IP Protection for Generative AI

- Foundation Models and IP -

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What is Happening Now in AI?

- Rise of the Foundation Model

![Diagram of Foundation Model](image)

Fig. 2. A foundation model can centralize the information from all the data from various modalities. This one model can then be adapted to a wide range of downstream tasks.

Source: Bommasani et al. (2021)
Collaborative Cycle in AI Development

IMAGENET

Motivation & Incentives

kaggle

Spreading New Technology

GitHub

Hugging Face

stack overflow

Sharing New Knowledge

arXiv.org
The End of Open Innovation?

GPT-4 Technical Report

OpenAI*

2 Scope and Limitations of this Technical Report

This report focuses on the capabilities, limitations, and safety properties of GPT-4. GPT-4 is a Transformer-style model [39] pre-trained to predict the next token in a document, using both publicly available data (such as internet data) and data licensed from third-party providers. The model was then fine-tuned using Reinforcement Learning from Human Feedback (RLHF) [40]. Given both the competitive landscape and the safety implications of large-scale models like GPT-4, this report contains no further details about the architecture (including model size), hardware, training compute, dataset construction, training method, or similar.

Source: OpenAI (2023)
(Emphasis added.)
Landscape of AI Ecosystem

Source: Competition and Markets Authority (UK) (2023)
(Emphasis added.)
Landscape of IP Issues

Datasets
- Copyrights
- Sui Generis Database Rights

Untrained Models
- Software Copyrights
- Trade Secrets
- Patents
  (Network architectures, learning methods, etc.)

Foundation Models
- Fair use
- Dataset Licenses

Fine-Tuned Models
- Closed Source (via Contract)
- Open Source

Services / Outputs
- Closed Source (via API)
- Open Source

- Copyrights (?)
- Patents (?)
- Trade Secrets
- Software Copyrights (?)
- Closed Source (via API)
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IP Protection of Datasets

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Relaxed Grip on AI Patents

- Patents with CPC code G06N 3/08 (learning methods)

  ![Google Patents](image)

  More than 100,000 results

- Example
  - Google’s patents on core technologies

  ![Google Challenge OpenAI With Self-Attention Patents](image)

  Can Google Challenge OpenAI With Self-Attention Patents?

  Alex Zhavoronkov, PhD Contributor
  Expert in AI for healthcare and longevity biotechnology

  Can Google Hold Critical IP in Systems Utilizing Self-Attention

  And when it comes to IP protection in AI, I don’t know any company stronger than Google. I remember our teams spending weeks ensuring that the architectures are unique enough to avoid the possible infringement of Google’s IP. Even DeepMind, a wholly-owned subsidiary of Alphabet, holds a very strong IP position in the space. A simple WIPO search returns over 800 results.

  Source: Forbes

  [D] Can Google sue OpenAI for using the Transformer in their products?

  As far as I know, the Transformer architecture is patented: https://patents.google.com/patent/US10452978B2/en. Since OpenAI has used the Transformer extensively (including GPT), I’m wondering if this can be considered as patent infringement.

  If you know about legal stuffs please share your opinions.

  Source: Reddit
IP Protection of Trained Models

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IP Protection of Trained Models

1. Download the weights
   - v1-5-pruned-emaonly.ckpt - 4.27GB, ema-only weight. uses less VRAM - suitable for inference
   - v1-5-pruned.ckpt - 7.7GB, ema+non-ema weights. uses more VRAM - suitable for fine-tuning

Source: https://huggingface.co/   
(Emphasis added.)
IP Protection of AI-Generated Outputs

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**Open Foundation Models: A Game Changer?**

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**Introducing Llama 2**

The next generation of our open source large language model

Llama 2 is available for free for research and commercial use.

Download the Model

<table>
<thead>
<tr>
<th>Benchmark (shots)</th>
<th>GPT-3.5</th>
<th>GPT-4</th>
<th>PaLM</th>
<th>PaLM-2-L</th>
<th>Llama 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMLU (5-shot)</td>
<td>70.0</td>
<td>86.4</td>
<td>69.3</td>
<td>78.3</td>
<td>68.9</td>
</tr>
<tr>
<td>TriviaQA (1-shot)</td>
<td>–</td>
<td>–</td>
<td>81.4</td>
<td>86.1</td>
<td>85.0</td>
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<tr>
<td>Natural Questions (1-shot)</td>
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<td>–</td>
<td>29.3</td>
<td>37.5</td>
<td>33.0</td>
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<tr>
<td>GSM8K (8-shot)</td>
<td>57.1</td>
<td>92.0</td>
<td>56.5</td>
<td>80.7</td>
<td>56.8</td>
</tr>
<tr>
<td>HumanEval (0-shot)</td>
<td>48.1</td>
<td>67.0</td>
<td>26.2</td>
<td>–</td>
<td>29.9</td>
</tr>
<tr>
<td>BIG-Bench Hard (3-shot)</td>
<td>–</td>
<td>–</td>
<td>52.3</td>
<td>65.7</td>
<td>51.2</td>
</tr>
</tbody>
</table>

**Table 4: Comparison to closed-source models** on academic benchmarks. Results for GPT-3.5 and GPT-4 are from OpenAI (2023). Results for the PaLM model are from Chowdhery et al. (2022). Results for the PaLM-2-L are from Anil et al. (2023).

Source: [https://ai.meta.com/llama/](https://ai.meta.com/llama/)  
(Emphasis added.)
IP Protection of **Open** Foundation Models

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Use Model Outputs to Train Another Model

- GPT 3.5 Outputs
- LlaMa1 Model

Fine-tuning

Alpaca Model

- Training costs < $600
- Performance comparable to GPT-3.5 (in certain tasks)

https://crfm.stanford.edu/2023/03/13/alpaca.html
Use Model Outputs to Train Another Model

• Potential violation of OpenAI’s Terms of Use
  – Legal question: Is this clause valid under applicable competition laws?

2. Usage Requirements

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(c) Restrictions. You may not (i) use the Services in a way that infringes, misappropriates or violates any person’s rights; (ii) reverse assemble, reverse compile, decompile, translate or otherwise attempt to discover the source code or underlying components of models, algorithms, and systems of the Services (except to the extent such restrictions are contrary to applicable law); (iii) use output from the Services to develop models that compete with OpenAI; (iv) except as permitted through the API, use any automated or programmatic method to extract data or output from the Services, including scraping, web harvesting, or web data extraction; (v) represent that output from the Services was human-generated when it is not or otherwise violate our Usage Policies; (vi) buy, sell, or transfer API keys without our prior consent; or (vii), send us any personal information of children under 13 or the applicable age of digital consent. You will comply with any rate limits and other requirements in our documentation. You may use Services only in geographies currently supported by OpenAI.

Source: https://openai.com/policies/terms-of-use
(Emphasis added.)
Takeaway

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Thank You!