



# Docling Technical Report

Version 1.0

Christoph Auer Maksym Lysak Ahmed Nassar Michele Dolfi Nikolaos Livathinos  
 Panos Vagenas Cesar Berrospi Ramis Matteo Omenetti Fabian Lindlbauer  
 Kasper Dinkla Lokesh Mishra Yusik Kim Shubham Gupta Rafael Teixeira de Lima  
 Valery Weber Lucas Morin Ingmar Meijer Viktor Kuropiatnyk Peter W. J. Staar

AI4K Group, IBM Research  
 Rüschlikon, Switzerland

## Abstract

This technical report introduces *Docling*, an easy to use, self-contained, MIT-licensed open-source package for PDF document conversion. It is powered by state-of-the-art specialized AI models for layout analysis (DocLayNet) and table structure recognition (TableFormer), and runs efficiently on commodity hardware in a small resource budget. The code interface allows for easy extensibility and addition of new features and models.

## 1 Introduction

Converting PDF documents back into a machine-processable format has been a major challenge for decades due to their huge variability in formats, weak standardization and printing-optimized characteristic, which discards most structural features and metadata. With the advent of LLMs and popular application patterns such as retrieval-augmented generation (RAG), leveraging the rich content embedded in PDFs has become ever more relevant. In the past decade, several powerful document understanding solutions have emerged on the market, most of which are commercial software, cloud offerings [3] and most recently, multi-modal vision-language models. As of today, only a handful of open-source tools cover PDF conversion, leaving a significant feature and quality gap to proprietary solutions.

With-1 *ling*, we open-source a very capable and efficient document conversion tool which builds on the powerful, specialized AI models and datasets for layout analysis and table structure recognition we developed and presented in the recent past [12, 13, 9]. Docling is designed as a simple, self-contained python library with permissive license, running entirely locally on commodity hardware. Its code architecture allows for easy extensibility and addition of new features and models.

Here-repository

delivers today:

- Converts PDF documents to JSON or Markdown format, stable and lightning fast
- Understands detailed page layout, reading order, locates figures and recovers table structures
- Extracts metadata from the document, such as title, authors, references and language
- Optionally applies OCR, e.g. for scanned PDFs
- Can be configured to be optimal for batch-mode (i.e high throughput, low time-to-solution) or interactive mode (compromise on efficiency, low time-to-solution)
- Can leverage different accelerators (GPU, MPS, etc).

## 2 Getting Started

To use Docling, you can simply install the [docling](#) package from PyPI. Documentation and examples are available in our [GitHub](#) repository at [github.com/DS4SD/docling](https://github.com/DS4SD/docling). All required model assets<sup>1</sup> are downloaded to a local huggingface datasets cache on first use, unless you choose to pre-install the model assets in advance.

Docling provides an easy code interface to convert PDF documents from file system, URLs or binary streams, and retrieve the output in either JSON or Markdown format. For convenience, separate methods are offered to convert single documents or batches of documents. A basic usage example is illustrated below. Further examples are available in the Docling code repository.

```
from Markdown document_converter import DocumentConverter

source = "https://arxiv.org/pdf/2206.01062" # PDF path or URL
converter = DocumentConverter()
result = converter.convert_single(source)
print(result.render_as_markdown()) # output: "## DocLayNet: A Large
                                  Human-Annotated Dataset for Document-Layout Analysis [...]"
```

Optionally, you can configure custom pipeline features and runtime options, such as turning on or off features (e.g. OCR, table structure recognition), enforcing limits on the input document size, and defining the budget of CPU threads. Advanced usage examples and options are documented in the README file. Docling also provides a *Dockerfile* to demonstrate how to install and run it inside a container.

## 3 Processing pipeline

Docling implements a linear pipeline of operations, which execute sequentially on each given document (see Fig. 1). Each document is first parsed by a PDF backend, which retrieves the programmatic text tokens, consisting of string content and its coordinates on the page, and also renders a bitmap image of each page to support downstream operations. Then, the standard model pipeline applies a sequence of AI models independently on every page in the document to extract features and content, such as layout and table structures. Finally, the results from all pages are aggregated and passed through a post-processing stage, which augments metadata, detects the document language, infers reading-order and eventually assembles a typed document object which can be serialized to JSON or Markdown.

