

Generative AI in Research

30th November 2023

Dr Henry Lydecker
Dr Gordon McDonald

*Sydney Informatics Hub Masterclass Series
and CSIRO National AI Month*

sydney.edu.au/informatics-hub



THE UNIVERSITY OF
SYDNEY

—
**Sydney
Informatics Hub**

CRT005 00026A



Acknowledgement of Country

We recognise and pay respect to the Elders and communities – past, present, and emerging – of the lands that the University of Sydney's campuses stand on.

For thousands of years they have shared and exchanged knowledges across innumerable generations for the benefit of all. We pay our respects to Elders past, present and emerging.

Sydney Informatics Hub

Sydney Informatics Hub is a Core Research Facility at the University of Sydney, enabling excellence in computational and data-driven research through advanced digital infrastructure, expert data consultancy and analytics training.



Statistics

- Experiment and survey design
- Meta-analysis
- Survival analysis
- Statistical modelling



Data Science & Software

- Machine Learning & AI
- Timeseries, clinical data, geospatial information
- Software development for data-driven research



Research Computing

- High performance computing, virtual desktop computing, modelling and visualisation
- Data community building



Bioinformatics

- A variety of omics partnered with national facilities and research infrastructure
- Reproducible and scalable workflows

Outline

1. AI is transforming our world
2. What Why and How-to Gen-AI
3. An AI powered future for research
4. Three tricks that will get us started
5. More advanced uses, expanding the boundaries of what AI can do

Why use Generative AI?

Across workers in all industries,

April: 40% regularly use Gen-AI, while 80% have tried it

Source: <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year>

July: 67% regularly use Gen-AI

Source: <https://www.getapp.com.au/blog/4073/generative-ai-tools-regulations>

Gen-AI could **increase global GDP by 7%,**

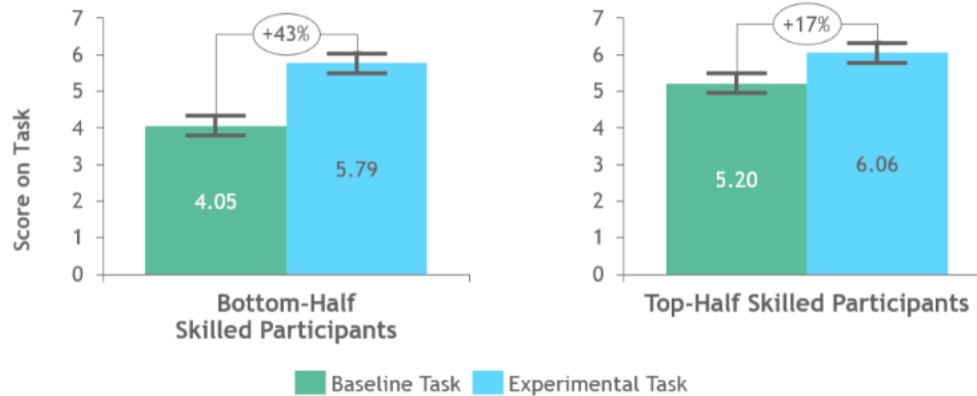
and expose 300M full-time jobs to automation

Source: <https://www.goldmansachs.com/intelligence/pages/generative-ai-could-raise-global-gdp-by-7-percent.html>

Benefit of AI assistance



Weaker performers improve more – it's an equalizer.



Source: BCG, September 2023: <https://www.bcg.com/publications/2023/how-people-create-and-destroy-value-with-gen-ai>



Job satisfaction increases 12%, feelings of self-efficacy increases 5%

Source: Science, July 2023: "Experimental evidence on the productivity effects of generative artificial intelligence"

<https://www.science.org/doi/10.1126/science.adh2586>

Benefit of AI assistance - Speed and Quality

 14% more enquiries resolved in customer service call centers.

New staff up to speed faster.

Source: <https://www.nber.org/papers/w31161>



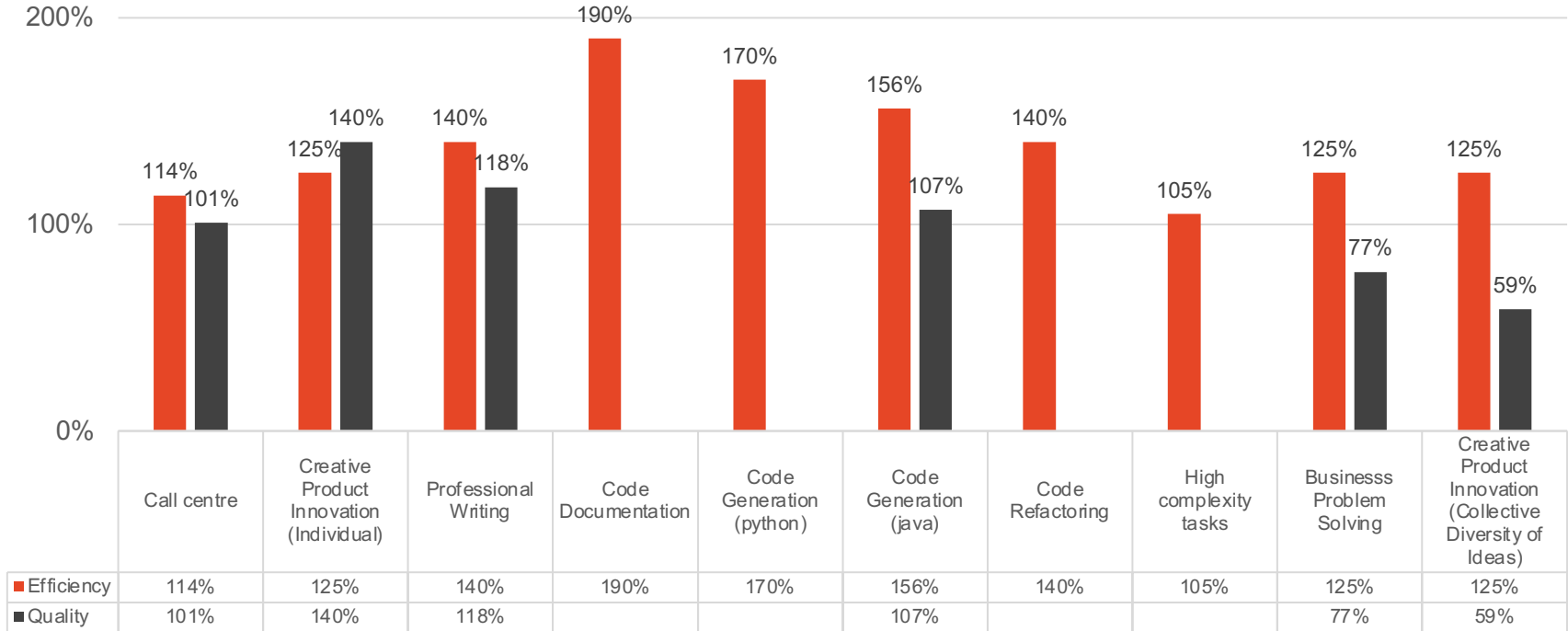
Professional writing was 40% quicker, and 18% better,
with people spending more time editing and less time drafting.



Software developers were 50% faster to 100% faster on small coding tasks.

Source: <https://arxiv.org/abs/2302.06590>, <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/unleashing-developer-productivity-with-generative-ai>

Benefit of AI assistance - Speed and Quality



~ Increasing task complexity = ambiguity, precision, multi-level

Fails without higher-level structure

AI will be just another tool

One hundred years ago, very few people needed to know how to type.

