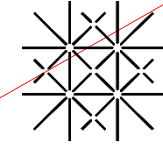


# AI in scientific writing: a guide for students and researchers



Universität  
Basel

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University Library Basel [yannick.staedler@unibas.ch](mailto:yannick.staedler@unibas.ch)

# Outline

- Short introduction on genAI
- Retrieval Augmented Generation
- Consensus
- New developments: Open AI Deep Research and Google Co-scientist
- Custom-based models
- Conclusion

# Generative AI: An Overview

## What is generative AI?

Generative AI refers to machine-learning models designed to generate human-like text based on prompts. These models understand language patterns, structure, and grammar to create content on a variety of topics.

## Capabilities of Models like GPT

- **Text Structuring**
- **Grammar and Style Correction**
- **Summarization and Paraphrasing**
- **Content Generation**

# Ethical Considerations in Generative AI

- **Data Privacy:** Risks of exposing sensitive patient information through AI-generated outputs.
- **Bias and Fairness:**
  - AI systems can perpetuate existing biases present in training data.
- **Accountability:**
  - Determining responsibility when AI systems produce erroneous or harmful outputs.
  - Example: Misdiagnosis due to AI-generated reports.
- **Transparency:**
  - The "black box" nature of some AI models makes it difficult to understand their decision-making processes.

# AI hallucinations

AI-generated research writing, while useful, can contain critical mistakes that jeopardize accuracy and credibility. Three common error types:

	Error Type	What to Look For
<b>Fabricated Data</b>	“Perfect-sounding” sample sizes, control groups, or results that can’t be traced to a real study	Fake data → unsound conclusions and misinformation
<b>Misinterpreted Findings</b>	Bold claims (e.g., a treatment is “effective”) drawn from limited or statistically weak evidence	Over-/under-stated outcomes distort the research narrative
<b>Inconsistent Tone / Precision</b>	Casual language, vague generalizations, or “word-soup” instead of precise scientific terms	Vague or unprofessional tone erodes academic credibility

- ❑ Especially common in references
- ❑ RAG tools

# Retrieval Augmented Generation

## RAG Key Stages

### • Indexing

- Convert source data (e.g. Semantic Scholar) to embeddings.
- Store embeddings in a vector database for fast similarity search.

