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DeepSeek-OCR 2：以“因果阅读顺序”重塑复杂文档理解

DeepSeek-OCR 2: Rewriting Complex Document Understanding with Visual Causal Reading Order

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Flash Analysis

(Please see APPENDIX 1 for English summary)

事件

2026 年 1 月 27 日，DeepSeek 团队正式发布研究论文《DeepSeek-OCR 2: Visual Causal Flow》，并同步开源面向 OCR 与文档解析场景的专用模型 DeepSeek-OCR 2（以下简称 DeepSeek-OCR2）。新版模型核心升级在于其视觉编码器 DeepEncoder V2 的突破性改进，该设计使模型摆脱传统“自上而下、从左至右”的机械式扫描方式，转为依据文档结构特征与语义关联进行动态理解，实现了更贴近人类认知逻辑的图文、表格及公式解析能力，有望显著提升复杂文档处理的准确性与效率。

点评

这次升级抓住了文档理解里最难啃的一块——复杂版式的阅读顺序。在复杂文档（如多栏排版、嵌套表格及公式混杂文本）的处理中，传统 OCR 及多数视觉语言模型常将图像中的“空间顺序”直接等同于“语义顺序”，导致识别结果出现串行、错位等问题。DeepSeek-OCR 2 针对这一核心瓶颈进行了关键改进：以轻量级语言模型 Qwen2-500M 替代原有的 CLIP 风格编码器，并引入具备因果注意力的“因果流查询”机制。该设计能够在编码阶段即对视觉 token 按内容逻辑进行重组，使其在进入解码器前已完成结构理顺，从而实现类似人类“先理解整体布局，再依序阅读内容”的认知过程，显著提升了模型对复杂版面的语义连贯性与识别准确率。

从公开指标看，它已经站进了第一梯队。在权威文档理解基准 OmniDocBench v1.5 的评测中，DeepSeek-OCR 2 的综合得分达到 91.09%，较上一代显著提升 3.73 个百分点；其反映阅读顺序准确性的编辑距离指标由 0.085 优化至 0.057，验证了其“按结构阅读”的技术路径在改善识别连贯性方面的有效性。横向对比来看，尽管当前在该榜单中略低于排名第一的 PaddleOCR-VL（92.86%），但差距已收窄至较小区间，表明其整体性能已逼近行业领先水平。尤为值得关注的是模型效率：在同等视觉 token 预算（1120）条件下，DeepSeek-OCR 2 的文档解析编辑距离为 0.100，优于 Gemini 3 Pro 的 0.115（该指标数值越低性能越好），体现出其在保持高压缩率的同时并未牺牲识别质量，具备了出色的性能-效率平衡能力。

