From the SelectedWorks of Antje Mays

November 8, 2023

Artificial intelligence for the information profession
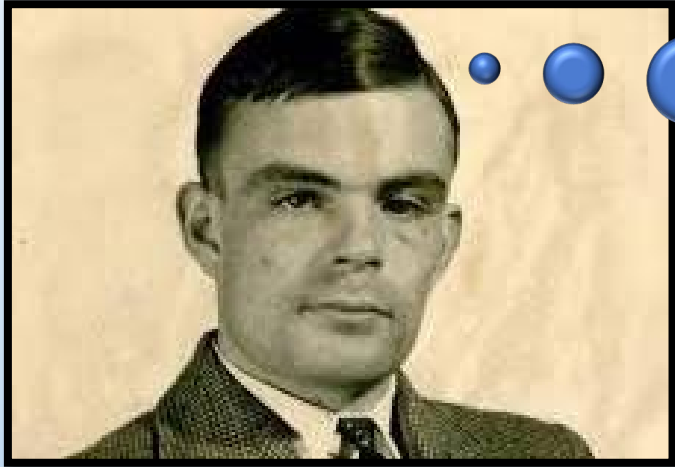
Dr. Antje Mays, *University of Kentucky*
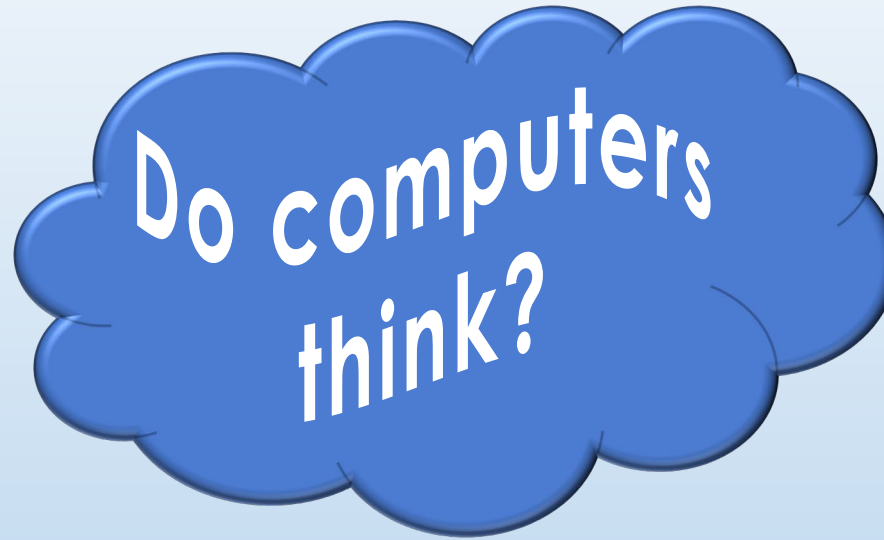
bepress™

AI started as productivity tool

- Rooted in automating logical tasks for efficiency gains

- Early experiments in:
  - Computing logic
  - Conversational bot
  - Robot
  - Autonomous vehicle

Source: Wooldridge (2018)

Libraries

AI and the mathematical roots of computing logic

Alan Turing, British mathematician

Do computers think?

Turing, Alan M. "Computing Machinery and Intelligence." *Mind* **59, no. 236 (1950): 433-460**

Types of artificial intelligence

- Machine learning

- Recommender systems ("you may also like…")

- Classification systems

- Expert systems

- Natural language processing

- Audio-visual processing

- Generative AI (text, image, AV, code, etc)

Sources: IBM (2023), Warwick (2012); Wooldridge (2021)

Libraries

AI use cases

- Automated customer / user support
- Corpus analysis (text, image, and more)
- Data analysis (on large scale) to derive insights
- Data cleanup and normalizing for data-centric projects
- Decision support
- Expert systems
- Fraud detection
- Law enforcement (e.g., facial recognition, behavior analysis & inferences)
- Medical diagnosis and treatment support
- Sentiment analysis

and more…

Library use case: a machine learning example

- Machine learning as classifier tool

- Infers from training data

- Based on patterns exemplified in training data,

  ➢ Training data inform classification labels for destination field.

Machine learning to automate subject-tagging

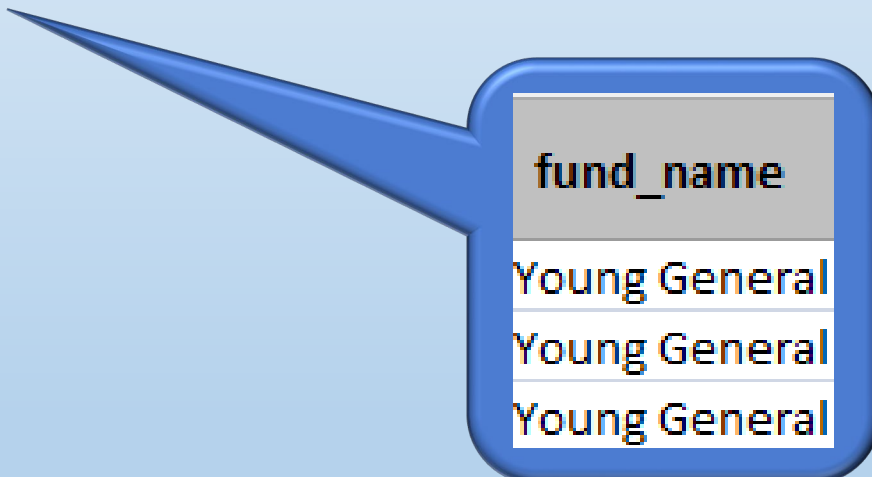**End Goal:** New Books & Media LibGuide – need clean subject data