Now, can you imagine someone getting a job without being able to use a keyboard?



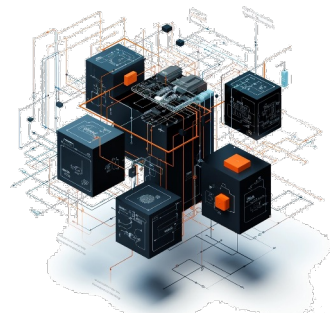
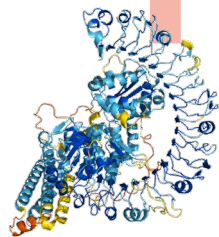
1926 photo of man dictating to typing woman, both in swimwear in swimming pool
Bundesarchiv, Bild 102-08112 / Georg Pahl / CC-BY-SA 3.0

What is generative AI?

“A friendly koala cyborg”



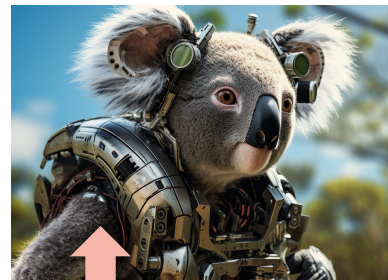
what is the best way to peel a mandarin?



Generative AI

has an internal representation
of meaning or content

[0, 1, .5, .2]



Generates...

Images, Video

Text



Peeling a mandarin, also known as a clementine or a tangerine, is generally a straightforward process. Here's a simple and efficient method to peel a mandarin:



Audio



3D structures
or molecules

Image Generators



Midjourney



Stable Diffusion



Adobe Firefly



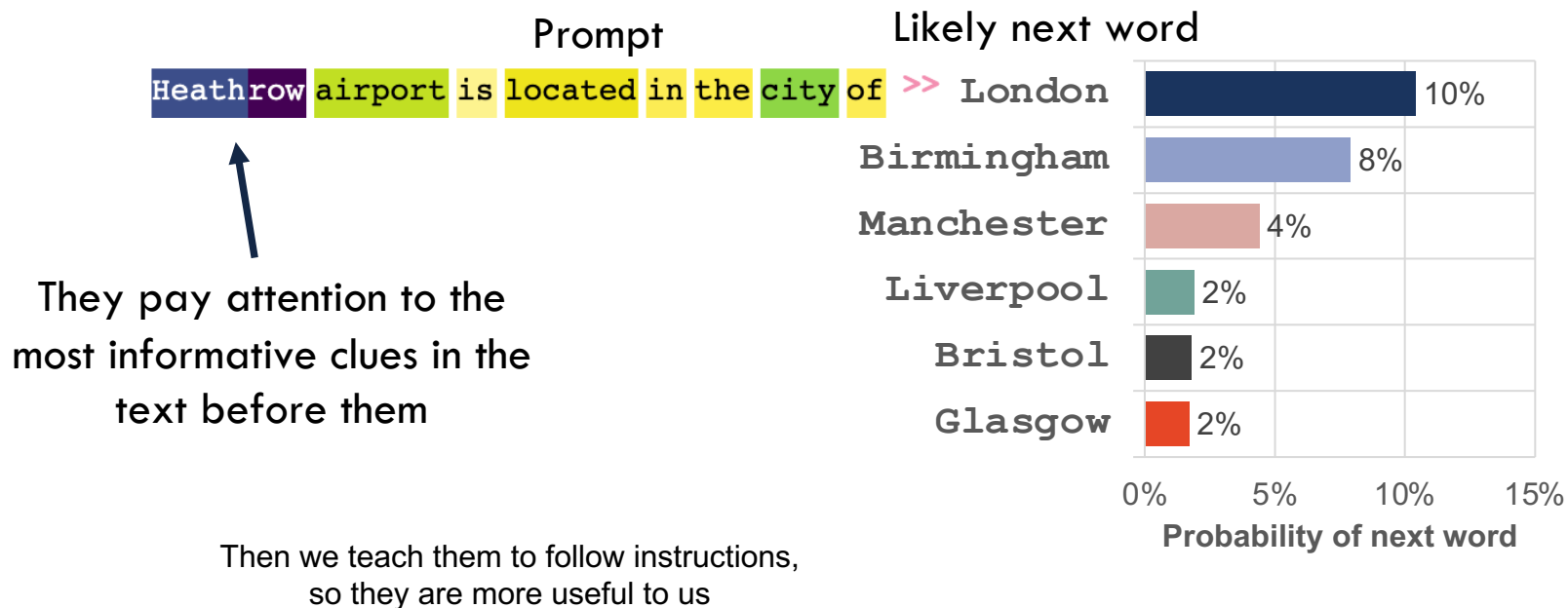
DALL·E

“3d digital art photo of the University of Sydney quadrangle.
smoke, artistic, jacaranda and sandstone theme”

What are Large Language Models?



Large Language Models pick the most likely next word



Large Language Models are text completion engines

But imagine the power of correctly predicting the next word...



The crime is murder. The murderer is ...
...it is you, Monsieur.. [] ? []

From the symptoms you have described
to me, the most likely diagnosis is... [] ? []



The lottery numbers for next week are... [] ? []



How-to

 **Assign a persona:** Instructing AI to simulate a specific type of personality or character or constrain its actions.

 **Ask for edits to AI outputs:** Help AI work to provide the answer you need.

 **Teach by examples:** Give example of correct answer before asking AI a question

 **Modularizing tasks:** Break down tasks into small units for AI to execute

 **Ask for explanation:** Get an explanation of the logic or process used

Important considerations



Sensitive Data

IP & data security, privacy, governance, sovereignty.



Ethics

Fairness, bias, licencing of data sources, impact, responsible use



Academic Integrity

Accuracy, correct attribution and accountability, reproducible research



Cost + Practicality

Financial feasibility, scalability, reliability



Reputational Risks

Publicity & liability from inaccurate or inappropriate AI use and response



Data Privacy: Use of cloud services in other jurisdictions

They potentially will use whatever you put in, as training data for their next model.

Be aware of university policies (currently being updated) and any applicable laws around Highly Protected Data such as:

- Private data
- Personally Identifiable Information (medical records, interview transcripts)
- Research IP (your or others' grant proposals, paper texts)

Be aware of what you are **legally allowed** to share and what you are not.

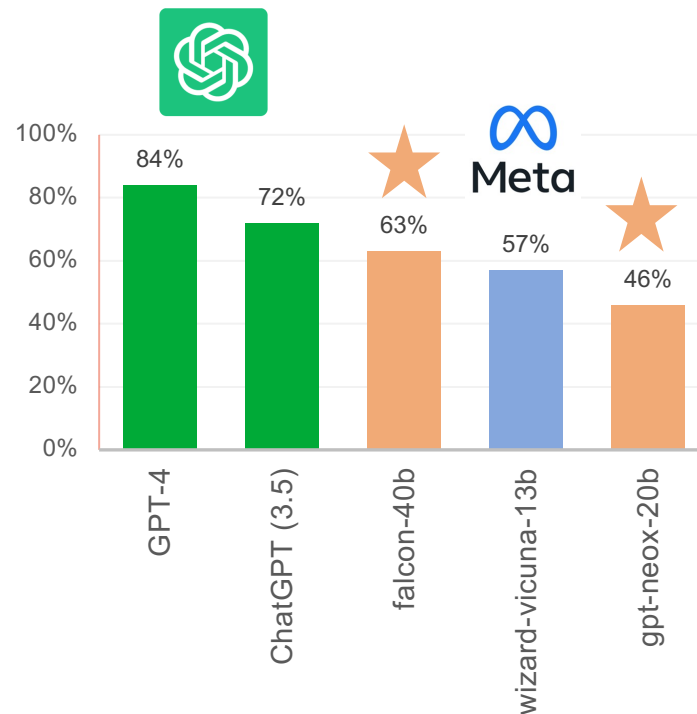
Data Privacy: potential solution

★ Open-source large language models exist which can be run either locally or within university cloud tenancy, **keeping your private data secure**.