### 3.1-2 F backends

Two basic requirements to process PDF documents in our pipeline are a) to retrieve all text content and their geometric coordinates on each page and b) to render the visual representation of each page as it would appear in a PDF viewer. Both these requirements are encapsulated in Docling's PDF backend interface. While there are several open-source PDF parsing libraries available for python, we faced major obstacles with all of them for different reasons, among which were restrictive

<sup>1</sup> see [huggingface.co/ds4sd/docling-models/](https://huggingface.co/ds4sd/docling-models/)

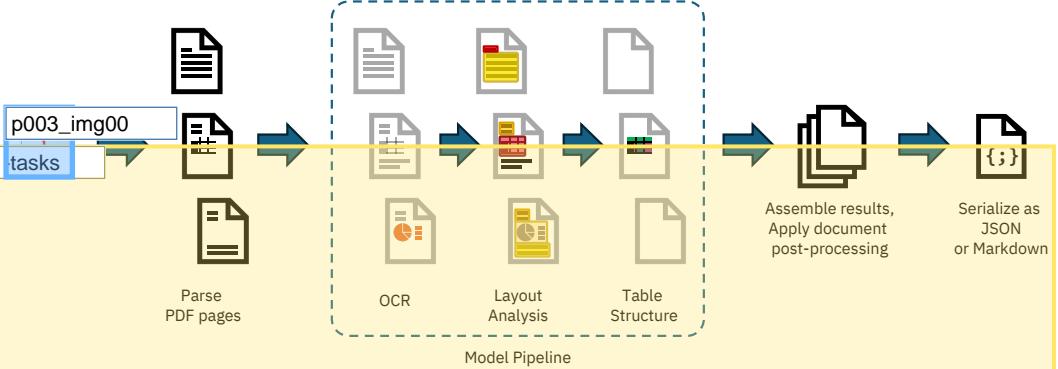


Figure 1: Sketch of Docling’s default processing pipeline. The inner part of the model pipeline is easily customizable and extensible.

licensing (e.g. `pymupdf` [7]), poor speed or unrecoverable quality issues, such as merged text cells across far-apart text tokens or table columns (`pypdfium`, PyPDF) [15, 14].

We therefore decided to provide multiple backend choices, and additionally open-source a custom-built PDF parser, which is based on the low-level `qpdf`[4] library. It is made available in a separate package named `docling-parse` and powers the default PDF backend in Docling. As an alternative, we provide a PDF backend relying on `pypdfium`, which may be a safe backup choice in certain cases, e.g. if issues are seen with particular font encodings.

### 3.2 AI models

As part of Docling, we initially release two highly capable AI models to the open-source community, which have been developed and published recently by our team. The first model is a layout analysis model, an accurate object-detector for page elements [13]. The second model is TableFormer [12, 9], a state-of-the-art table structure recognition model. We provide the pre-trained weights (hosted on [huggingface](#)) and a separate package for the inference code as `docling-ibm-models`. Both models are also powering the open-access `deepsearch-experience`, our cloud-native service for knowledge exploration tasks.

#### Layout-2ysis Model

Our layout analysis model is an object-detector which predicts the bounding-boxes and classes of various elements on the image of a given page. Its architecture is derived from RT-DETR [16] and re-trained on DocLayNet [13], our popular human-annotated dataset for document-layout analysis, among other proprietary datasets. For inference, our implementation relies on the `onnxruntime` [5].

The Docling pipeline feeds page images at 72 dpi resolution, which can be processed on a single CPU with sub-second latency. All predicted bounding-box proposals for document elements are post-processed to remove overlapping proposals based on confidence and size, and then intersected with the text tokens in the PDF to group them into meaningful and complete units such as paragraphs, section titles, list items, captions, figures or tables.

#### Table Structure Recognition

The TableFormer model [12], first published in 2022 and since refined with a custom structure token language [9], is a vision-transformer model for table structure recovery. It can predict the logical row and column structure of a given table based on an input image, and determine which table cells belong to column headers, row headers or the table body. Compared to earlier approaches, TableFormer handles many characteristics of tables, such as partial or no borderlines, empty cells, rows or columns, cell spans and hierarchy both on column-heading or row-heading level, tables with inconsistent indentation or alignment and other complexities. For inference, our implementation relies on `PyTorch` [2].