1. **Start:** Extract new titles' purchase data and bibliographic descriptions:
   1. Fund-code information as proxy to clean controlled subject names
   2. Bibliographic data to glean subjects and foundation for AI-classified subjects
   3. Unique record ID

2. **Data cleanup** / fill-in / normalization via machine learning

3. **Create raw html code:**
   1. Field concatenation – en masse for all record lines:
      1. Unique record ID and universal public-display URL syntax to hyperlink each title
      2. Additional html to enrich descriptions seen by end users
   2. Copy concatenated html into LibGuide html editor

Types of machine learning

- Supervised learning (our example will use supervised learning)
- Unsupervised learning
- Reinforcement learning
- Neural nets
- Deep learning and convolutional neural nets

Messy data – missing data

- **Productivity gap 1:**
  - Some fund codes are too general for automatic subject associations
    - ➢ → subject-agnostic → no automatable subject association
    - ➢ Missing proxy for automatic subject labelling

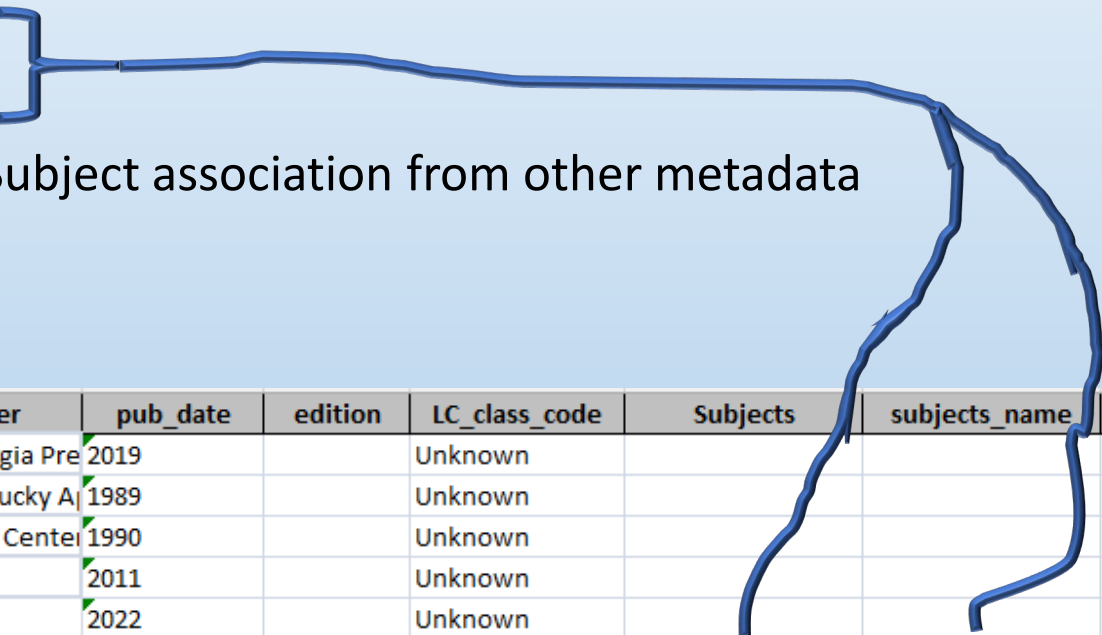| fund_name |
|-----------|
| Young General |
| Young General |
| Young General |

Messy data – missing data, ctd.

- **Productivity gap 2:**
  - ➢ Too many minimal bibliographic records → combination of data problems:
    - ➢ No data in Subject field
    - ➢ No content description
    - ➢ → need to extrapolate Subject association from other metadata

unique_record	title_complete	publication_place	publisher	pub_date	edition	LC_class_code	Subjects	subjects_name	bib_lvl	resource_type	language
9941646044202636	Literary Field Guide to Sout	Athens	Univ of Georgia Pre	2019		Unknown			m	Book - Physical	English
9941646044302636	Health In Appalachia: Proce		Univ of Kentucky A	1989		Unknown			m	Book - Physical	English
9941646044602636	Children In Appalachia: Pro		Appalachian Center	1990		Unknown			m	Book - Physical	English
9941646143802636	Appalachia - The Journal of		Read Books	2011		Unknown			m	Book - Physical	English
9941764345202636	Lords of Chaos			2022		Unknown			m	Book - Electronic	English
9941774243002636	Media Literacy: Media Ethic			2022		Unknown			m	Book - Electronic	English
9941774243102636	Advertising at the Edge of t			2022		Unknown			m	Book - Electronic	English
9941784144802636	Food Choices - How Our Die			2022		Unknown			m	Book - Electronic	English
9941786943402636	Céline and Julie Go Boating			2022		Unknown			m	Book - Electronic	French

Messy data – missing data, ctd.