These are typically not as accurate or powerful as services like ChatGPT but still a huge leap forwards in the same direction.

Best models now are variants of Llama2

Multiple-choice
question answering



Ethics: ChatGPT filter developed using dubious labor practices

- OpenAI needed to build a smart filter to screen out offensive content.
- OpenAI engaged a contractor called Sama to develop this filter.
- Sama paid Kenyan workers \$1.32 - \$2 USD per hour to read and label content including details of murder, sexual abuse, suicide, and incest.

<https://afrotech.com/kenyan-workers-openai-chatgpt>

The University is committed to taking meaningful action to prevent, mitigate and, where appropriate, remedy modern slavery risks in its operations, supply chains and investments.

Attribution and use

Be aware of the policies of:

- Your Institution
- Your Funding Bodies
- Your Publishers

in regards to

- Attribution of AI generated content,
- How to acknowledge the use of these tools appropriately, and
- Whether you're allowed to use them in the first place?

Attribution and use: Nature

Scientific Journal 'Nature' Says No to Publishing A.I.-Generated Images and Videos, Calling Out Their Lack of 'Integrity'

The journal, however, will allow text created using large language models, provided their use is documented.

Richard Whiddington, June 14, 2023



what is the best way to peel a mandarin?



Peeling a mandarin, also known as a clementine or a tangerine, is generally a straightforward process. Here's a simple and efficient method to peel a mandarin:

Attribution and use: ARC grant review



Australian Government
Australian Research Council



Are Australian Research Council reports being written by ChatGPT?

Multiple accounts from researchers suggest that feedback for Discovery Project grant funding was written by artificial intelligence

- Get our **morning and afternoon news emails**, **free app** or **daily news podcast**



MEDIA STATEMENT

30 June 2023

Confidentiality obligations of assessors

Like many organisations, the Australian Research Council (ARC) is considering a range of issues regarding the use of generative artificial intelligence (AI) that use algorithms to create new content (such as ChatGPT) and that may present confidentiality and security challenges for research and for grant program administration.

While we are undertaking this work we would like to remind all peer reviewers of their obligations to ensure the confidentiality of information received as part of National Competitive Grants Program processes.

The [Australian Code for the Responsible Conduct of Research](#), 2018 sets out that individuals are to participate in peer review in a way that is fair, rigorous and timely and maintains the confidentiality of the content. If there are concerns with how confidentiality has been managed during a review, the ARC has a robust process to manage this concern. Further information can be found under the [ARC Research Integrity Policy](#).

Release of material that is not your own outside of the closed Research Management System, including into generative AI tools, **may constitute a breach of confidentiality**. As such, the ARC advises that peer reviewers should not use AI as part of their assessment activities.

The ARC will be updating guidance on this area in the near future.

<https://www.arc.gov.au/news-publications/media/media-releases/confidentiality-obligations-assessors>

<https://www.theguardian.com/technology/2023/jul/08/australian-research-council-scrutiny-allegations-chatgpt-artificial-intelligence>

The Vision – AI enabling research

Improving efficiency & productivity

AI tools can aide every single component of the scientific process, multiplying the ability of researchers to solve the world's problems.

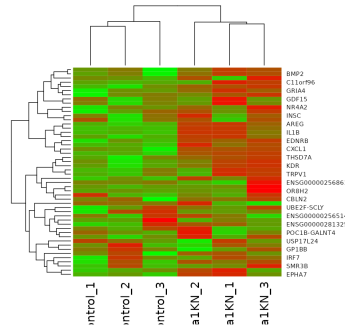
Reducing Friction

Instead of being bogged down with busy work and grunt tasks that interrupt the flow of work, researchers will be able to focus on more engaging tasks.

Democratizing Access

AI tools can be an equalizer, enabling everyone to use natural language to drive complex tools.

The Vision – AI enabling research



Three Gen-AI tips for Research

1. Anchoring to verified knowledge
2. Conversational data analysis
3. Maps of meaning

Retrieval Augmented Generation

Anchoring AI to verified knowledge



The problem: by default, chat bots do not think or use tools



You

Can I connect my personal device to the University's network



ChatGPT

Certainly! Connecting your personal device to the university's network is often allowed, but it's important to follow the university's guidelines and policies to ensure a secure and compliant connection. Here's a general guide to help you with the process:

Based upon the model's system prompt, it will attempt to provide an answer that is statistically likely to look like the right answer.

Problem: Language Models make stuff up

User Question:

*How can I
use technique X to
understand Y?*

Bot Answer:

*According to plausible-
sounding but imaginary
paper ?? you can ...*



Problem: Language Models make stuff up

User Question:

*How can I
use technique X to
understand Y?*

Bot Answer:

*According to plausible-
sounding but imaginary
paper ?? you can ...*

ABC NEWS



This US lawyer used ChatGPT to research a legal brief with embarrassing results. We could all learn from his error

ABC RN /

By [Damien Carrick](#) and [Sophie Kesteven](#) for the [Law Report](#), with additional reporting from Reuters.

Posted Sat 24 Jun 2023 at 11:15am

A New York-based lawyer has been fined after he misused the artificial intelligence chatbot, ChatGPT, relying on it for research for a personal injury case.

Last week Steven A. Schwartz, fellow lawyer Peter LoDuca and law firm Levidow, Levidow & Oberman, were fined US\$5,000 (AU\$7,485) for submitting fake citations in a court filing.



Australian academics apologise for false AI-generated allegations against big four consultancy firms

Case studies created by Google Bard AI as part of submission to parliamentary inquiry proven to be factually incorrect

- [Follow our Australia news live blog for latest updates](#)
- [Get our morning and afternoon news emails, free app or daily news podcast](#)

