Collaborative PDF

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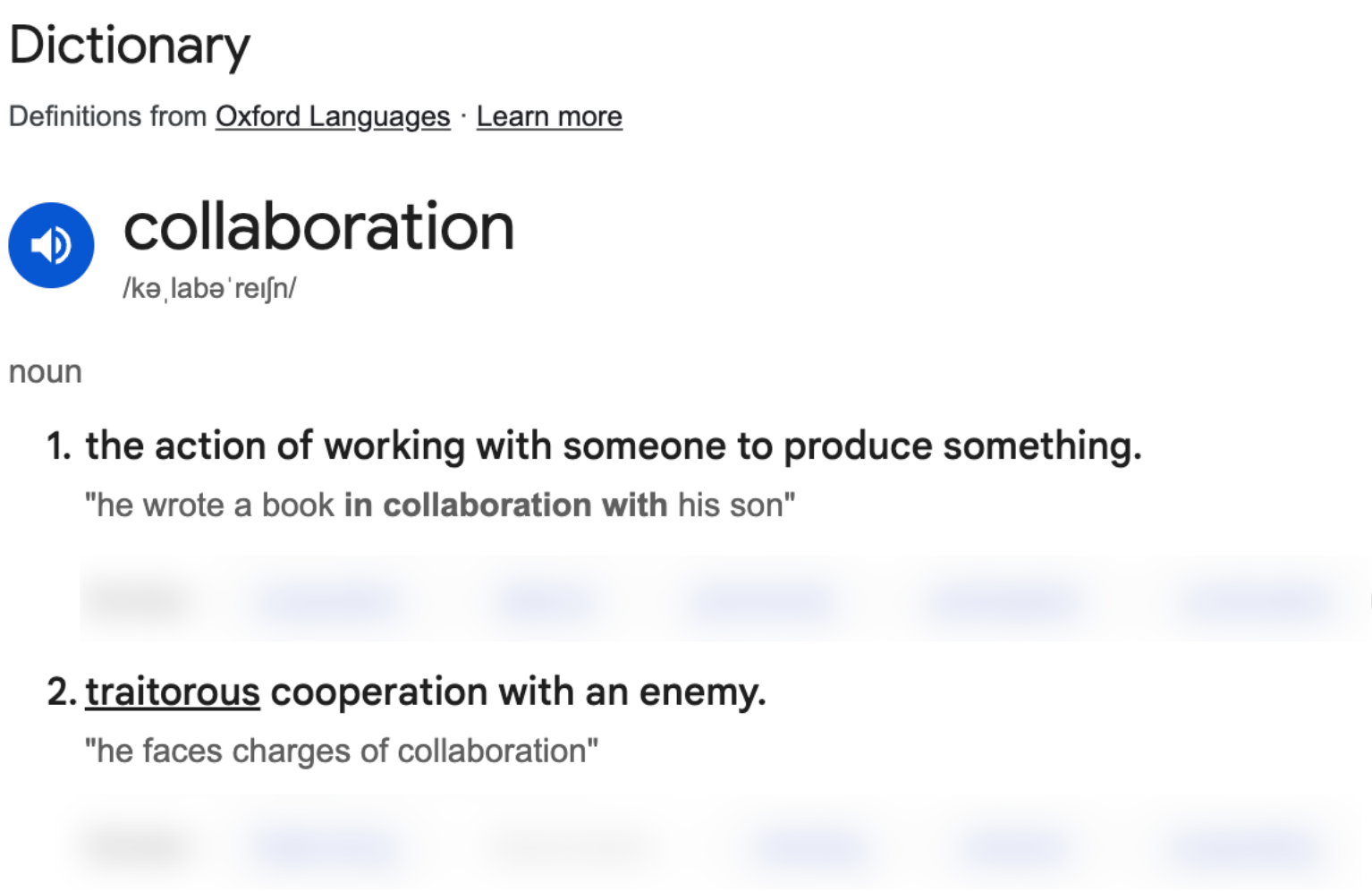
Collaboration