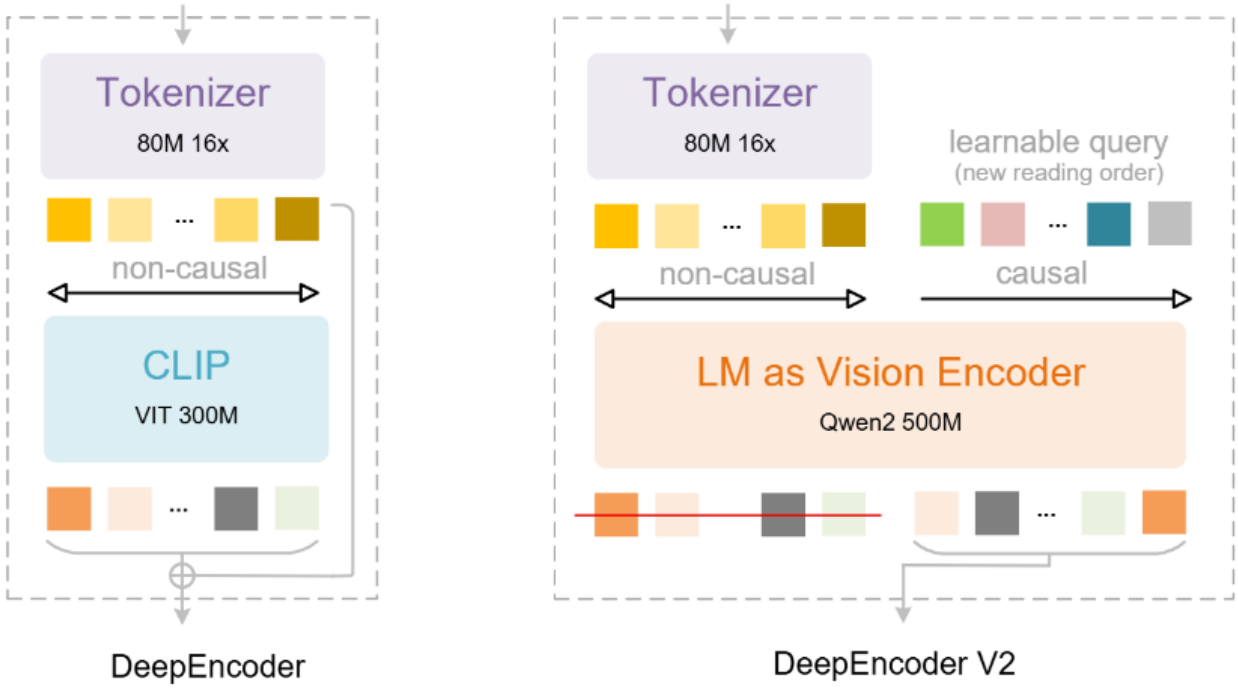
这个模型对产业落地的意义很直接：更低成本、更强文档解析能力。在性能表现上，该模型对复杂文档页面的处理仅需 256 至 1120 个视觉 token，极高的信息压缩效率将显著降低下游大模型在处理 PDF、扫描文件、财报、研报及合同等材料时的计算负载与处理时延。同时，该模型以 Apache-2.0 协议开源，参数量为 30 亿，适中的规模与友好的许可使其易于集成至企业现有流程，可广泛应用于 PDF 转 Markdown、表格与公式结构化抽取、以及 RAG 知识库构建等场景。从生产环境反馈来看，其在实际线上日志图像与批量 PDF 处理任务中的文本“重复率”指标显著改善（例如分别从 6.25%下降至 4.17%、从 3.69%下降至 2.88%），表明模型在真实业务场景中的识别稳定性与可靠性得到了进一步验证。

从长期想象空间看，DeepSeek-OCR 2 更像一次架构方向的试探：将文档的“阅读顺序与结构理解”能力前置至视觉编码器阶段，通过引入因果注意力机制实现视觉信息流的逻辑重排，使后端语言模型能够在更符合人类认知习惯的序列上进行推理。这一架构创新不仅为视觉-语言模型（VLM）的设计提供了新的技术路径，也使其能够作为生成高质量、强结构化训练数据的工具，从而反哺大语言模型的预训练与优化。此外，研发团队清晰界定了当前模型的适用边界，并明确了后续迭代方向（例如针对文本密集的报纸类文档，计划通过局部裁剪优化与专项数据补充进行改善）。这种“问题可归因、优化有路径”的迭代方法论，有助于形成持续、稳定的产品化演进能力，为模型的长期应用与商业化落地奠定了坚实基础。