- **Productivity gap 2, ctd.:**
  - ➢Too many minimal bibliographic records → combination of data problems:
    - ➢ No data in Subject field
    - ➢ No content description
    - ➢ → need to **extrapolate** Subject association from **other metadata**

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9941784144802636	Food Choices - How Our Die			2022		Unknown			m	Book - Electronic	English
9941786943402636	Céline and Julie Go Boating			2022		Unknown			m	Book - Electronic	French

Machine learning for creating subject labels

- Task: to **extrapolate** subject associations from **metadata** describing titles where subjects are known.
- Supervised machine learning to generate Subject name labels:
  - Where titles' subject fields are blank
  - Where descriptive data are minimal or missing
- Training data – drawn from titles with known subject associations:
  - Inputs (title metadata)
  - Outputs (associated subjects – controlled vocabulary)
- Real-world output – inference from training data:
  - Examines real title's descriptive data
    - based on word patterns in input-output training data
  - From word patterns in training data, populates Subject for the real titles.

From training data to populating empty fields

- Example solution: Supervised machine learning.
- Populates destination fields based on example data ("training data")
- Training data "teach" the machine:
  - Word patterns in example input data (title and descriptive data)
  - Associative patterns in adjacent column's Subject field
- Real titles' destination Subject fields, AI-populated by:
  - Comparing title word patterns against training titles' word patterns
  - Drawing from examples of training titles and metadata and desired subjects

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Machine learning tool

- **PromptLoop** – spreadsheet AI plugin, works with:
  - Excel
  - Google Sheets

PromptLoop plugin ➜ Excel

Pop-up window will open

File   Home   Insert   Draw   Page Layout   Formulas   Data   Review   View   Help

PivotTable   Recommended PivotTables   Table | Pictures   Shapes ˅   Icons   3D Models ˅ | SmartArt   Screenshot ˅ | Get Add-ins   My Add-ins

Tables   Illustrations

Office Add-ins

MY ADD-INS | ADMIN MANAGED | **STORE**

Add-ins may access personal and document info
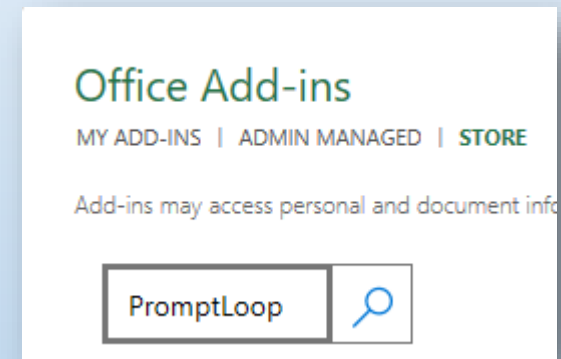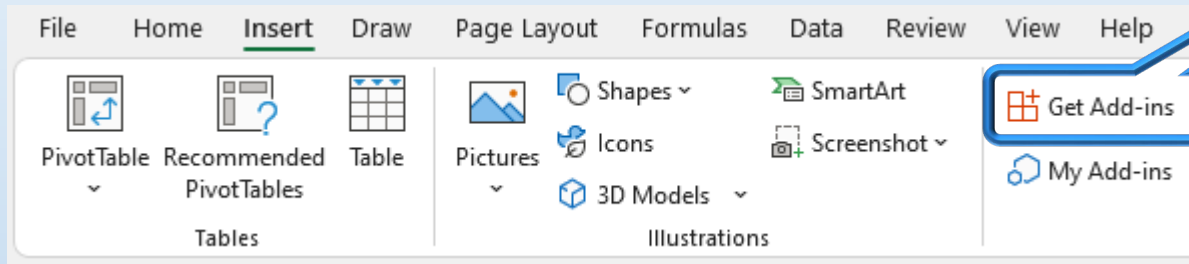
PromptLoop 🔍

Add, if plugin is new

PromptLoop
Promptloop is a platform to build spreadsheet capabilities using AI models.
★★★★★ (1)

Add

PromptLoop plugin ➔ Google Sheets:

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Preparing the Data

Training data: Input data

- For best results, enrich training data by:
  - ➢ concatenating Title field with several metadata fields

- Training data: titles with known subjects – titles concatenated with:
  - Subject
  - Subject Name
  - Language

Training data: Output data

- For titles with known subjects:

- Subject field adjacent to Title field

- Subjects in training output column:
  - Formal subject name for each title
  - Controlled vocabulary
  - Consistent title-to-subject associations

Training data – sample rows in spreadsheet

Concatenation formula:

=E2&" "&F2&" "&G2&" "&H2

Combines these fields:
- Title
- Subject
- Subject Name
- Language

Enriched training data - concatenated training field:

