting back the artifacts it assimilates from the worldwide web, human biases and misconceptions, uncited use of others’ intellectual property, and made-up hallucinations are infused into what the Internet can offer as curated knowledge and insight.
PERFORMANCE DOES NOT GUARANTEE EVENTUAL COMPETENCE

One of the "Seven deadly sins of AI predictions" is to assume that basic performance will lead to high competence, given enough time and resources.
Unless we are wise, LLM may become a type of digital duct-tape to hold together an obsolete industrial-era educational system.
OTHER PEOPLE ARE OFTEN A BETTER SOURCE OF KNOWLEDGE AND INSPIRATION THAN AI

A group of peers will bring more diverse perspectives, more creative ideas, and greater social support than a chatbot can.
Call to Action by Parents

love of learning, flexibility, resilience, confidence, initiative, growth mindset