Dictionary

Definitions from Oxford Languages · Learn more

collaboration

/kəˌlabəˈreɪʃn/

noun

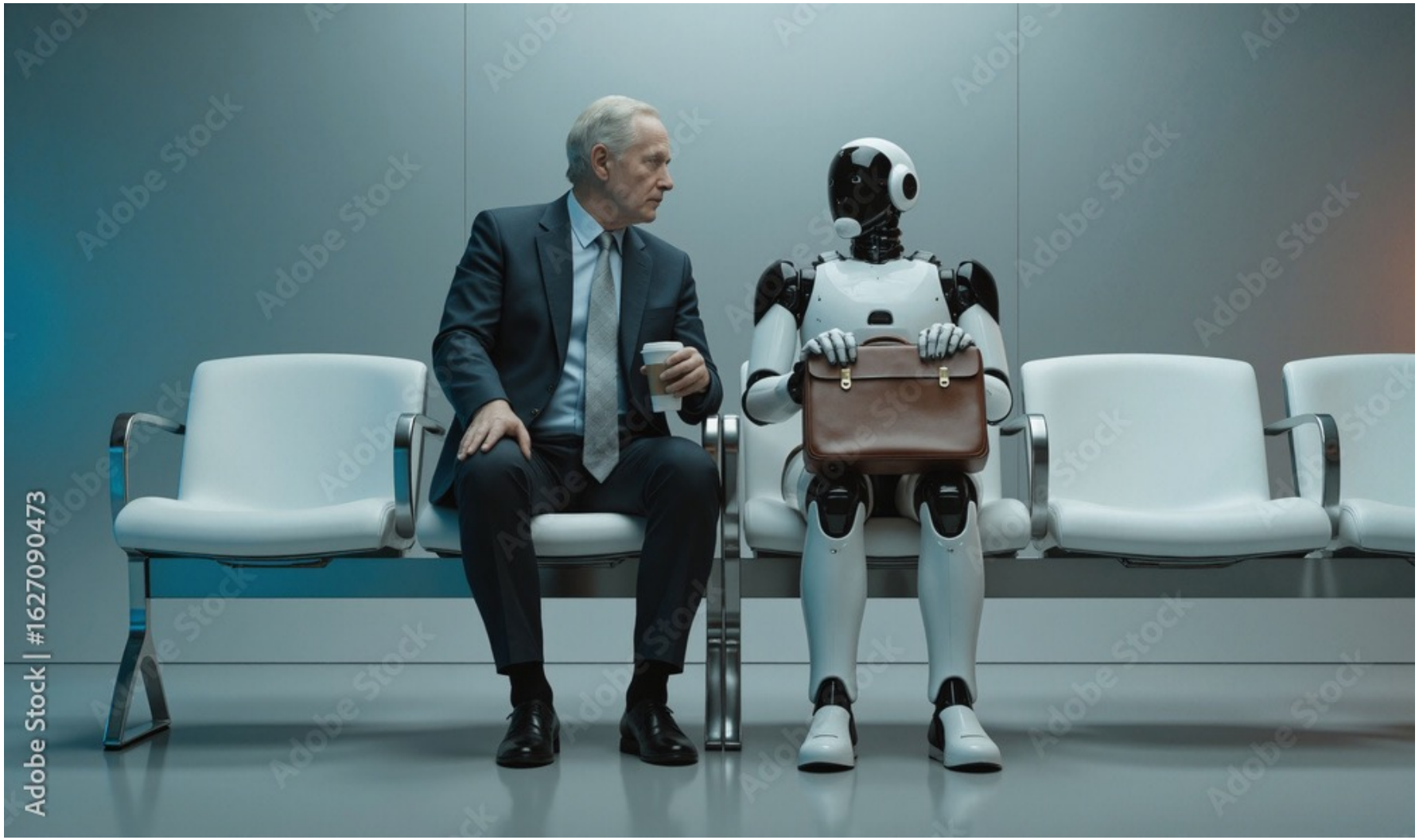
1. **the action of working with someone to produce something.**

   "he wrote a book **in collaboration with** his son"

2. **traitorous cooperation with an enemy.**

   "he faces charges of collaboration"

Who (or what) are we looking to collaborate with?



What sorts of Collaboration are we looking for?

- Viewing
- Comprehension
- Commenting & Annotating
- Editing
- Manipulation/Transformation

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What sorts of Collaboration are we looking for?

- Viewing
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Comprehension

Structural Semantics

- The current PDF tagging functionality
  - aka the “Structure Tree”
  - How a document’s content is constructed
- DParts – Document Parts
  - Relationships of Pages w/associated “attributes” (aka DPM, DPart Metadata)

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Derivation (to HTML & beyond)

- PDF Association's Derivation Algorithm
  - https://pdfa.org/resource/deriving-html-from-pdf/
  - Tagged PDF -> HTML

- LLMs love HTML (& understand general semantics such as headings, lists & tables)
- HTML can be easily converted (with loss) to Markdown, for those cases where the LLM prefer that.

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What about the PDF-centric ”goodness”?

- XMP Metadata (not just PDF, but still)
- Annotations (incl. hyperlinks)
- Form Fields (incl. Signatures)
- Associated/Embedded Files

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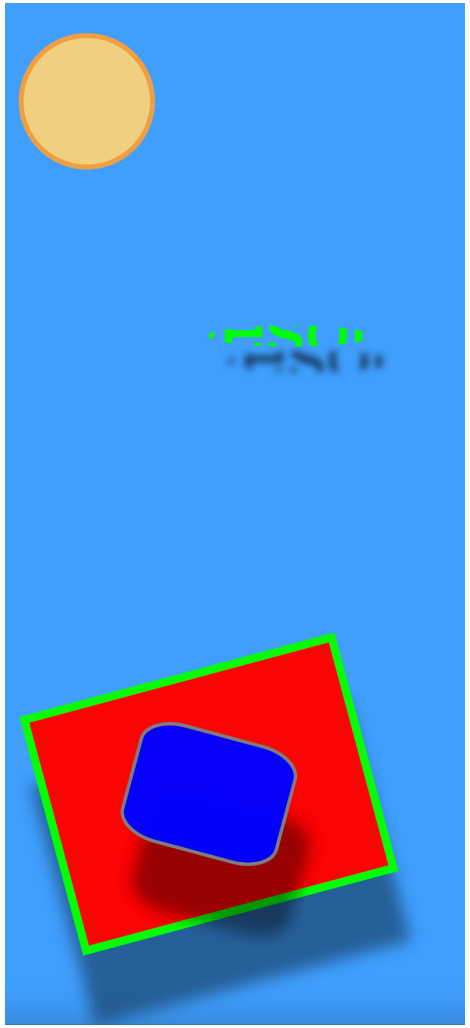
Missing: Content Semantics