Controlled vocabulary

	A	B
1	Input example: concatenated field combining metadata from example titles with known subjects	Output example: desired output: examples of desired subject associations
2	A is for Affrilachia / written by Frank X	Appalachian Studies
3	African American workers and the App	Appalachian Studies
4	Against the current : paddling upstrea	Appalachian Studies
5	Another Appalachia : coming up quee	Appalachian Studies
120	Food : delicious science. Chemistry.; F	Agriculture, Food and Environment
121	Food deserts and food insecurity in th	Agriculture, Food and Environment
122	Food matters / Permacology Productic	Agriculture, Food and Environment
123	Food, science, and the human body. e	Agriculture, Food and Environment
189	Jennifer West : media archaeology / e	Communication
190	Killing us softly : advertising's image o	Communication
296	L'Astrée. Trosième partie / Honoré d'	French & Francophone Studies
297	Au revoir les enfants / ecrit et réalisé	French & Francophone Studies
313	Descartes et la question de la civilité :	French & Francophone Studies
278	Renegade rhymes : rap music, narrativ	Music
279	The Routledge companion to musical	Music
280	Routledge handbook of Asian music :	Music
281	The science of brass instruments / Mu	Music
282	Seeding the tradition : musical creativ	Music

A is for Affrilachia / written by Frank X Walker ; illustrated by upfromsumdirt. African Americans--Appalachian Region--History--Juvenile literature.; Appalachian Region--History--Juvenile literature.; African Americans--Appalachian Region--History.; Alphabet.; Informational works.; Alphabet books.; Picture books.

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Training data – Title-to-subject associations

	A	B
1	**Input example: concatenated field combining metadata from example titles with known subjects**	**Output example: desired output: examples of desired subject associations**
2	A is for Affrilachia / written by Frank X	Appalachian Studies
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Controlled vocabulary

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Training data – Title-to-subject associations

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1	Input example: concatenated field combining metadata from example titles with known subjects	Output example: desired output: examples of desired subject associations
2	A is for Affrilachia / written by Frank X	Appalachian Studies
3	African American workers and the App	Appalachian Studies
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120	Food : delicious science. Chemistry.; F	Agriculture, Food and Environment
121	Food deserts and food insecurity in th	Agriculture, Food and Environment
122	Food matters / Permacology Productic	Agriculture, Food and Environment
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Training data: subject associations

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Target data: Subject names populated by AI output

Target data

Destination for AI output

	D	E
1	**Titles dataset: concatenated descriptive field**	**AI output: Subject names**
2	Literary Field Guide to Southern Appalachia Univ of Georgia Press	
3	Health In Appalachia: Proceedings from the 1988 Conference On Appalachia, November 3-5, 1988. Univ of Kentucky Appalac	
4	Children In Appalachia: Proceedings from the 1990 Conference In Appalachia, Nov. 6-7, 1990. Appalachian Center	
5	Appalachia - The Journal of The Appalachian Mountain Club - Vol. Vi. Read Books	
6	Lords of Chaos film (heavy metal band)	
7	Media Literacy: Media Ethics	
8	Advertising at the Edge of the Apocalypse	
9	Food Choices - How Our Diet Affects the Environment -	
10	Céline and Julie Go Boating - Céline et Julie vont en bateau French French film	

AI-generated Subject names will go here

PromptLoop syntax

Google Sheets:

- **=PROMPTLOOP_INFERENCE(A2:A360,B2:B360,D2)**

Excel:

- =PROMPTLOOP.INFERENCE(A2:A360,B2:B360,D2)

Role of PromptLoop formula:

- Inference function
- Infers from training data
- Learns from training data's title-to-subject associations
- Draws on titles' word patterns in training data (column A) and target data (column D)
- Populates destination field with AI-produced Subject names

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PromptLoop formula – Google Sheets – detail

- **=PROMPTLOOP_INFERENCE(A2:A360,B2:B360,D2)**

  The formula ➔ meaning:

  - Training data in columns **A** and **B**:
  - ➔ cells **A2 through A360** provide titles with descriptive data
  - ➔ cells B2 through B360 provide each title's matching subject

  - Target data in column **D**:
  - ➔ Cells with **titles** in need of AI-produced subject names

  - Destination cells in column **E** – each row:
  - ➔ AI output of subject names, based on titles' word patterns in adjacent cells D

Populating the Subject names fields

=PROMPTLOOP_INFERENCE(A2:A360,B2:B360,D2)

E2   fx =PROMPTLOOP_INFERENCE(A2:A360,B2:B360,D2)

Copy formula to next cells down

	Ⓐ Training data	Ⓑ	C	Ⓓ	E
	Input example: concatenated field combining metadata from example titles with known subjects	Output example: desired output: examples of desired subject associations		Target data — Titles dataset: concatenated descriptive field	Destination data — AI output: Subject names
2	A is for Affrilachia / written by Frank X	Appalachian Studies		Literary Field Guide to Southern Appalachia Univ of Geo	cell E2
3	African American workers and the App	Appalachian Studies		Health In Appalachia: Proceedings from the 1988 Confe	
4	Against the current : paddling upstrea	Appalachian Studies		Children In Appalachia: Proceedings from the 1990 Con	
5	Another Appalachia : coming up quee	Appalachian Studies		Appalachia - The Journal of The Appalachian Mountain	