**The-improvements** Is all table objects detected in the layout analysis to the TableFormer model, by providing an image-crop of the table and the included text cells. TableFormer structure predictions are matched back to the PDF cells in post-processing to avoid expensive re-transcription text in the table image. Typical tables require between 2 and 6 seconds to be processed on a standard CPU, strongly depending on the amount of included table cells.

## OCR

Docling provides optional support for OCR, for example to cover scanned PDFs or content in bitmaps images embedded on a page. In our initial release, we rely on *EasyOCR* [1], a popular third-party OCR library with support for many languages. Docling, by default, feeds a high-resolution page image (216 dpi) to the OCR engine, to allow capturing small print detail in decent quality. While EasyOCR delivers reasonable transcription quality, we observe that it runs fairly slow on CPU (upwards of 30 seconds per page).

We are actively seeking collaboration from the open-source community to extend Docling with additional OCR backends and speed improvements.

### 3.3-improvements

In the final pipeline stage, Docling assembles all prediction results produced on each page into a well-defined datatype that encapsulates a converted document, as defined in the auxiliary package *docling-core*. The generated document object is passed through a post-processing model which leverages several algorithms to augment features, such as detection of the document language, correcting the reading order, matching figures with captions and labelling metadata such as title, authors and references. The final output can then be serialized to JSON or transformed into a Markdown representation at the users request.

### 3.4 Extensibility

Docling provides a straight-forward interface to extend its capabilities, namely the model pipeline. A model pipeline constitutes the central part in the processing, following initial document parsing and preceding output assembly, and can be fully customized by sub-classing from an abstract base-class (*BaseModelPipeline*) or cloning the default model pipeline. This effectively allows to fully customize the chain of models, add or replace models, and introduce additional pipeline configuration parameters. To use a custom model pipeline, the custom pipeline class to instantiate can be provided as an argument to the main document conversion methods. We invite everyone in the community to propose additional or alternative models and improvements.

**Implementati-1** model classes must satisfy the python `Callable` interface. The `__call__` method must accept an iterator over page objects, and produce another iterator over the page objects which were augmented with the additional features predicted by the model, by extending the provided `PagePredictions` data model accordingly.

## 4 Performance

In this section, we establish some reference numbers for the processing speed of Docling and the resource budget it requires. All tests in this section are run with default options on our standard test set distributed with Docling, which consists of three papers from arXiv and two IBM Redbooks, with a total of 225 pages. Measurements were taken using both available PDF backends on two different hardware systems: one MacBook Pro M3 Max, and one bare-metal server running Ubuntu 20.04 LTS on an Intel Xeon E5-2690 CPU. For reproducibility, we fixed the thread budget (through setting *OMP\_NUM\_THREADS* environment variable) once to 4 (Docling default) and once to 16 (equal to full core count on the test hardware). All results are shown in Table 1.

**If-4** need to run Docling in very low-resource environments, please consider configuring the `pypdfium` backend. While it is faster and more memory efficient than the default `docling-parse` backend, it will come at the expense of worse quality results, especially in table structure recovery.

Establishing GPU acceleration support for the AI models is currently work-in-progress and largely untested, but may work implicitly when CUDA is available and discovered by the onnxruntime and

`torch-datasets` g the Docling pipeline. We will deliver updates on this topic at in a future version of this report.

Table 1: Runtime characteristics of Docling with the standard model pipeline and settings, on our test dataset of 225 pages, on two different systems. OCR is disabled. We show the time-to-solution (TTS), computed throughput in pages per second, and the peak memory used (resident set size) for both the Docling-native PDF backend and for the pypdfium backend, using 4 and 16 threads.

CPU	Thread budget	native backend			pypdfium backend		
		TTS	Pages/s	Mem	TTS	Pages/s	Mem
Apple M3 Max (16 cores)	4	177 s	1.27	6.20 GB	103 s	2.18	2.56 GB
	16	167 s	1.34		92 s	2.45	
Intel(R) Xeon E5-2690 (16 cores)	4	375 s	0.60	6.16 GB	239 s	0.94	2.42 GB
	16	244 s	0.92		143 s	1.57	