### • Retrieval

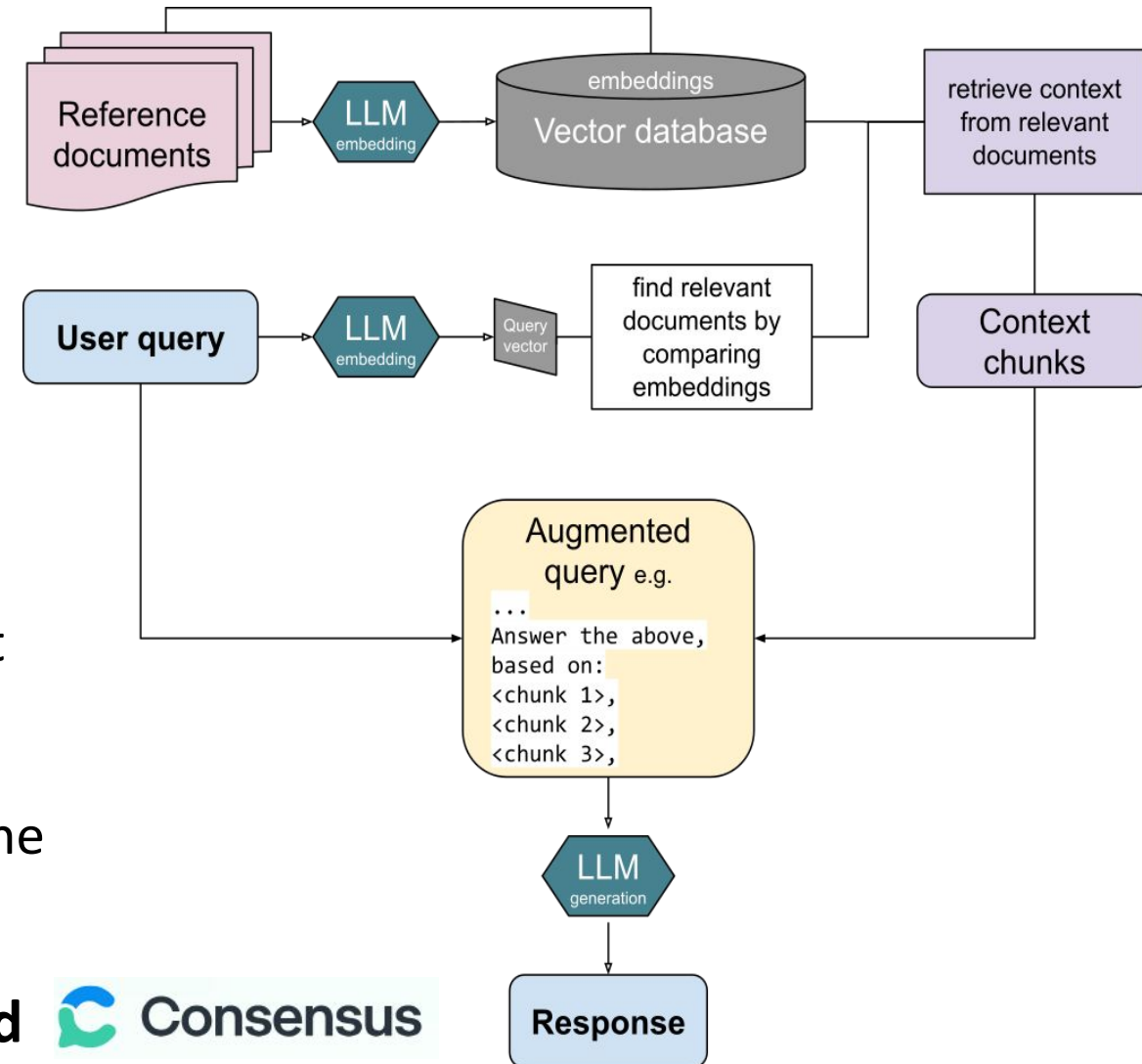
- On each user query, a retriever selects the most relevant documents, using similarity measures aligned with the chosen index.

### • Augmentation

- Inject the retrieved snippets into the prompt that the LLM sees.

### • Generation

- The LLM produces an answer grounded in both the user query and the retrieved context.



□ we benchmarked different services and licensed  Consensus



# Consensus

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# Consensus

Find the best science, faster.

write an essay on the current consensus on gut infections and Alzheimer's disease



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write an essay on the current consensus on gut infections and Alzheimer's disease



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The relationship between gut infections and Alzheimer's disease (AD) has garnered significant attention in recent years, with emerging evidence suggesting a complex interplay between the gut microbiota and the pathogenesis of AD. This essay explores the current consensus on this topic, highlighting key findings and potential therapeutic implications.

**Gut Microbiota and Alzheimer's Disease**

The gut microbiota, a diverse community of microorganisms residing in the gastrointestinal tract, plays a crucial role in maintaining host health and has been implicated in various diseases, including neurological disorders like AD. The microbiota-gut-brain axis is a bidirectional communication system involving neural, immune, endocrine, and metabolic pathways, which may influence the development and progression of AD <sup>1 4 7</sup>.

**Mechanisms Linking Gut Microbiota to AD**

Several mechanisms have been proposed to explain how gut microbiota may contribute to AD pathogenesis. Dysbiosis, or the imbalance of gut microbial communities, can lead to increased gut permeability and disruption of the blood-brain barrier, facilitating the entry of harmful substances into the central nervous system. This can trigger neuroinflammation and neuronal injury, key features of AD <sup>1 4 6</sup>. Additionally, gut bacteria can produce amyloids and lipopolysaccharides, which may modulate inflammatory pathways and promote the aggregation of amyloid-beta (A $\beta$ ) peptides, a hallmark of AD <sup>1 4 7</sup>.

↓ Results



**Evidence from Human and Animal Studies**



write an essay on the current consensus on gut infections and Alzheimer's disease



### 1 The Gut Microbiota and Alzheimer's Disease.

Gut microbiota alterations may influence Alzheimer's disease development through increased gut and blood-brain barrier permeability, inflammation, and modulation of signaling pathways.