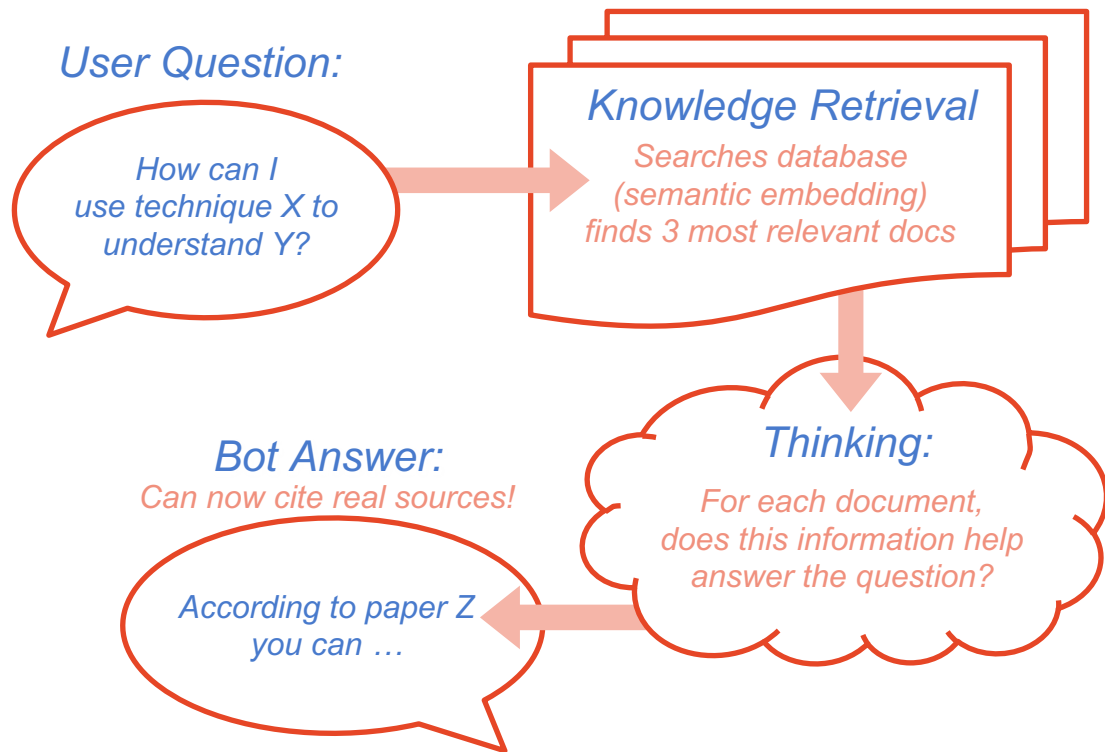
Henry Belot

Fri 3 Nov 2023 01:08 AEDT



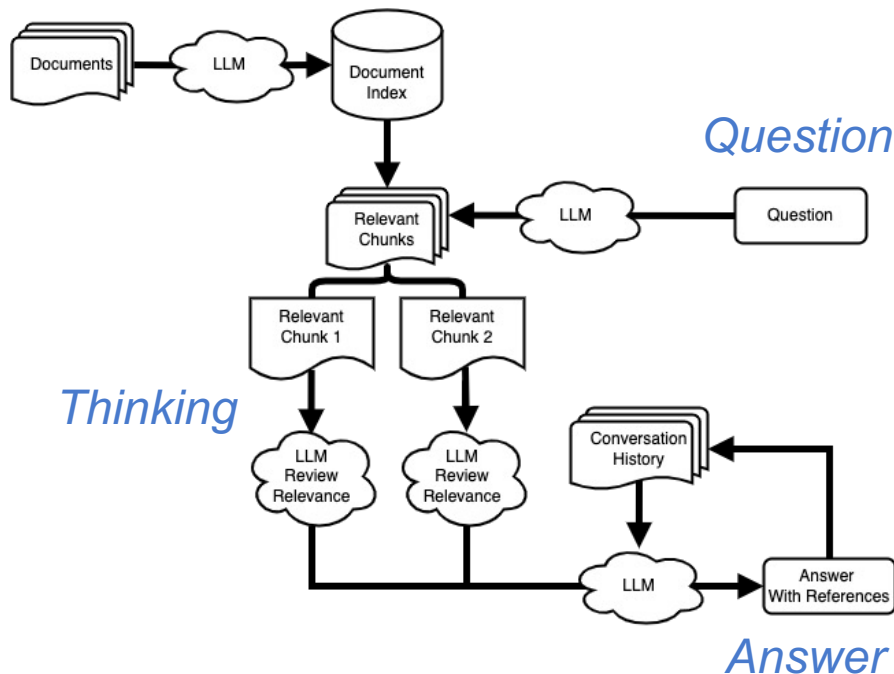
A group of academics has offered an unreserved apology to the big four consultancy firms after admitting they used artificial intelligence to make false allegations of serious wrongdoing in a submission to a parliamentary inquiry.

Solution: Retrieval Augmented Generation



Solution: Retrieval Augmented Generation

Knowledge



Can I take my IP with me and use it for whatever I want?



According to the University of Sydney's Research Agreements Policy 2011, the university generally asserts and retains ownership of its IP ¹. This means that the university owns the intellectual property created by its representatives in the course of conducting research under a research agreement to ensure that it can continue to conduct research, grant rights to others, and develop the IP. In order to achieve dissemination of research outcomes for the public good, the University invests in providing the resources to effectively capture, protect and commercialise IP rights ². It is important to note that the University of Sydney requires that any use of its IP be approved in advance by the relevant delegate, consistently with the Brand Approval Procedures 2015 ³.

Based on this information, it is important to consult with the University of Sydney to determine the specific terms and conditions under which IP can be used.

Citations:

1. Research Agreements Policy 2011.pdf/Research Agreements Policy 2011-10.json

2. Research Agreements Policy 2011.pdf/Research Agreements Policy 2011-10.json

3. Brand Policy 2015.pdf/Brand Policy 2015-8.json

Adjust Regenerate



Type a new question (e.g. Summarize the Leave Policy)



Thought process

Supporting content

Citation

Document Section

Document

4 of 7

90%



THE UNIVERSITY OF
SYDNEY

outcomes of sponsored research consistently with the [Charter of Freedom of Speech and Academic Freedom](#).

- (b) Commercial considerations might sometimes require short, finite delays in publication. However, the right to publish the results of all research in a timely manner is a critical tenet of the concept of academic freedom and the integrity of the research process.
- (c) The validity and credibility of University research relies upon the fact that the academic environment fosters an open and independent approach, where staff and students are free to reveal and challenge theories, knowledge and understanding in accordance with internationally accepted scholarly norms.

(2) The University generally asserts and retains ownership of its IP

- (a) The University will seek to retain ownership of IP created by University representatives in the course of conducting research under a Research Agreement so that it can preserve its ability to continue to conduct research and to grant rights to others to conduct research and, where appropriate, to develop such IP. In this way the University can ensure that the maximum impact is achieved from its research.
- (b) Where any rights to use the University's IP are granted to third parties, the University must continue to be free to pursue research and education with its IP in the future.
- (c) The University has, as a part of its core mission, an obligation to translate the outcomes of its research for the public good and believes that this mission is best supported by retaining ownership of its IP. It is for this reason that the University asserts ownership of certain IP under its IP Rule.
- (d) In order to achieve dissemination of research outcomes for the public good, the University invests in providing the resources to effectively capture, protect and commercialise IP rights.

(3) The University will grant rights to its Background IP if it is satisfied that it is entitled to do so and that the terms are reasonable

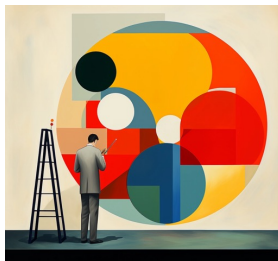
- (a) Licences granted to third parties to use the University's Background IP should only extend to identifiable IP required in order to use the IP which is the outcome of the particular research project.
- (b) In some instances commercial considerations may warrant the grant of broader rights provided that the University is satisfied that it is entitled to do so and that the terms are reasonable.
- (c) Ownership of Background IP which is provided to a research project will be retained by the party that contributes it.

How RAG will empower research



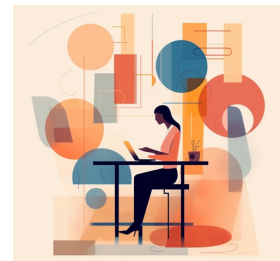
Literature Assistant

Academic articles could be indexed and interacted with using an AI assistant to more rapidly conduct literature reviews and meta-analyses, potentially reducing mis-citation errors and freeing up time for hypothesis development.



Grant Helper

Find grant opportunities relevant to you. Help you write the grant application by using your research output, the grant's terms, conditions, structure.