## 5 Applications

Thanks to the high-quality, richly structured document conversion achieved by Docling, its output qualifies for numerous downstream applications. For example, Docling can provide a base for detailed enterprise document search, passage retrieval or classification use-cases, or support knowledge extraction pipelines, allowing specific treatment of different structures in the document, such as tables, figures, section structure or references. For popular generative AI application patterns, such as retrieval-augmented generation (RAG), we provide *quackling*, an open-source package which capitalizes on Docling’s feature-rich document output to enable document-native optimized vector embedding and chunking. It plugs in seamlessly with LLM frameworks such as LlamaIndex [8]. Since Docling is fast, stable and cheap to run, it also makes for an excellent choice to build document-derived datasets. With its powerful table structure recognition, it provides significant benefit to automated knowledge-base construction [11, 10]. Docling is also integrated within the open IBM data prep kit [6], which implements scalable data transforms to build large-scale multi-modal training datasets.

### 6-1.7.0 Work and contributions

Docling is designed to allow easy extension of the model library and pipelines. In the future, we plan to extend Docling with several more models, such as a figure-classifier model, an equation-recognition model, a code-recognition model and more. This will help improve the quality of conversion for specific types of content, as well as augment extracted document metadata with additional information. Further investment into testing and optimizing GPU acceleration as well as improving the Docling-native PDF backend are on our roadmap, too.

**We encourage everyone to propose or implement additional features and models, and will gladly take your inputs and contributions under review.** The codebase of Docling is open for use and contribution, under the MIT license agreement and in alignment with our contributing guidelines included in the Docling repository. If you use Docling in your projects, please consider citing this technical report.

## References

- [1] J. AI. Easyocr: Ready-to-use ocr with 80+ supported languages. <https://github.com/JaidedAI/EasyOCR>, 2024. Version: 1.7.0.

- 2-5 Ansel, E. Yang, H. He, N. Gimelshein, A. Jain, M. Voznesensky, B. Bao, P. Bell, D. Berard, E. Burovski, G. Chauhan, A. Chourdia, W. Constable, A. Desmaison, Z. DeVito, E. Ellison, W. Feng, J. Gong, M. Gschwind, B. Hirsh, S. Huang, K. Kalambarkar, L. Kirsch, M. Lazaros, M. Lezcano, Y. Liang, J. Liang, Y. Lu, C. Luk, B. Maher, Y. Pan, C. Puhrsich, M. Reso, M. Saroufim, M. Y. Siraichi, H. Suk, M. Suo, P. Tillet, E. Wang, X. Wang, W. Wen, S. Zhang, X. Zhao, K. Zhou, R. Zou, A. Mathews, G. Chanan, P. Wu, and S. Chintala. Pytorch 2: Faster

- machine-<https://github.com/pytorch/pytorch2-2> dynamic python bytecode transformation and graph compilation.  
In *Proceedings of the 29th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Volume 2 (ASPLOS '24)*. ACM, 4 2024. doi: 10.1145/3620665.3640366. URL <https://pytorch.org/assets/pytorch2-2.pdf>.
- [3] C. Auer, M. Dolfi, A. Carvalho, C. B. Ramis, and P. W. Staar. Delivering document conversion as a cloud service with high throughput and responsiveness. In *2022 IEEE 15th International Conference on Cloud Computing (CLOUD)*, pages 363–373. IEEE, 2022.
  - [4] J. Berkenbilt. Qpdf: A content-preserving pdf document transformer, 2024. URL <https://github.com/qpdf/qpdf>.
  - [5] O. R. developers. Onnx runtime. <https://onnxruntime.ai/>, 2024. Version: 1.18.1.
  - [6] IBM. Data Prep Kit: a community project to democratize and accelerate unstructured data preparation for LLM app developers, 2024. URL <https://github.com/IBM/data-prep-kit>.
  - [7] A. S. Inc. PyMuPDF, 2024. URL <https://github.com/pymupdf/PyMuPDF>.