Rigorous Journal

Highly Cited

2017 · 614 citations · Chunmei Jiang et al. · *Journal of Alzheimer's disease : JAD*



### 2 Interconnections between the Gut Microbiome and Alzheimer's Disease: Mechanisms and Therapeutic Potential

The gut microbiome may play a role in Alzheimer's disease pathogenesis and may offer potential therapeutic approaches, but current research limitations limit further exploration.



Ask this paper

2024 · 0 citations · Ahmad M. Sait et al. · *International Journal of Molecular Sciences*



### 3 Relationship Between the Gut Microbiota and Alzheimer's Disease: A Systematic Review.

Gut microbiota may play a role in cognitive disorders like Alzheimer's disease, but more human studies are needed for definitive conclusions.





# Consensus

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Effects of intensive lifestyle changes on the progression of mild cognitive impairment or early dementia due to Alzheimer's disease: a randomized, controlled clinical trial

Intensive lifestyle changes may significantly improve cognition and function in patients with mild cognitive impairment or early dementia due to Alzheimer's disease after 20 weeks.



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## Ask Paper

Beta

A full text PDF is available for this paper. Ask to summarize the findings, explore the methods used, explain complex terms, and more.

Ask this paper

Effects on the progression of mild cognitive impairment or early dementia due to  
...d, controlled clinical trial

significantly improve cognition and function in patients with mild  
dementia due to Alzheimer's disease after 20 weeks.



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Ornish et al. *Alzheimer's Research & Therapy* (2024) 16:122  
<https://doi.org/10.1186/s13195-024-01462-z>

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# Effects of intensive lifestyle changes on the progression of mild cognitive impairment or early dementia due to Alzheimer's disease: a randomized, controlled clinical trial

Dean Ornish<sup>1,2\*</sup>, Catherine Madison<sup>1,3</sup>, Miia Kivipelto<sup>4,5,6,7</sup>, Colleen Kemp<sup>8</sup>, Charles E. McCulloch<sup>9</sup>, Douglas Galasko<sup>10</sup>, Jon Artz<sup>11,12</sup>, Dorene Rentz<sup>13,14,15</sup>, Jue Lin<sup>16</sup>, Kim Norman<sup>17</sup>, Anne Ornish<sup>1</sup>, Sarah Tranter<sup>8</sup>, Nancy DeLamarter<sup>1</sup>, Noel Wingers<sup>1</sup>, Carra Richling<sup>1</sup>, Rima Kaddurah-Daouk<sup>18</sup>, Rob Knight<sup>19</sup>, Daniel McDonald<sup>20</sup>, Lucas Patel<sup>21</sup>, Eric Verdin<sup>22,23</sup>, Rudolph E. Tanzi<sup>1,24,25,26</sup> and Steven E. Arnold<sup>1,3,7</sup>

Abstract

**Background** Evidence links lifestyle factors with Alzheimer's disease (AD). We report the first randomized, controlled clinical trial to determine if intensive lifestyle changes may beneficially affect the progression of mild cognitive impairment (MCI) or early dementia due to AD.

**Methods** A 1:1 multicenter randomized controlled phase 2 trial, ages 45–90 with MCI or early dementia due to AD and a Montreal Cognitive Assessment (MoCA) score of 18 or higher. The primary outcome measures were changes in cognition and function tests: Clinical Global Impression of Change (CGIC), Alzheimer's Disease Assessment Scale (ADAS-Cog), Clinical Dementia Rating–Sum of Boxes (CDR-SB), and Clinical Dementia Rating Global (CDR-G) after 20 weeks of an intensive multidomain lifestyle intervention compared to a wait-list usual care control group. ADAS-Cog, CDR-SB, and CDR-Global scales were compared using a Mann-Whitney-Wilcoxon rank-sum test, and CGIC was compared using Fisher's exact test. Secondary outcomes included plasma Aβ42/40 ratio, other biomarkers, and correlating lifestyle with the degree of change in these measures.