Learning from title-to-subject patterns

AI-generated Subject names will go here

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AI output ➜ Subject names

Target data

AI output in destination cells

	D	E
1	**Titles dataset: concatenated descriptive field**	**AI output: Subject names**
2	Literary Field Guide to Southern Appalachia Univ of Georgia Press	Appalachian Studies
3	Health In Appalachia: Proceedings from the 1988 Conference On Appalachia, November 3-5, 1988. Univ of Kentucky Appalac	Appalachian Studies
4	Children In Appalachia: Proceedings from the 1990 Conference In Appalachia, Nov. 6-7, 1990. Appalachian Center	Appalachian Studies
5	Appalachia - The Journal of The Appalachian Mountain Club - Vol. Vi. Read Books	Appalachian Studies
6	Lords of Chaos film (heavy metal band) ⟵	[error - not enough Music titles with similar words]
7	Media Literacy: Media Ethics	Communication
8	Advertising at the Edge of the Apocalypse	Communication
9	Food Choices - How Our Diet Affects the Environment -	Agriculture, Food and Environment
10	Céline and Julie Go Boating - Céline et Julie vont en bateau French French film	French & Francophone Studies

Training data were too dissimilar to this Music title
➤ insufficient Music examples among training data to provide basis for inferring this title's subject.
➤ Solution: looked up in catalog and examined the item in streaming video portal ➜ filled Subject in manually.

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Subject fields via AI → basis for project:

libguides.uky.edu/new

By Subject: A

- African American & Africana Studies
- Agriculture, Food and Environment
- Anthropology
- Appalachian Studies
- Arabic & Islamic Studies
- Architecture, Historic Preservation, Interior Design, Product Design
- Art
- Arts Administration
- Asian Studies

- AI-powered filling-in of needed fields speeds up the data work.
- This speeds up projects' next phases.
- Saves time for large projects.

New Books & Media at UK Libraries

List of new books and media with clickable links and description for each title. Covers print and ebooks, as well as hardcopy and digital media. The site provides a master list, plus subject breakdown.

Welcome - New Library Books & Media

Welcome

New Books & Media: Titles A - Z

By Format: Books, Media, and more!

By Languages & Cultures:

By Subject: Major Discipline Groupings

By Subject: A

By Subject: B - C

By Subject: D - E

By Subject: F - G

By Subject: H - J

By Subject: K - M

By Subject: N - R

By Subject: S - Z

Reference

Popular Reading Collection

Welcome

Welcome to the *New Books and Media at UK Libraries* site.

These pages show new books and media purchased for UK Libraries between July 2022 and June 2023.

New materials are listed in several ways:

- By title A - Z
- By languages
- By Subject -- grouped by major disciplines
- By Subject Name A - Z:
  - A - E
  - F - M
  - N - Z

Each subject page can be embedded in subject-focused LibGuides and shared with our user communities.

New titles in focused collections:

- Reference
- Popular Reading Collection

Search this Guide

Project Takeaways

- Destination data:
  - Use a separate data table to populate subject labels
  - Then copy the AI-generated tables into the working table

- Preserve the master data table as backup. Always! Or else . . .

- Grimy data: No data project is ever 100% clean

- Setup takes time
  - Data: • structures   • content   • processes & protocols

- Configuring training data for meaningful associative examples:
  - takes time
  - takes trial & error: ensuring training data are relevant to the task at hand

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Project Caveats

- **Plug-ins are tied to user account**
  - ➢ Issues arise when office suite is on work account and plug-in is on home account
- **Best when spreadsheet suite and plug-in are pegged to same account**
  - Plug-in won't run on work account if:
    - institution does not have the software
    - Plug-in cannot connect to home account
- **Free plug-in version will quickly encounter data limits**
  - Will result in not populating all the needed destination data lines

More AI: a few additional tools...

Machine Learning

- Azure Machine Learning

- Watson and WatsonX

- TensorFlow

- Python (standalone or spreadsheet add-in)

- Unsilo

More AI: a few more tools, ctd.

Generative AI

- **Large language models** | natural language processing:
  - Bard
  - ChatGPT

- **Imaging models**
  - Adobe Firefly
  - DALL-E
  - Bing Image Creator
  - Midjourney
  - Canva
  - Vertex

AI implementations – broad considerations

Intellectual considerations

Will this AI tool bring insights?

Will this AI tool enhance knowledge, or foster laziness?

Risks & Ethical AI: considerations:

- Work access
- Displacement
- Skill needs

- Data safety

Sources: Marr (2023), Wooldridge (2021)

- Confidentiality
- Privacy

Practical considerations:

Is this AI tool the most effective solution to the problem at hand?

To boost success, start with an AI project tailored to a specific purpose.

No algorithmic bias & influence-mongering

- Respecting humans

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AI: a few final words...