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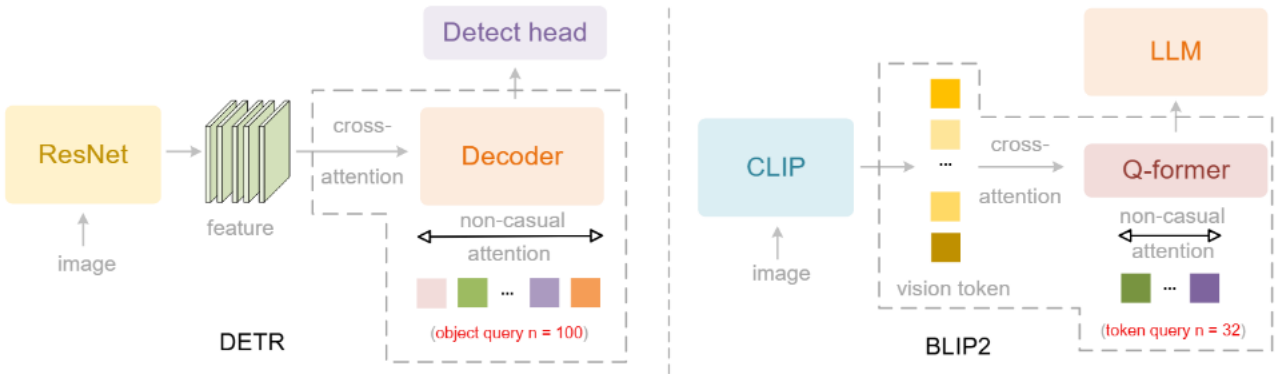
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Fig.1 DeepEncoder vs DeepEncoder V2：从“扫描顺序”到“因果阅读顺序”



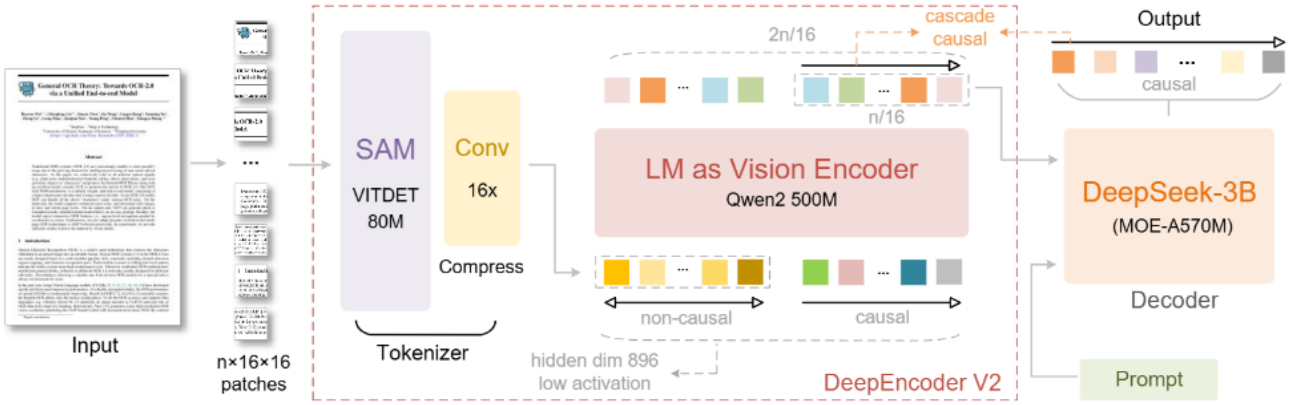
Source: DeepSeek, HTI

Fig.2 DeepEncoder vs DeepEncoder V2：从“扫描顺序”到“因果阅读顺序”



Source: DeepSeek, HTI

Fig.3 DeepSeek-OCR 2 端到端架构总览：DeepEncoder V2 + DeepSeek-3B 解码器



Source: DeepSeek, HTI

Fig.4 DeepSeek-OCR 2 端到端架构总览：DeepEncoder V2 + DeepSeek-3B 解码器

Table 2 | Edit Distances for different categories of document-elements in OmniDocBench v1.5. V-token^{max} denotes the lowest maximum number of visual tokens.