- 8-[https://aclanthology.org/llama\\_index](https://aclanthology.org/llama_index) ex, 11 2022. URL [https://github.com/jerryjliu/llama\\_index](https://github.com/jerryjliu/llama_index).
- [9] M. Lysak, A. Nassar, N. Livathinos, C. Auer, and P. Staar. Optimized Table Tokenization for Table Structure Recognition. In *Document Analysis and Recognition - ICDAR 2023: 17th International Conference, San José, CA, USA, August 21–26, 2023, Proceedings, Part II*, pages 37–50, Berlin, Heidelberg, Aug. 2023. Springer-Verlag. ISBN 978-3-031-41678-1. doi: 10.1007/978-3-031-41679-8\_3. URL [https://doi.org/10.1007/978-3-031-41679-8\\_3](https://doi.org/10.1007/978-3-031-41679-8_3).
  - [10] L. Mishra, S. Dhibi, Y. Kim, C. Berrospi Ramis, S. Gupta, M. Dolfi, and P. Staar. Statements: Universal information extraction from tables with large language models for ESG KPIs. In D. Stammbach, J. Ni, T. Schimanski, K. Dutia, A. Singh, J. Bingler, C. Christiaen, N. Kushwaha, V. Muccione, S. A. Vaghefi, and M. Leippold, editors, *Proceedings of the 1st Workshop on Natural Language Processing Meets Climate Change (ClimateNLP 2024)*, pages 193–214, Bangkok, Thailand, Aug. 2024. Association for Computational Linguistics. URL <https://aclanthology.org/2024.climateNLP-1.15>.

- 11-2023 <https://doi.org/10.1038/s41467-024-50779-y> rin, V. Weber, G. I. Meijer, F. Yu, and P. W. J. Staar. Patcid: an open-access dataset of chemical structures in patent documents. *Nature Communications*, 15(1):6532, August 2024. ISSN 2041-1723. doi: 10.1038/s41467-024-50779-y. URL <https://doi.org/10.1038/s41467-024-50779-y>.
- [12] A. Nassar, N. Livathinos, M. Lysak, and P. Staar. Tableformer: Table structure understanding with transformers. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 4614–4623, 2022.
  - [13] B. Pfitzmann, C. Auer, M. Dolfi, A. S. Nassar, and P. Staar. Doclaynet: a large human-annotated dataset for document-layout segmentation. pages 3743–3751, 2022.
  - [14] pypdf Maintainers. pypdf: A Pure-Python PDF Library, 2024. URL <https://github.com/py-pdf/pypdf>.
  - [15] P. Team. PyPDFium2: Python bindings for PDFium, 2024. URL <https://github.com/pypdfium2-team/pypdfium2>.
  - [16] Y. Zhao, W. Lv, S. Xu, J. Wei, G. Wang, Q. Dang, Y. Liu, and J. Chen. Detrs beat yolos on real-time object detection, 2023.

## Appendix-Adjustment

In this section, we illustrate a few examples of Docling's output in Markdown and JSON.