Don't be passive users of other providers' platforms – create value in your own right.
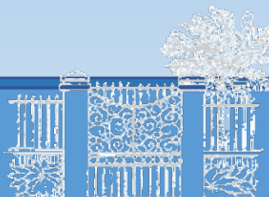
Intelligent automation, and:
- ethical considerations
  - responsibility
  - transparency
  - governance

Source: IBM Think Conference (2023)
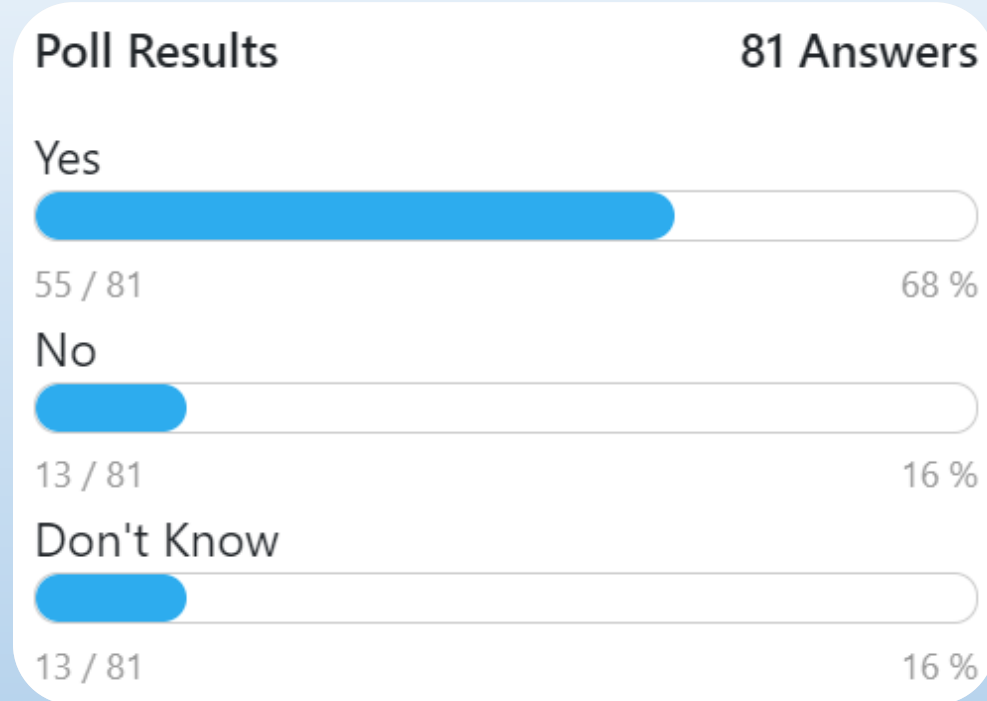
Session Interactives

Poll Responses

Captured asynchronously from Nov. 8 live session and Nov. 29 virtual session
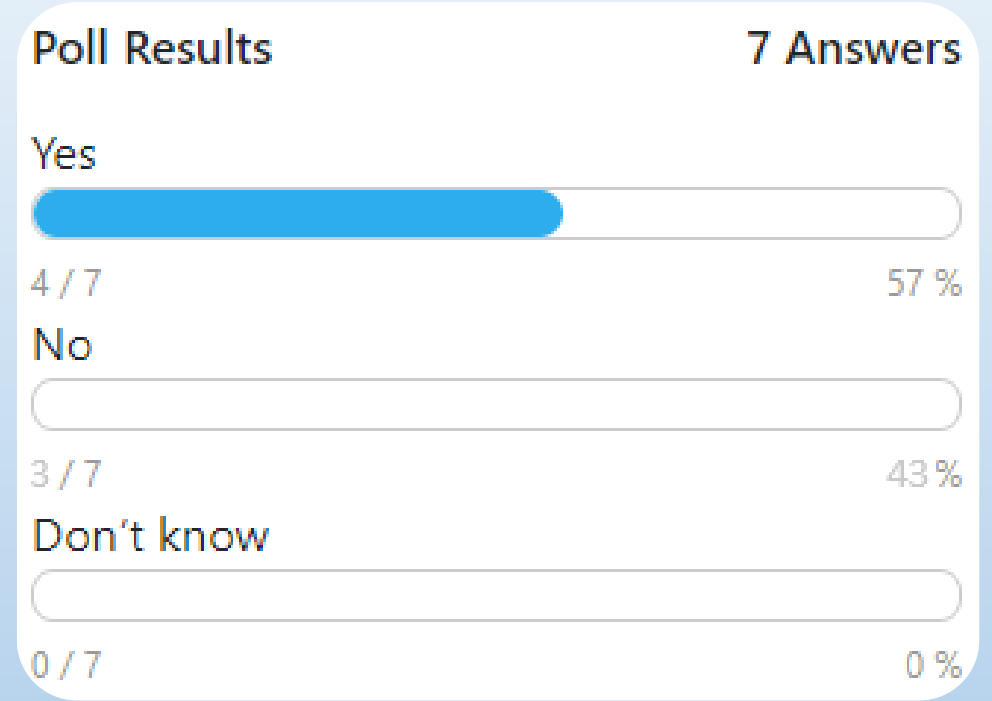
Poll responses

Live session Nov.8, 2023 – poll responses

Virtual session Nov.29, 2023 – poll responses

Poll Results	81 Answers
Yes	
55 / 81	68 %
No	
13 / 81	16 %
Don't Know	
13 / 81	16 %