Policy Navigator

Complex policy documents, spread across university and external organizations could be indexed and an AI assistant can help find answers to user queries based on the most appropriate policy documents.

Tools to build a Rag-based model

Cloud Provider Toolkits

- Microsoft Azure
- Amazon Web Services
- Google Cloud Platform

Building on Existing Tools

- Jupyter-AI
- “GPTs” in ChatGPT Pro
- DocsGPT

Standalone Tools

- Cogniti.ai
- Flowise
- LangChain

Conversational Data Analysis

- Reducing barriers for data processing & statistical analysis



Researcher Problem: turning raw data into scientific insights takes a lot of work

- Real-world data is messy, and "cleaning" it can take a lot of time and effort.
- Programming languages like Python and R provide powerful and efficient ways to clean and analyze data, but many researchers are not coders and do not want to be.
- Thankfully, GenAI tools can make it a lot easier for anyone to use Python & R.

Write Code & Analyze Data

ChatGPT's Code Interpreter & Advanced Data Analysis

1. Upload data & ask a question



214_LAND_VALUE_DATA_20171101.csv
Spreadsheet



You are a Data Scientist. Figure out what this csv file is about is and do some exploratory data analysis, summarising the data and plotting useful graphs to show me what information i've got. Work step by step. Ask questions of the data that you think I might ask next. Keep analysing and don't ask for permission.



Let's start the analysis by loading the CSV file and taking a look at the first few rows to understand what data it contains.

Finished working

Show work ▾

2. Get code and result!

The dataset appears to contain information about land values, with various details about each property, including:

- District code and name
- Property ID, type, and name
- Address information (unit number, house number, street name, suburb name, postcode)
- Land area and zoning
- Multiple instances of base date, land value, authority, and basis

Geographical Analysis:

1. Number of Unique Districts and Suburbs:

- Districts: 1 (All properties are in the same district: BLACKTOWN)
- Suburbs: 48

2. Top 5 Suburbs with Highest Average Land Values:

- HUNTINGWOOD: \$2, 982, 061
- ROUSE HILL: \$2, 767, 542
- EASTERN CREEK: \$2, 702, 310
- ST MARYS: \$1, 746, 333
- ARNDELL PARK: \$1, 651, 157

Conclusion:

- The dataset contains information about 109, 213 unique properties, mostly of type **NORMAL**, in the district of BLACKTOWN, spread across 48 different suburbs.
- The land area for these properties generally averages around 691.3 m² with variations.
- Suburbs like HUNTINGWOOD, ROUSE HILL, and EASTERN CREEK have the highest average land values.
- The dataset includes land value data from 2012 to 2016, but each year's data is in a separate column, and there is no variation within each year's data in this dataset.
- The land values (**LAND VALUE 1**) are highly skewed, with a mean value of 475, 069 and a maximum value of 78, 000, 000.

Write Code & Analyze Data

Jupyter-AI or Open Interpreter running in Google Colab or a Jupyter Notebook

1. Upload data & ask a question

Comment Share Settings Profile

+ Code + Text

RAM Disk

Topic modelling on restaurant review tags

```
[11] interpreter.chat("""
Please do topic modelling with BERTopic on the
restaurant review tags in '/content/drive/MyDrive/restaurant_tags.csv'
""")
```

Alright, let's make a plan to achieve this.

Plan

- 1 Validate and Install Required Packages: This includes pandas and BERTopic for Python.
- 2 Load the Dataset: We'll load the 'restaurant_tags.csv' file into a pandas dataframe.
- 3 Preprocess Text Data: Cast the entire text data into a list.
- 4 Perform Topic Modeling with BERTopic: Fit the BERTopic model onto the list of reviews.
- 5 Output: Return the topics generated by the model.

Let's start with the first step: installing the required packages. If you have these packages already installed, you may skip this step. Otherwise, this step is important for performing the task successfully.

```
!pip install bertopic pandas
```

Output truncated. Showing the last 2000 characters.

```
10/dist-packages (from triton==2.0.0->torch==1.6.0->sentence-transformers==0.4.1->bertopic) (16.0.6)
Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.10/dist-packages (from
```

2. Get code and result!

I summarized the top ten topics in the dataset as follows:

- Topic -1: 'Diverse' (Various types)
- Topic 0: 'Ethnic Food'
- Topic 1: 'Feedback'
- Topic 2: 'Desserts'
- Topic 3: 'Meal Time' (Referring to meal timings or occasions like breakfast, lunch, dinner, etc.)
- Topic 4: 'Service'
- Topic 5: 'Beverages'
- Topic 6: 'Oriental food'
- Topic 7: 'Vegan food'
- Topic 8: 'Seafood'

This interpretation is based on the top 10 representative tags for each topic and may not perfectly align with every review tagged with the topic.

I've added these summary labels as 'Label' in the topic information dataframe above.

Next, I will create a mapping of each review tag to its appropriate topic label, add a new column to the original dataframe, and fill it with the applicable label for each review. After updating the dataset, I'll save it as a new CSV file.

```
# Create a dictionary for mapping each review to its topic label
review_topic_dict = dict(zip(reviews, [topic_labels.get(topic, 'Other') for topic in topics]))

# Create a new column in the data for the topic labels
review_data['Topic Label'] = review_data['Review Tag'].map(review_topic_dict)
```

Write code

<http://rtutor.ai/>

1. Upload data

Dataset: rna_seq Reset

Example requests:

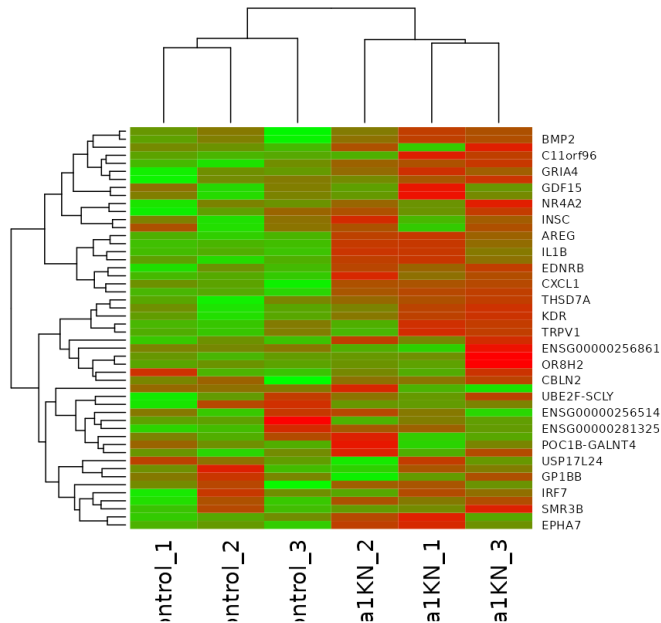
Heatmap of variable genes ▼

Each row represents a gene. Each column is a sample. Remove genes with sum less than 10. Add 1 to all numbers. Log transform using base 2. Rank genes by standard deviations in descending order. Convert data as matrix. Subtract row means from all rows. Create a heatmap of the top 50 genes using red and green colors. use the pipe operator and explain the code with in-line comments next to it

Submit Settings ☐ Python

2. Ask question

```
1 df <- df %>%
2   filter(rowSums(.) >= 10) %>%           # Remove genes with sum less than 10
3   mutate_all(~ . + 1) %>%               # Add 1 to all numbers
4   mutate_all(~ log2(.)) %>%             # Log transform using base 2
5   arrange(desc(apply(., 1, sd))) %>%    # Rank genes by sd in descending order
6   slice(1:50) %>%                       # Select top 50 genes
7   as.matrix() %>%                       # Convert data as matrix
8   sweep(2, rowMeans(.), FUN = "-")      # Subtract row means from all rows
9
10 # Create a heatmap of the top 50 genes using red and green colors
11 heatmap(df, col = colorRampPalette(c("green", "red"))(256))
```



3. Get code and result!

(4. Rerun if it didn't work!)