**KDD-14-18**

**Permission-analysis**

**30-2012**

**007\_img01**

**CONCEPTS**

Computer vision - Object detection  
Document analysis - Machine learning

**Figure 1:** Four examples of complex page layouts across different document categories

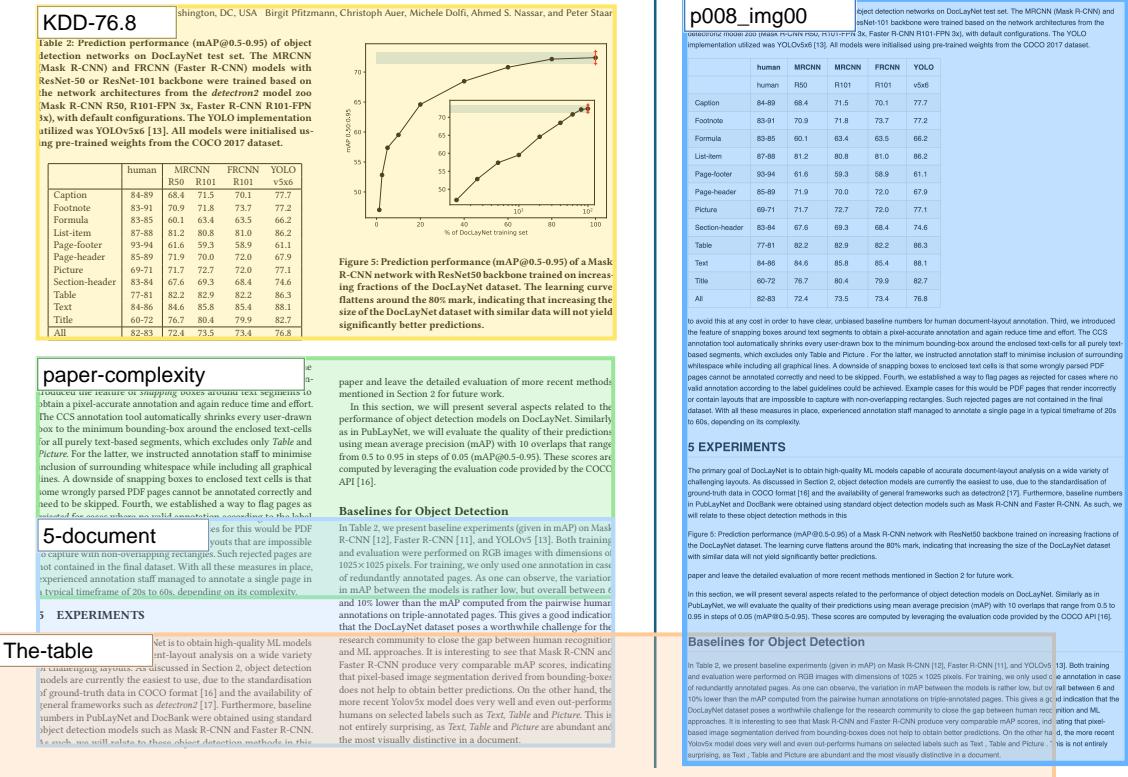
**KEYWORDS**

PDF document conversion, layout segmentation, object-detection, data set, Machine Learning

**ACM Reference Format:**

Birgit Pfitzmann, Christoph Auer, Michele Dolfi, Ahmed S. Nassar, and Peter Staar. 2022. DocLayoutNet: A Large Human-Annotated Dataset for Document Layout Analysis. In Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD '22), August 22–26, 2022, Washington, DC, USA. ACM, New York, NY, USA, 8 pages. <https://doi.org/10.1145/3534678.3539043>

Figure-shown page of the DocLayNet paper ([arxiv.org/pdf/2206.01062](https://arxiv.org/pdf/2206.01062.pdf)) - left PDF, right rendered Markdown. If recognized, metadata such as authors are appearing first under the title. Text content inside figures is currently dropped, the caption is retained and linked to the figure in the JSON representation (not shown).



**Figure 3: Page 6 of the DocLayNet paper. If recognized, metadata such as authors are appearing first under the title. Elements recognized as page headers or footers are suppressed in Markdown to deliver uninterrupted content in reading order. Tables are inserted in reading order. The paragraph in “5. Experiments” wrapping over the column end is broken up in two and interrupted by the table.**

A

class label	Count	% of Total			triple inter-annotator mAP @ 0.5-0.95 (%)						
		Train	Test	Val	All	Fin	Man	Sci	Law	Pat	Ten
Caption	22524	2.04	1.77	2.32	84-89	40-61	86-92	94-99	95-99	69-78	n/a
Footnote	6318	0.60	0.31	0.58	83-91	n/a	100	62-88	85-94	n/a	82-97
Formula	25027	2.25	1.90	2.96	83-85	n/a	n/a	84-87	86-96	n/a	n/a
List-item	185660	17.19	13.34	15.82	87-88	74-83	90-92	97-97	81-85	75-88	93-95
Page-footer	70878	6.51	5.58	6.00	93-94	88-90	95-96	100	92-97	100	96-98
Page-header	58022	5.10	6.70	5.06	85-89	66-76	90-94	98-100	91-92	97-99	81-86
Picture	45976	4.21	2.78	5.31	69-71	56-59	82-86	69-82	80-95	66-71	59-76
Section-header	142884	12.60	15.77	12.85	83-84	76-81	90-92	94-95	87-94	69-73	78-86
Table	34733	3.20	2.27	3.60	77-81	75-80	83-86	98-99	58-80	79-84	70-85
Text	510377	45.82	49.28	45.00	84-86	81-86	88-93	89-93	87-92	71-79	87-95
Title	5071	0.47	0.30	0.50	60-72	24-63	50-63	94-100	82-96	68-79	24-56
Total	1107470	941123	99816	66531	82-83	71-74	79-81	89-94	86-91	71-76	68-85