Poll Results	7 Answers
Yes	
4 / 7	57 %
No	
3 / 7	43 %
Don't know	
0 / 7	0 %

Responses as of Nov.29, 2023

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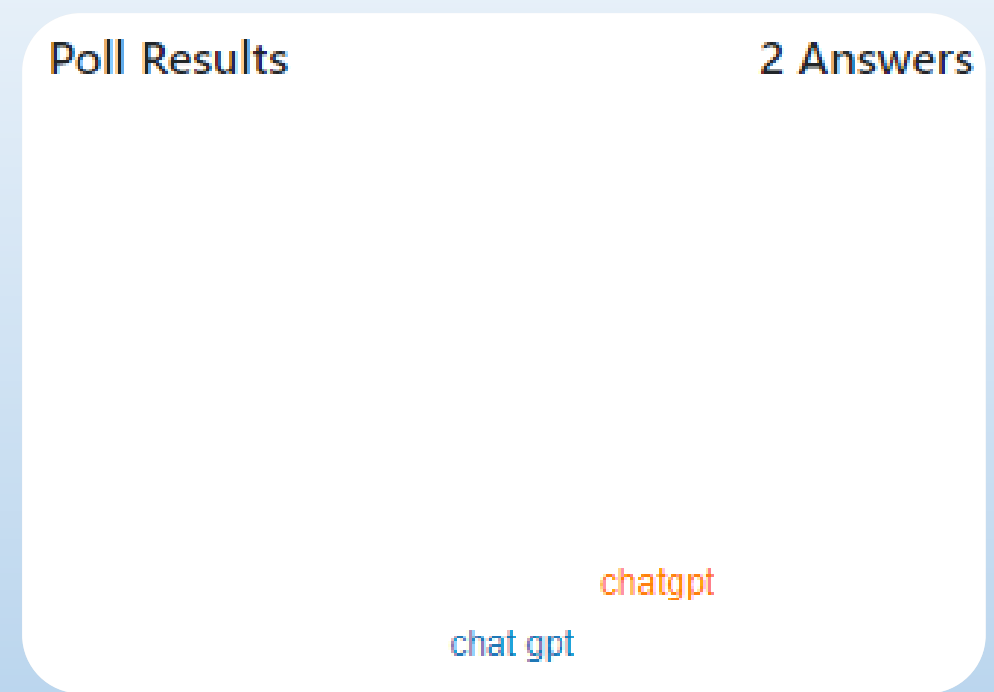
Poll responses   Q: What types of AI tools are you using/considering?

Live session Nov.8, 2023 – poll responses
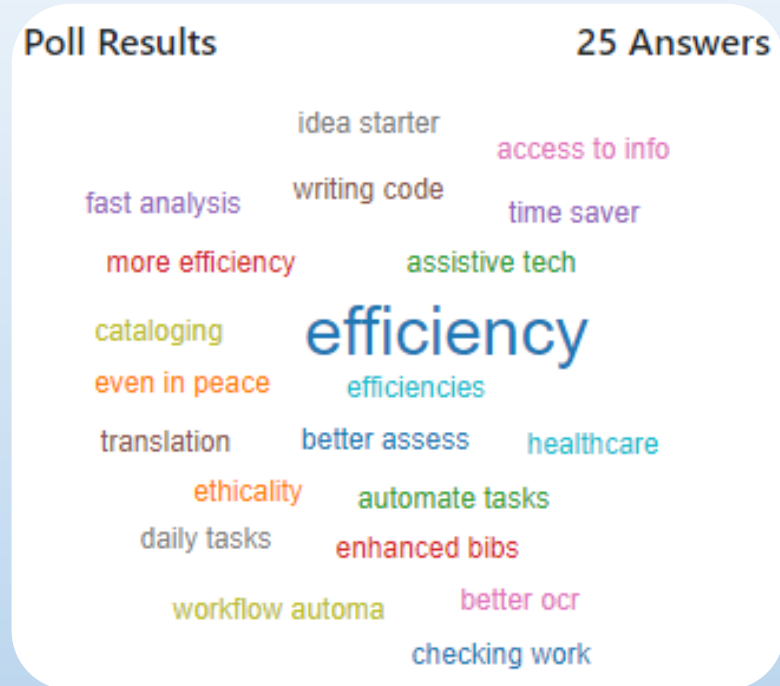
Virtual session Nov.29, 2023 – poll responses
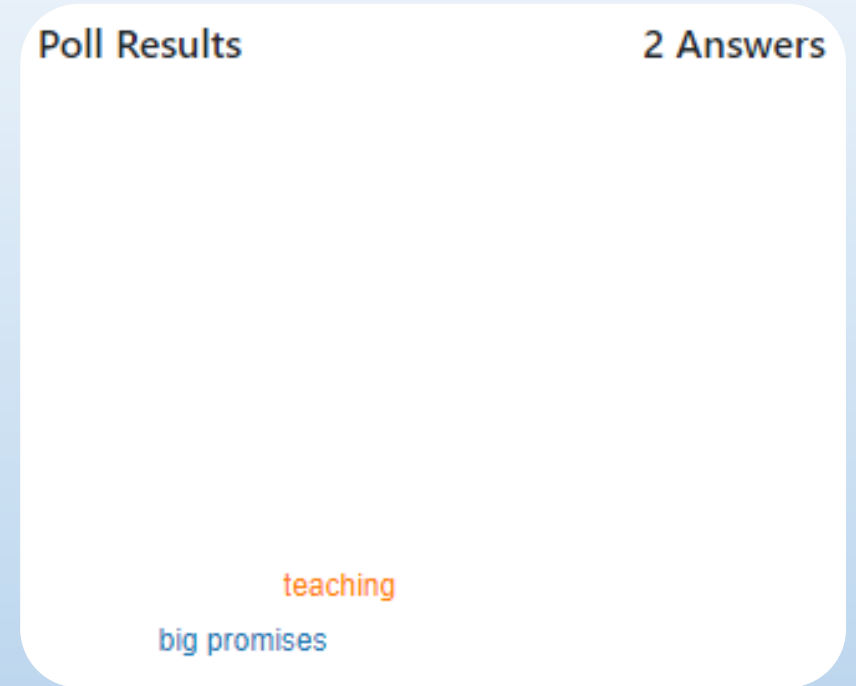