Model	V-token^{max}↓	Text^{Edit}↓	Formula^{Edit}↓	Table^{Edit}↓	R-order^{Edit}↓	Overall^{Edit}↓
Gemini-3 pro [44]	1120	-	-	-	-	0.115
Seed-1.8 [41]	5120	-	-	-	-	0.106
DeepSeek-OCR	1156	0.073	0.236	0.123	0.085	0.129
DeepSeek-OCR 2	1120	0.048	0.198	0.096	0.057	0.100

Source: DeepSeek, HTI

Appendix

English Summary

Event

On January 27, 2026, the DeepSeek team officially released its research paper *DeepSeek-OCR 2: Visual Causal Flow* and simultaneously open-sourced a dedicated model for OCR and document parsing, DeepSeek-OCR 2 (hereafter "DeepSeek-OCR2"). The core upgrade of the new version lies in a breakthrough improvement to its visual encoder, DeepEncoder V2. This design enables the model to move beyond the traditional "top-to-bottom, left-to-right" mechanical scanning paradigm and instead perform dynamic understanding based on document layout features and semantic relationships. As a result, it achieves more human-like capabilities in parsing text, tables, and formulas, with the potential to significantly improve the accuracy and efficiency of complex document processing.

Commentary

This upgrade targets one of the hardest problems in document understanding: determining the correct reading order for complex layouts. When processing complex documents—such as multi-column pages, nested tables, and formula-rich text—traditional OCR systems and most vision-language models often treat "spatial order" as equivalent to "semantic order," leading to issues like concatenation errors and misalignment. DeepSeek-OCR 2 addresses this bottleneck with two key changes: it replaces the original CLIP-style encoder with a lightweight language model, Qwen2-500M, and introduces a "causal flow query" mechanism with causal attention. This allows the model to reorganize visual tokens by content logic during encoding, effectively "straightening out" the structure before decoding. In practice, it mirrors a human cognitive process: first grasp the global layout, then read content in a coherent order—materially improving semantic continuity and recognition accuracy on complex pages.

Public benchmarks suggest the model has entered the top tier. On the widely used document understanding benchmark OmniDocBench v1.5, DeepSeek-OCR 2 achieves an overall score of 91.09%, representing a 3.73 percentage-point improvement over the previous generation. Its edit-distance metric reflecting reading-order quality improves from 0.085 to 0.057, validating the effectiveness of its "structure-first reading" approach in enhancing coherence. In peer comparison, while it is still slightly below the top-ranked PaddleOCR-VL (92.86%), the gap has narrowed to a small margin, indicating performance approaching industry-leading levels. Particularly notable is efficiency: under the same visual token budget (1120), DeepSeek-OCR 2 records a document-parsing edit distance of 0.100, outperforming Gemini 3 Pro at 0.115 (lower is better). This demonstrates an excellent performance–efficiency balance: high compression without sacrificing quality.

The implications for real-world deployment are straightforward: lower cost and stronger document parsing. From an efficiency standpoint, the model processes complex pages using only 256 to 1120 visual tokens. This high information compression can significantly reduce compute load and latency when downstream LLMs handle PDFs, scanned documents, financial statements, research reports, and contracts. The model is open-sourced under the Apache-2.0 license and comes with 3B parameters—an accessible scale and permissive licensing that make it easier to integrate into enterprise workflows. Potential use cases include PDF-to-Markdown conversion, structured extraction of tables and formulas, and RAG knowledge-base construction. Production feedback also appears encouraging: in real-world online log images and batch PDF processing tasks, the text "duplication rate" improves meaningfully (e.g., from 6.25% to 4.17%, and from 3.69% to 2.88%), suggesting improved stability and reliability in practical settings.

Looking further ahead, DeepSeek-OCR 2 can be viewed as an architectural exploration: it pushes "reading order and structural understanding" upstream into the visual encoder. By using causal attention to reorder the visual information flow logically, it enables the backend language model to reason over sequences that better match human reading habits. This innovation not only offers a new design path for vision-language models (VLMs) but also positions the model as a practical tool for generating high-quality, highly structured training data—potentially benefiting broader LLM pretraining and optimization. Moreover, the team clearly defines current limitations and outlines iterative directions—for example, improving performance on text-dense newspaper-like documents via local cropping strategies and targeted data augmentation. This "root-cause identifiable, optimization path clear" iteration methodology supports sustained productization and lays a solid foundation for long-term application and commercialization.

Risks: 1) Intensifying competition; 2) Supply chain risks; 3) Risk that compute costs and monetization fall short of expectations

附录 APPENDIX

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