Data curation

<https://gptforwork.com/> ChatGPT in google sheets!

3 Quickly extract data:

- 1 Select cell B36. The formula indicates that this cell is the outcome of the extraction of an email address from cell A36.

	A	B	C
34	Example 2: Quickly extract data		
35	Inputs	Outputs	
36	John Smith 555-123-4567 john.smith@example.com	john.smith@example.com	Drag B36 down!

- 2 Drag the formula down to apply it to the values below.

	A	B	C
34	Example 2: Quickly extract data		
35	Inputs	Outputs	
36	John Smith 555-123-4567 john.smith@example.com	john.smith@example.com	Drag B36 down!
37	Sarah Johnson <sarah.johnson@example.com> 555-987-6543	sarah.johnson@example.com	
38	Mitchell Pritchett ginger18@example.com 532-981-7403	ginger18@example.com	
39	david.brown@example.com David Brown	david.brown@example.com	
40	Emily Davis 555-246-8139 emily.davis@example.com	emily.davis@example.com	
41	Michael Thompson michael.thompson@example.com 555-369-2584	michael.thompson@example.com	
42	Olivia Wilson 555-789-1234 olivia.wilson@example.com	olivia.wilson@example.com	
43	Stephanie Martinez steph.martinez@example.com 555-789-0123	steph.martinez@example.com	
44	Olivia Taylor olive22@example.com 987-654-3210	olive22@example.com	
45	Emily Williams 555-456-7890 emily.williams@example.com	emily.williams@example.com	
46	Sophia Lee 555-555-5555 sophia.lee@example.com	sophia.lee@example.com	
47	123 Main Street 555-555-5555 jane.doe@example.com	jane.doe@example.com	
48	Emma Davis 555-246-1357 emma.davis@example.com	emma.davis@example.com	
49	Benjamin Johnson ben.johnson@example.com 555-123-4567	ben.johnson@example.com	
50	Olivia Thompson 555-369-1478 olivia.thompson@example.com	olivia.thompson@example.com	
51	Ethan Wilson ethan.wilson@example.com 555-987-6543	ethan.wilson@example.com	
52	Ava Thompson 555-369-8520 ava.thompson@example.com	ava.thompson@example.com	
53	Christopher Anderson chris.anderson@example.com 555-369-2584	chris.anderson@example.com	
54	Sophia Davis sophia.davis@example.com 555-246-8139	sophia.davis@example.com	
55	Madison Smith 555-123-7890 madison.smith@example.com	madison.smith@example.com	

Maps of meaning

Using semantic embedding and dimensionality reduction to reduce the scope of your problem



Topic Modelling, Map Your Corpus



u/mrx-ai · 1 yr. ago

How ChatGPT actually works

A lot of buzz around ChatGPT –but not too much. ...

Actually, OpenAI did not release much technical details. The methodology is based on previous research.

I tried my best to describe in some detail how ChatGPT works in this article:

<https://www.assemblyai.com/blog/how-chatgpt-actually-works/>

It also contains my personal criticism on some technical details and as relevant references and a link to a cool open source repo for RLHF!

What is the best piece of technical content you read so far about ChatGPT?

r/LanguageTechnology

text nlp model
language would



r/Python

python github
code project
use

u/deepkrg17 · 1 mo. ago

You should know these f-string tricks

F-strings are faster than the other string formatting methods and are easier to read and write. Here are some tricks you may not have known.

1. Number formatting :

You can do various formatting with numbers.

```
>>> number = 150
>>> # decimal places to n -> .nf
>>> print(f"number: {number:.2f}")
number: 150.00
>>> # hex conversion
```

u/Guilty-History-9249 · 10 mo. ago

pytorch is bundling an old libcudnn.so.8 file causing perf drop on a 4090.

This was known at least as far back of Oct by the A1111 github folks the the the the spread far.

I had to independently discover this. I was getting about 13.8 it/s during SD img gen and now I get 39.5. For a long time many of us thought Torch 2.0 was somehow involved in this huge improvement that we knew a few were getting. However, it isn't the Torch version at all. On Linux if I replace the libcudnn.so.8 file in pytorch with the same file from the cuDNN version 8.7 the perf jumps 3X. This is even with torch 1.12 cu113.

This isn't a tech support post but just information that might help some folks.

r/pytorch

self torch
pytorch nn
model



r/investing

market stock
would stocks
like

u/MorningTendies · 9 mo. ago

We Just Witnessed the Largest U.S. Bank Failure since the Global Financial Crisis

Silicon Valley Bank (SVB) Shares Dropped Over 60% Before Trading was Halted

The Effect Was Felt Throughout the Financial Sector In the Past 5 Days:

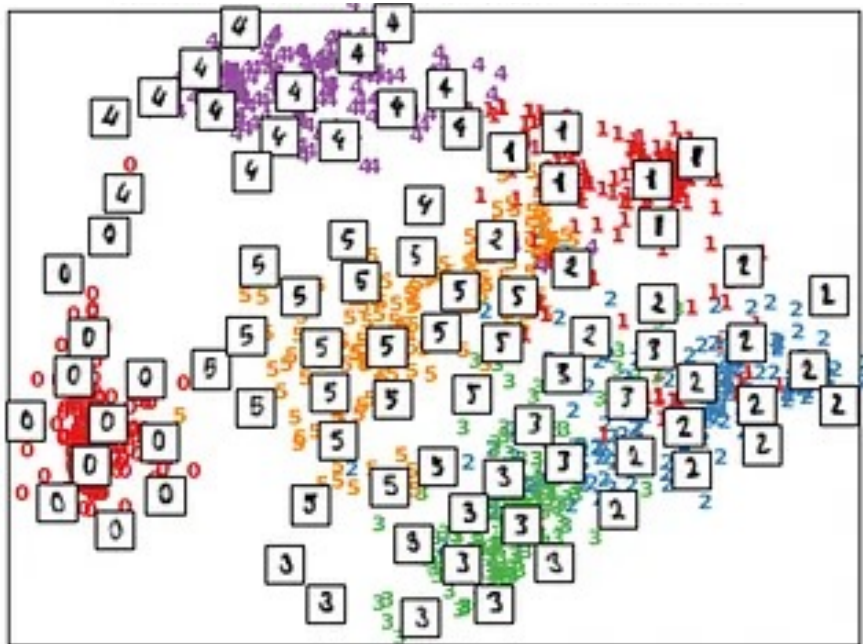
Asset Class	Change
SVB	-51%
Bank of America	-23.75%
Wells Fargo	-11.9%
JPMorgan Chase	-8.08%

SVB Bank surprised the market by announcing it needed to raise capital. It had been forced to sell all of its available-for-sale bonds at a loss as clients withdrew deposits, it said.

That the efforts to raise capital had failed and that SVB had to shut its doors.

[View full post](#)

Topic Modelling, Map Your Images



MNIST handwritten digits



Advanced Uses



Multimodal Models

Language + Vision

Ecology/Conservation



What animal is in this photo?