**Results** Fifty-one AD patients enrolled, mean age 73.5. No significant differences in any measures at baseline. Only two patients withdrew. All patients had plasma Aβ42/40 ratios <0.0672 at baseline, strongly supporting AD diagnosis. After 20 weeks, significant between-group differences in the CGIC ( $p=0.001$ ), CDR-SB ( $p=0.032$ ), and CDR Global ( $p=0.037$ ) tests and borderline significance in the ADAS-Cog test ( $p=0.053$ ). CGIC, CDR Global, and ADAS-Cog showed improvement in cognition and function and CDR-SB showed significantly less progression, compared to the control group which worsened in all four measures. Aβ42/40 ratio increased in the intervention group and decreased

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What would you like to know about this paper?

Summarize the paper in a few sentences →

Were there any conflicts of interest? →

Did the authors mention any limitations? →

Ask this paper... →



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Did the authors mention any limitations? →

What are the limitations of this study? →



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## Ask Paper Beta



What are the limitations of this study?

The study has several limitations, including a small sample size of only 51 patients, with less racial and ethnic diversity than intended ([Source](#)). Additionally, the study lasted only 20 weeks, which is relatively short for interventions with mild cognitive impairment (MCI) or early dementia due to Alzheimer's disease, and direct measures of brain structure were not included in the trial ([Source](#)).

Ask this paper...



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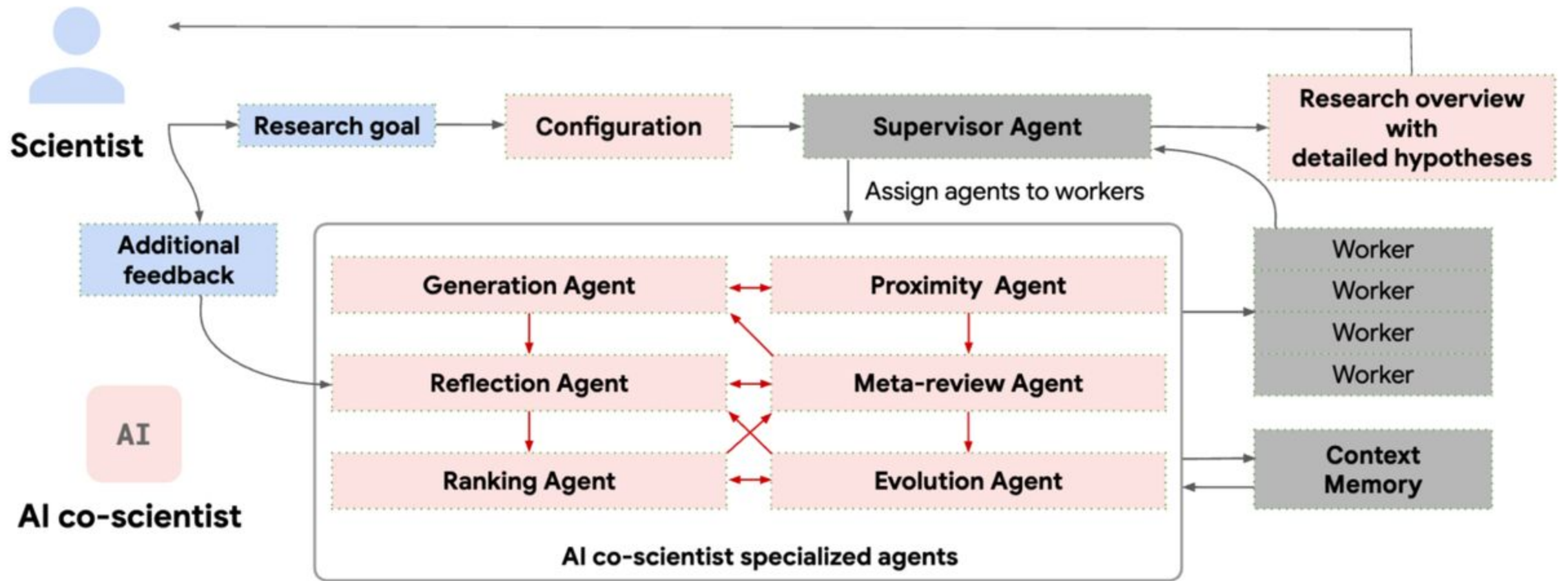
# New developments: Open AI's Deep Research and Google's Co-scientist