Responses as of Nov.29, 2023

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Poll responses

Live session Nov.8, 2023 – poll responses

Virtual session Nov.29, 2023 – poll responses

Poll Results · 25 Answers

idea starter
access to info
fast analysis · writing code · time saver
more efficiency · assistive tech
cataloging · **efficiency**
even in peace · efficiencies
translation · better assess · healthcare
ethicality · automate tasks
daily tasks · enhanced bibs
workflow automa · better ocr
checking work

Poll Results · 2 Answers

teaching
big promises

Responses as of Nov.29, 2023

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Poll responses

Live session Nov.8, 2023 – poll responses

Virtual session Nov.29, 2023 – poll responses

Poll Results	20 Answers

hallucinations
monoculturalism
the unknown
inaccurate data
integrity
fake citations
misuse managing   profit vs good
loss of art
ethics
madeupcitations
plagiarism
misinformation
cheating
faculty fear
false resources
narrow views   bad actors

Poll Results	2 Answers

bad actors   abuse

Responses as of Nov.29, 2023

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Poll responses

Q: What other thoughts do you have about AI?

Live session Nov.8, 2023 – 11 poll responses

- It is the present of information science and will become one of its historical gems.
- we need to embrace it and find a way to work with it. Trying to ban its use will backfire
- possibilities
- teaching it right
- it will soon be involved in everything we do
- worry that it will be harmful
- We need to regulate it and start putting it to work in logical and helpful ways
- it is the unknown
- Learn and embrace!
- AI is only as good as training and retraining. Always measure impact of AI-based decision making.
- it is very weak and monocultural

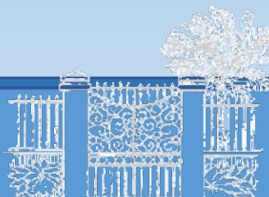*Virtual session Nov.29, 2023 – poll responses*

- Study hard and learn.
- what are the limits

Responses as of Nov.29, 2023

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Session Interactives

Online Q: Best AI certification?

List of programs will be added here to post-conference slides and Proceedings narrative.

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Recommended readings

- *AAAI Code of Professional Ethics and Conduct*. La Canada, CA: American Association for Artificial Intelligence, 2021. Web. https://aaai.org/about-aaai/ethics-and-diversity/

  - **Tip for readers:** Professional code of conduct and practices around of AI and its ethical considerations. Amended with a diversity statement in 2021

- Hofstadter, Douglas. "Gödel, Escher, Bach, and AI." *Atlantic*, July 8, 2023.

  - **Tip for readers:** Examination of chatbot technology from the intersection of mathematics, logic, and the philosophy of human reasoning.

- IBM. "What is artificial intelligence (AI)? *Think*, 2023. Web. https://www.ibm.com/topics/artificial-intelligence

  - **Tip for readers:** Brief overview and definition of artificial intelligence, plus short summary of AI's history

- Marr, Bernard. *The 15 Biggest Risks Of Artificial Intelligence*. Web. https://bernardmarr.com/the-15-biggest-risks-of-artificial-intelligence

  - **Tip for readers:** AI expert describes 15 societal, security, and economic risks to consider.

Recommended readings, ctd.

- Turing, Alan M. "Computing Machinery and Intelligence." *Mind* 59, no. 236 (1950): 433–460.
  - **Tip for readers:** Classic work from the earliest stages of AI. Written by British mathematician Alan Turing, this article is widely considered the seminal work that set in motion and influenced subsequent work on artificial intelligence.

- Warwick, Kevin. *Artificial Intelligence : the Basics*. Abingdon, Oxon: Routledge, 2012.
  - **Tip for readers:** Accessibly written overview of types of artificial intelligence, human-machine interaction, and their impacts on culture and society.

- Wooldridge, Michael J. *A brief history of artificial intelligence : what it is, where we are, and where we are going*. First U.S. edition. New York: Flatiron Books, 2021
  - **Tip for readers:** Accessibly written history of artificial intelligence, tracing AI from early developments to the present, likely technological trajectories, and their impacts.

- Wooldridge, Michael J. and Alice Roberts. *Artificial intelligence* (The ladybird expert series). London: Penguin Books, 2018
  - **Tip for readers:** Accessibly written history of artificial intelligence, overview of its milestones, and coverage of the major categories of AI tools.

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