

HOW COMPLEXITY SCIENCE — AND ITS CONCEPTS — CAN CONTRIBUTE TO A BETTER UNDERSTANDING OF 'GENAI' COMPETITIVE DYNAMICS AND TO THE DESIGN OF A PRO-ACTIVE PRO-INNOVATION/COMPETITION POLICY

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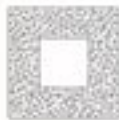
GenAI Competitive Dynamics and Challenges

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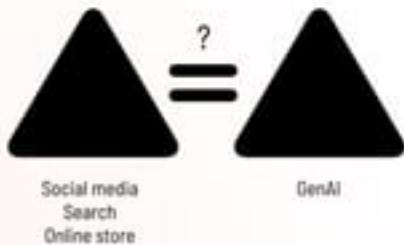
**1. Competitive
dynamics in
Generative AI**

**2. Pro-active
competition
law and policy**



1. Competitive dynamics in Generative AI





1.1. Can we confidently predict
who will 'win'? No.
(computer science)

BIG DATA

Just ***big*** data is the **wrong focus**:

1. Small datasets can compete with big ones
2. Small companies can access large amounts of data

- April 2021: Koala: A Dialogue Model for Academic Research
- February 2021: Retrieval-Enhanced Transformer
 - June 2021: Low-Rank Adaptation (LoRA)
- September 2020: Less Than One-Shot Algorithms
 - February 2020: Dataset Distillation
 - April 2021: Attention Is All You Need
 - 1970s: Synthetic data

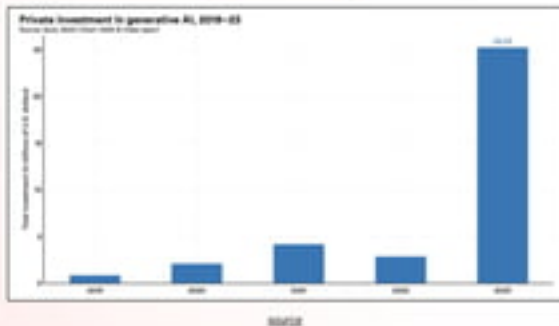
COSTS

Today, it's expensive = favor big players

- OpenAI spent \$540 million on the development of GPT-4 in 2022 alone
- OpenAI spends \$700,000 per day to run ChatGPT (2023)

But tomorrow? Chip makers are lowering these costs (Nvidia's latest GPU cut the price of training LLMs from \$10 million with 960 CPUs down to just \$400,000) + **new model compression** and algorithms that lower costs: one can train and run "good enough" LLMs on a single GPU (even smartphones) in just a few of hours + **federated learning** is pushing

CAPITAL

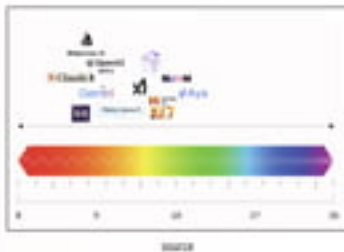


TALENTThe logo for Mistral AI, featuring the word "MistralAI" in a bold, 3D, orange-yellow font.**Midjourney**

Less than 50 employees
(<https://www.crunchbase.com/>)

= non-ergodicity

ACCESS



ACCESS

'Open' foundation models
power strong competitive dynamics:

1. They can be forked (1000 forks on Llama 3 in one weekend) = diversity
2. They include limited/distributed amendment and termination provisions
3. They include "anti-opportunism" provisions
4. They do not restrict interoperability / access to the API = little leveraging power (address many antitrust concerns)

1.2. Does this imply that GenAI
won't experience dominance? No.
(complexity science)

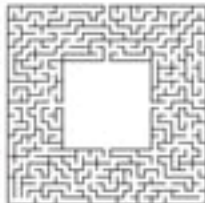
INCREASING RETURNS

Significant increasing returns:

1. No immediate "learning effect":
not like search/socials, more like operating systems

2. But "ecosystem effects":
interaction between different layers
(infrastructure - models - apps)

2. Pro-active competition law and policy



1. Follow increasing returns

What generates
these returns?
(snowball effect)



Target practices
diminishing these
returns = freezing
the ecosystem

1. Follow increasing returns

How effective is
the practice?
Depends on the
ability to enter
frozen layers



2. Deploy computational antitrust



E.g.: Audit code and T&C

- Track changes in the API (for the 'closed' ones)
- Track changes in access terms to models (for the 'open' ones)
 - Track changes to non-compete provisions
 - Track changes to interoperability terms

32 more examples, text

3. Document regulatory barriers (and captures)

Article 53

Prohibit the providers of general purpose AI models from engaging in anti-competitive behavior

Article 54

Prohibit the providers of general purpose AI models

The providers of general purpose AI models shall ensure that their models do not engage in anti-competitive behavior in the AI market

1. The providers of general purpose AI models shall ensure that their models do not engage in anti-competitive behavior in the AI market

- (a) to not engage in anti-competitive behavior in the AI market
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Article 55

Prohibit the providers of general purpose AI models

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Article 53 of the AI Act + Annex II
(Providers of general purpose AI models)

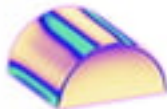
4. Exempt open systems



1. Forming joint ventures (between OS/OA companies) without notifying antitrust agencies



2. Forming strategic alliances without facing cartel sanctions (sharing up-front costs, marketing networks, and technical knowledge)



3. Creating/extending R&D exemption to antitrust law (25% + rivalry)

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