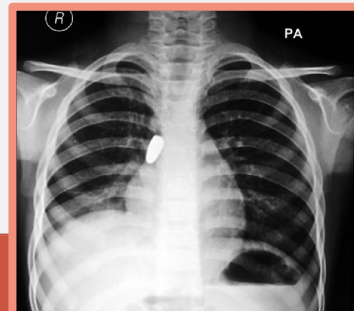
A koala is in this photo.

Geospatial



“Trees”

Medical Imaging



What is this image?

This image is a black and white photograph of a baby's chest, showing the baby's heart and lungs.

What is unusual about this child's chest x-ray?

The unusual aspect of this child's chest x-ray is that it has a small metal object inside the baby's chest, which is not typically seen in a normal chest x-ray.

Agents, Chained LLM Architectures

OpenAI Assistants/ GPTs

<https://platform.openai.com/docs/assistants/how-it-works>

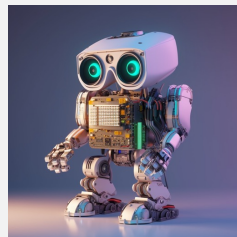
Flowise <https://flowiseai.com/>

(Langflow <https://www.langflow.org/>)

(Rivet <https://github.com/Ironclad/rivet>)

Azure AI Studio <https://ai.azure.com>

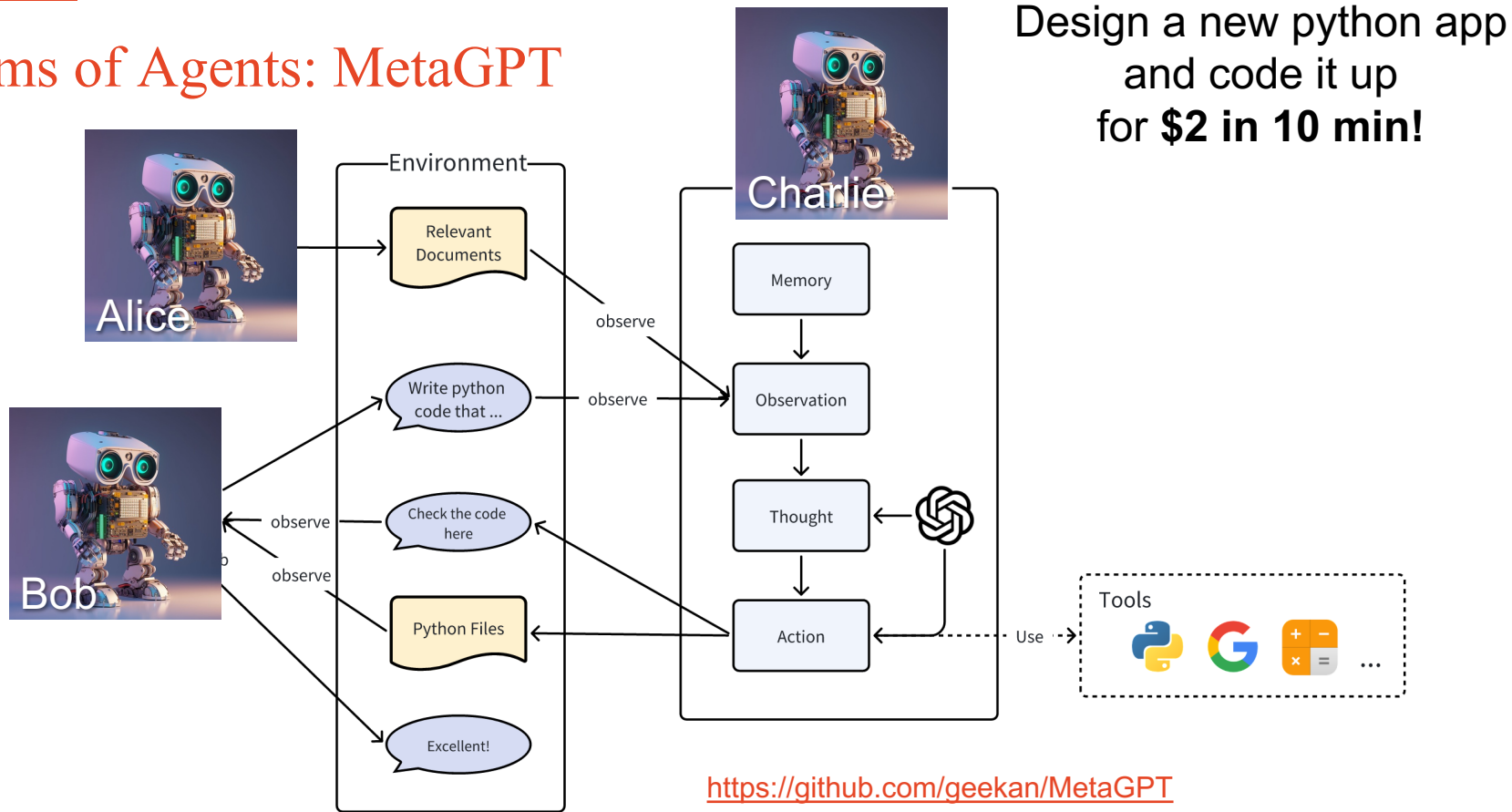
Langchain <https://www.langchain.com>



Agents

to reduce
time to science

Teams of Agents: MetaGPT

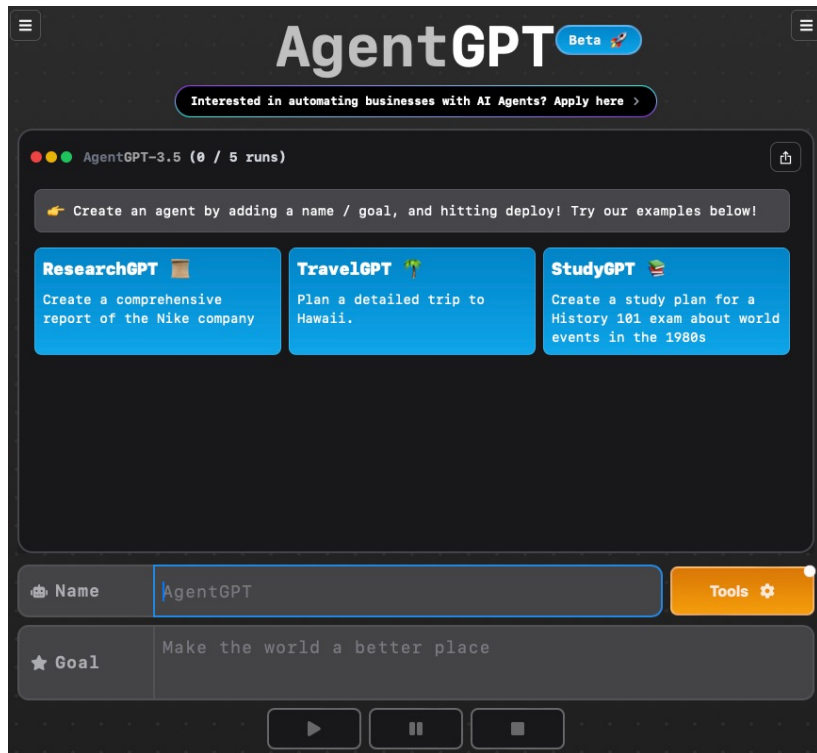


Design a new python app
and code it up
for **\$2 in 10 min!**

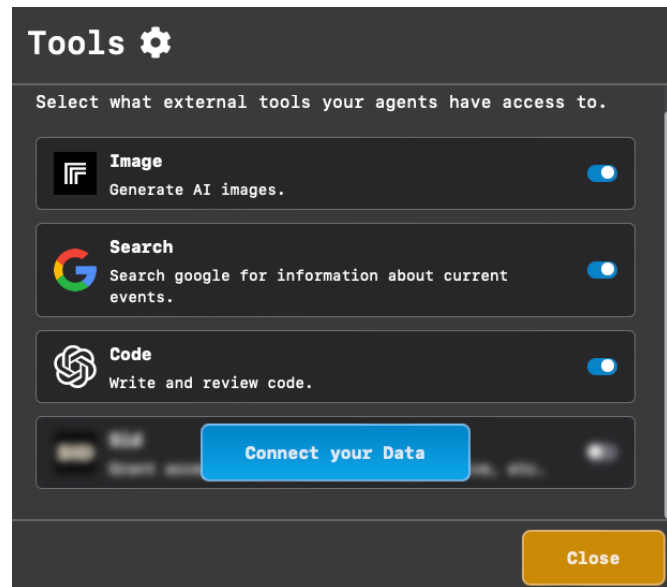
<https://github.com/geekan/MetaGPT>

<https://huggingface.co/spaces/deepwisdom/MetaGPT>

Teams of Agents: AgentGPT



Goal-oriented information
discovery and synthesis



<https://agentgpt.reworkd.ai>

Other Solved Generative AI Tasks: Audio

Audio transcription + translation

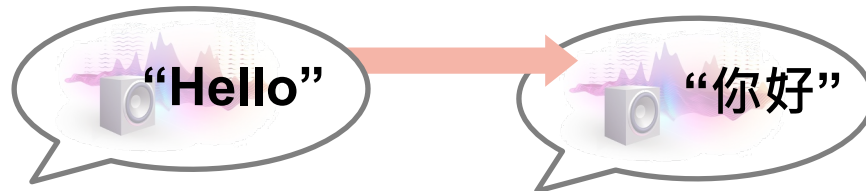


Hello

你好

[whisper.cpp](https://github.com/guillaumelord/whisper.cpp)

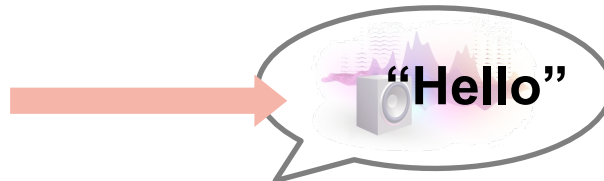
Audio – Audio Translation



[wav2vec2](https://github.com/tyl3r/wav2vec2)

Audio Synthesis

Hello

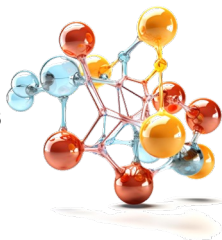


<https://elevenlabs.io>

Generative X

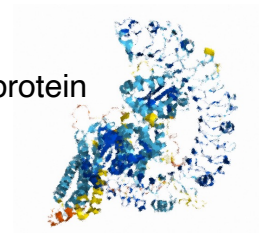
Drug discovery

Design your own chemicals



Biology

Design your own protein
synthetic biology

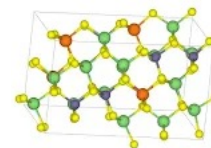


Manufacturing

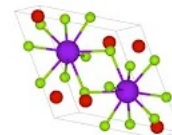
Design me a diffraction grating / micro resonator / widget with these properties...

Material discovery

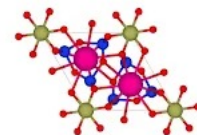
AI mineral discovery and
autonomous material synthesis