# ChatGPT "Deep Research" Mode

- Available since February 2025
- Searches the live web in real-time to deliver the latest information
- Synthesizes multiple reputable sources → comprehensive, well-supported answers
- Use when you need:
  - data beyond the model's Oct 2023 cutoff
  - precise statistics or specialized expertise
  - breaking news, new research, current regulations
- Compared with regular ChatGPT:
  - Source: live search vs pre-trained knowledge
  - Accuracy: high, up-to-date vs limited by cutoff
- How: ask your question → click "Deep Research" → receive referenced answer

# Google Co-scientist

(<https://research.google/blog/accelerating-scientific-breakthroughs-with-an-ai-co-scientist/>)



- **Gemini 2.0 “AI co-scientist”**: A multi-agent virtual collaborator that emulates the scientific method to rapidly generate and refine novel hypotheses and research proposals.
- **Impact shown**: Reproduced a decade of antibiotic-resistance findings in 72 hours, matching human conclusions and illustrating its power to dramatically speed up discovery.

# Customized GenAI models

Very impressive results but for the practical life of scientist, this is still only small fraction of what AI models can do to augment research workflows

## **Customized models (GPT)**

What are the advantages of a customized GPT model ?

Domain accuracy – internalizes your field's terminology and data formats, it also can use a specific knowledge base

How do you customize a GPT model ?

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I will present you two models developed by Dr. Sara Manafzadeh



# PhyloPen

By SARA MANAFZADEH &

Elite evolutionary biology writing assistant with end-to-end academic publishing support

[manafzadeh.sara@gmail.com](mailto:manafzadeh.sara@gmail.com)

Help me draft a phylogenetics-based introduction.

Suggest a macroevolutionary hypothesis for...

Format this manuscript for Systematic Biology.

Identify literature gaps in evolutionary developmental...

Ask anything



1-click prompts



Web access



# *PhyloPen: A Custom GPT for Evolutionary Biologists*

## **Purpose:**

- Assist evolutionary biologists in writing and refining academic manuscripts (review papers)
- Support full scholarly workflows: from brainstorming to peer-review response
- Bridge historical and modern perspectives in evolutionary science

# PhyloPen - Demonstration

# PhyloPen - Demonstration

- connection to teaching App in Replit



# EU Grant Pro Mentor

By SARA MANAFZADEH &

EU grant writer with EU ethics compliance, data & table generation

manafzadeh.sara@gmail.com

Can you review the scientific framing of this MSCA...

Help me adapt this to ERC Consolidator Grant format.

Can you generate a Gantt chart and work package...

Review for ethics issues and suggest complian...

Ask anything



1-click prompts



Web access



# Why EU Grant Pro Mentor

## - *Bridging Grant Writing Expertise with AI*

**Problem:** EU grant writing is time-consuming, technically demanding, and rule-bound.

**Gap:** Generic AI tools fail to meet the formatting, ethics, and strategic depth of Horizon Europe and related programmes.

**Solution:** Custom GPT tuned for EU grant programmes in Life, Health, and Natural Sciences.

### **Built with:**

- GPT-4 + tools (PubMed, Eurostat, CORDIS, logic model builders)
- Programme-specific formatting rules (ERC, MSCA, EIC, Horizon RIA/IA)
- Ethics engine (Nagoya, GDPR, dual-use, fieldwork, etc.)

# EU Grant Pro Mentor - Demonstration

These are only two examples of how customized GPT models can enhance the efficiency of academic workflows

**Data Analysis GPT** - Suggest data analyses and provide Python codes

**Teaching and Learning GPTs** - Enhance teaching materials and student engagement.

**Knowledgebase & Administrative GPTs** - Provide answers from university policies, guides, and systems

**Academic Manager & Coordinator GPTs** - Assist academic managers, coordinators, and department heads with planning, reporting, and communication.