B

class label	Count	% of Total			% of Total			triple inter-annotator mAP @ 0.5-0.95 (%)			triple inter-annotator mAP @ 0.5-0.95 (%)			triple inter-annotator mAP @ 0.5-0.95 (%)			triple inter-annotator mAP @ 0.5-0.95 (%)						
		Train	Test	Val	All	Fin	Man	Sci	Law	Pat	Ten	All	Fin	Man	Sci	Law	Pat	Ten	All	Fin	Man		
Caption	22524	2.04	1.77	2.32	84-89	40-61	86-92	94-99	95-99	69-78	n/a	84-89	40-61	86-92	94-99	95-99	69-78	n/a	84-89	40-61	86-92		
Footnote	6318	0.60	0.31	0.58	83-91	n/a	100	62-88	85-94	n/a	82-97	100	62-88	85-94	n/a	82-97	n/a	100	62-88	85-94	n/a		
Formula	25027	2.25	1.90	2.96	83-85	n/a	n/a	84-87	86-96	n/a	n/a	n/a	84-87	86-96	n/a	n/a	n/a	84-87	86-96	n/a	n/a		
List-item	185660	17.19	13.34	15.82	87-88	74-83	90-92	97-97	81-85	75-88	93-95	74-83	90-92	97-97	81-85	75-88	93-95	74-83	90-92	97-97	81-85	75-88	
Page-footer	70878	6.51	5.58	6.00	93-94	88-90	95-96	100	92-97	100	96-98	88-90	95-96	100	92-97	100	96-98	88-90	95-96	100	92-97	100	
Page-header	58022	5.10	6.70	5.06	85-89	66-76	90-94	98-100	91-92	97-99	81-86	86-76	90-94	98-100	91-92	97-99	81-86	86-76	90-94	98-100	91-92	97-99	
Picture	45976	4.21	2.78	5.31	69-71	56-59	82-86	69-82	80-95	66-71	59-76	77-81	75-80	83-86	98-99	58-80	79-84	70-85	77-81	75-80	83-86	98-99	58-80
Section-header	142884	12.60	15.77	12.85	83-84	76-81	90-92	94-95	87-94	69-73	78-86	76-81	83-84	76-81	90-92	94-95	87-94	69-73	78-86	76-81	83-84	76-81	
Table	34733	3.20	2.27	3.60	77-81	75-80	83-86	98-99	58-80	79-84	70-85	81-86	89-93	89-93	87-92	71-79	87-95	71-79	87-92	71-79	87-95	71-79	
Text	510377	45.82	49.28	45.00	84-86	81-86	88-93	89-93	87-92	71-79	87-95	81-86	89-93	89-93	87-92	71-79	87-95	71-79	87-92	71-79	87-95	71-79	
Title	5071	0.47	0.30	0.50	60-72	24-63	50-63	94-100	82-96	68-79	24-56	71-74	79-81	89-94	86-91	71-76	68-85	71-74	79-81	89-94	86-91	71-76	
Total	1107470	941123	99816	66531	82-83	71-74	79-81	89-94	86-91	71-76	68-85	82-83	71-74	79-81	89-94	86-91	71-76	68-85	82-83	71-74	79-81	89-94	

p009_img01		p009_img02	
4	"#-c ls": 12,	4	"#-c ls": 12,
5	"#-r ws": 14,	5	"#-r ws": 14,
6	"dat": [	6	"dat": [
7		7	
8	"bbox": [	8	"bbox": [
9	329.0 998779296875,	9	329.0 998779296875,
10	643.4 185546875,	10	643.4 185546875,
11	483.3 764404296875,	11	483.3 764404296875,
12	651.7 64892578125	12	651.7 64892578125
13	],	13	],
14	"spans": ...	14	"spans": ...
27	],	27	],
28	"text": "triple inter-annotator mAP @ 0.5-0.95 (%)",	28	"text": "triple inter-annotator mAP @ 0.5-0.95 (%)",
29	"col": 5,	29	"col": 5,
30	"col-span": [5,12],	30	"col-span": [5,12],
31	"row": 0,	31	"row": 0,
32	"row-span": [0,1]	32	"row-span": [0,1]
33	},	33	},
34	# ...	34	# ...
35	]	35	]

Figure-C shows Figure 1 from the DocLayNet paper in the original PDF (A), as rendered Markdown (B) and in JSON representation (C). Spanning table cells, such as the multi-column header "triple inter-annotator mAP@0.5-0.95 (%)", is repeated for each column in the Markdown representation (B), which guarantees that every data point can be traced back to row and column headings only by its grid coordinates in the table. In the JSON representation, the span information is reflected in the fields of each table cell (C).