$\text{Li}_4\text{MgGe}_2\text{S}_7$



KV_3Se_3



$\text{Rb}_2\text{HfSi}_3\text{O}_9$

So what will you build?

How to Engage with Us



 THE UNIVERSITY OF SYDNEY

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Home / Research / Facilities / **Sydney Informatics Hub**

Sydney Informatics Hub

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We provide support, training, and expertise in research data management, statistics, data science, software engineering, simulation, visualisation, bioinformatics, and research computing.

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→

Request a Quote
Request a quote or estimate for your research project or grant
→

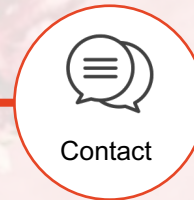
Workshops and training

Research project support

Share



sydney.edu.au/informatics-hub



And fill out our
request form

Or send us an email:



sih.info@sydney.edu.au

Generative AI in Research

30th November 2023

Dr Henry Lydecker
Dr Gordon McDonald

*Sydney Informatics Hub Masterclass Series
and CSIRO National AI Month*

sydney.edu.au/informatics-hub



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CRT005 00026A

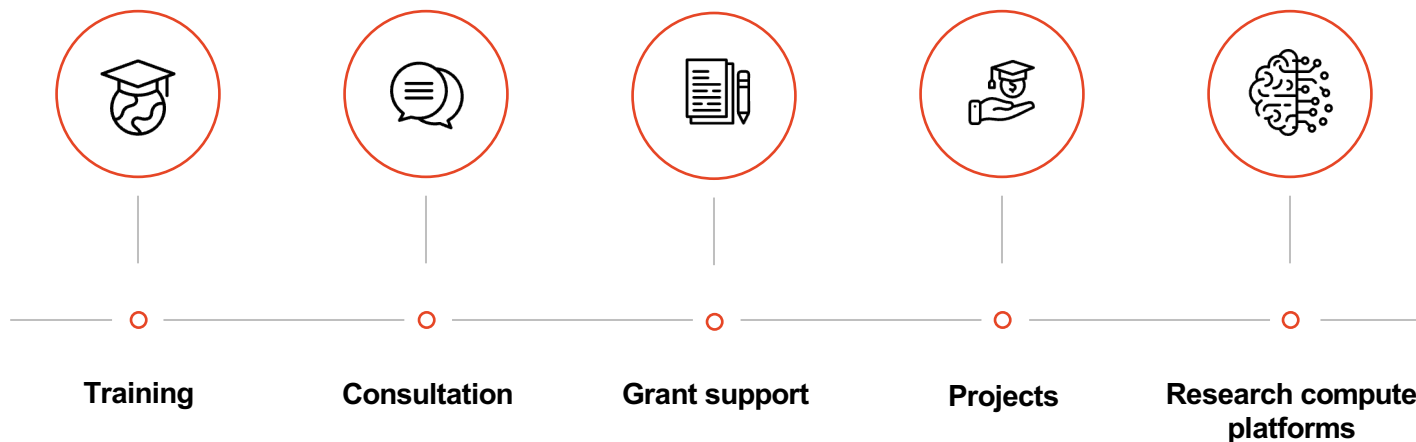


Sydney Informatics Hub (SIH)

Ways that you can engage with us:



sydney.edu.au/informatics-hub



Sydney Informatics Hub - Areas of Expertise



Statistics

- Experiment and survey design
- Meta-analysis
- Survival analysis
- Statistical modelling



Data Science & Software

- Machine Learning & AI
- Timeseries, clinical trials, geospatial
- Software for data-driven research



Research Computing

- High performance computing,
- Virtual desktop computing,
- Modelling and Simulation
- Data community building



Bioinformatics

- A variety of omics partnered with national facilities and research infrastructure
- Reproducible and scalable workflows

Sydney Informatics Hub Team

Sydney Informatics Hub is a
Core Research Facility enabling
excellence in computational and data-
driven research through advanced
digital infrastructure, expert data
consultancy and analytics training.