**Event Organizer GPTs** - Plan and manage academic events like symposiums, workshops, or conferences.

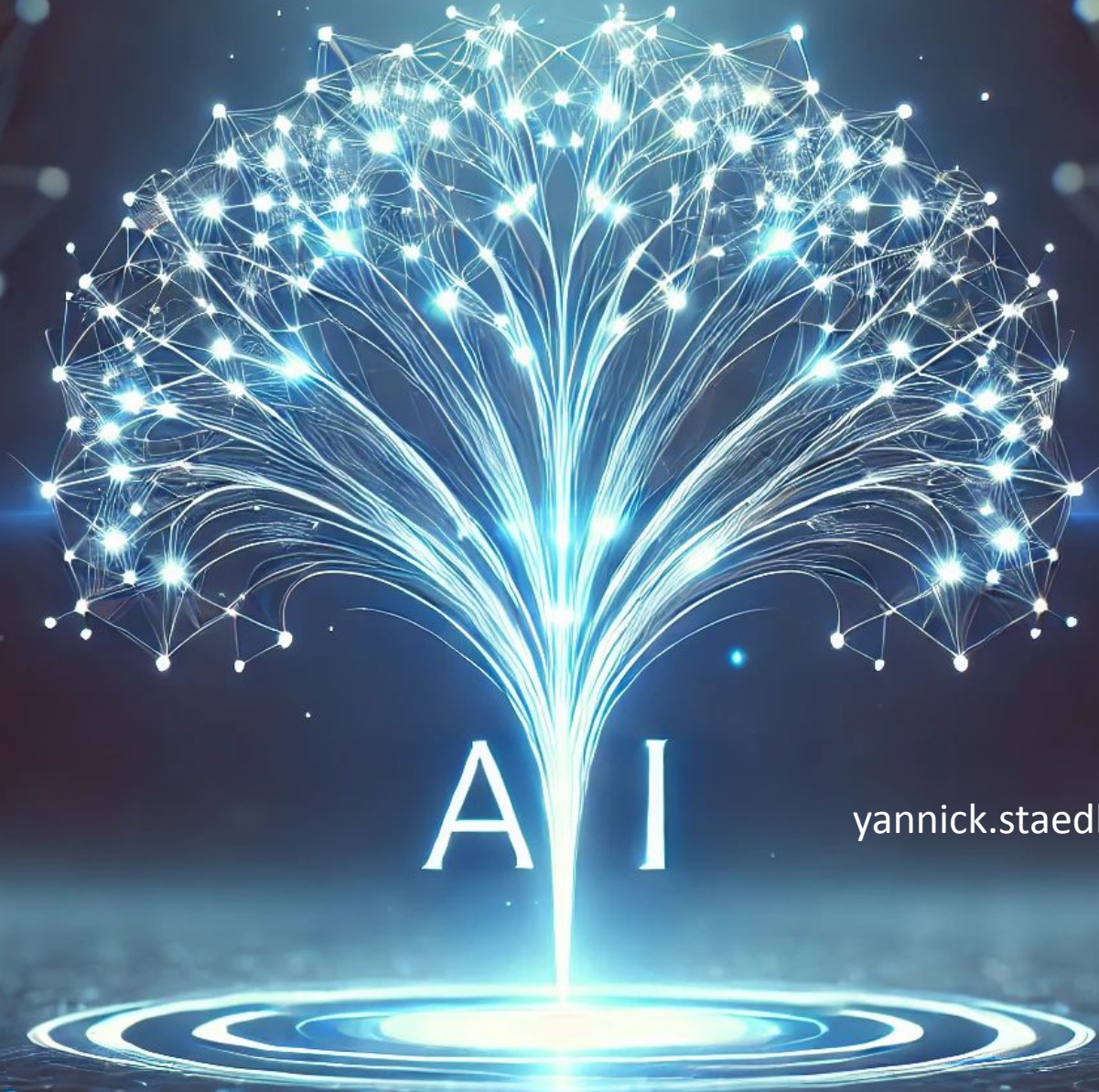
Etc...

**Competitiveness of a research institution, may be soon shaped not only by smart minds, infrastructure, and funding, but also by the quality of the AI models they deploy to augment their workflows.**

**We will keep at the cutting edge**

**To help you stay at the cutting edge**

Thank you for your attention !



yannick.staedler@unibas.ch