- Explicitly identify objects
  - Regular polygons with rounded corners
  - Text on a curve
- Explicitly identify object components
  - Shadow cast on an object
  - Effects (e.g., glow, blur)
- Explicitly identify grouping objects
  - Axis components on a graph inside a Figure structural element



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How to express all this to AI?

- Find a “markup language” it may have already trained on
  - SVG works for many things (e.g., object grouping, effects, etc.), but not others (e.g., reflowable text)
  - But LOTS of stuff there isn’t a single option out there
- Try a “data driven approach”
  - Create a JSON grammar that can describe content + attributes
  - Convince an existing LLM to use it
- Train your own model
- Throw up your hands and run screaming

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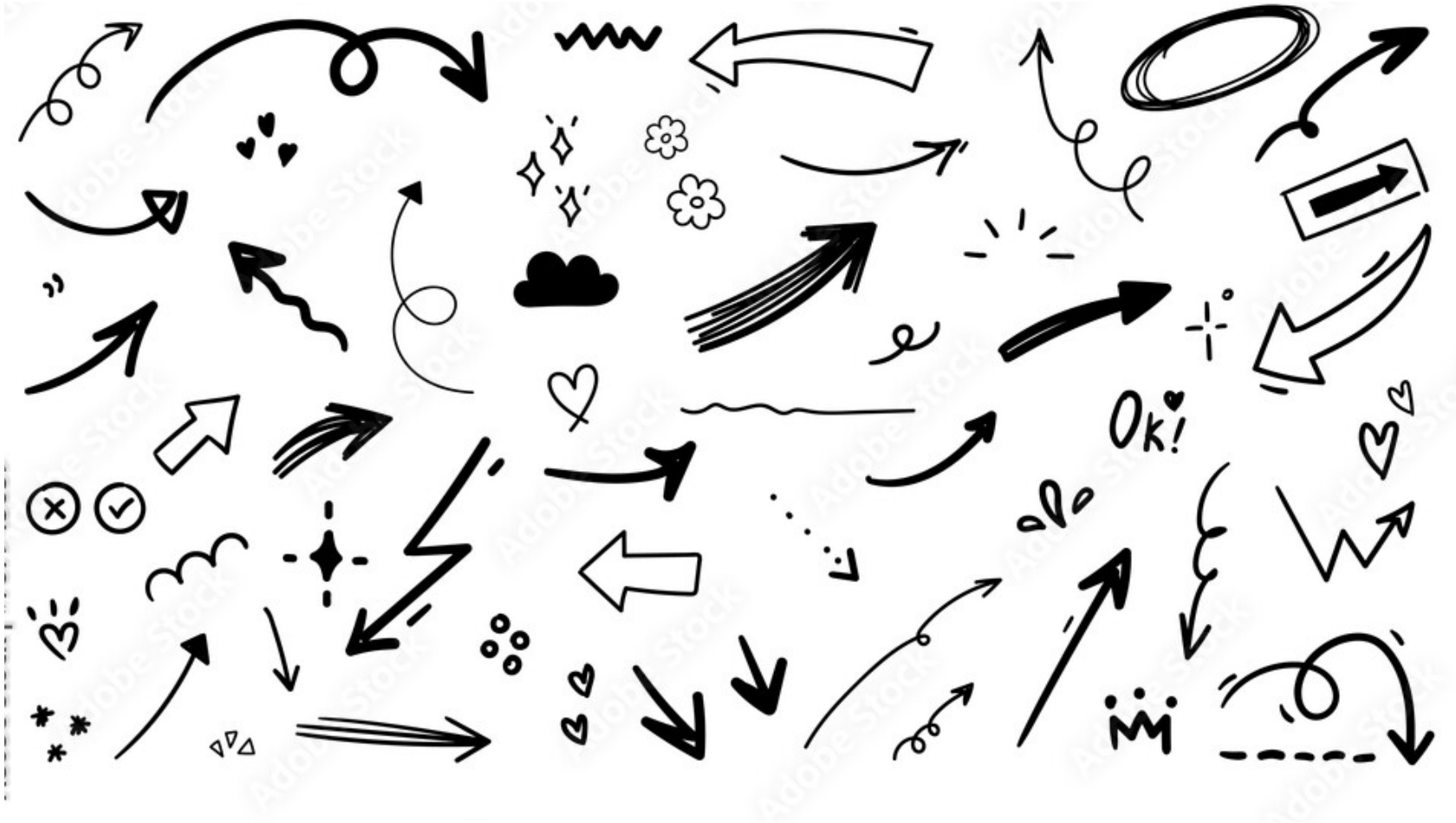
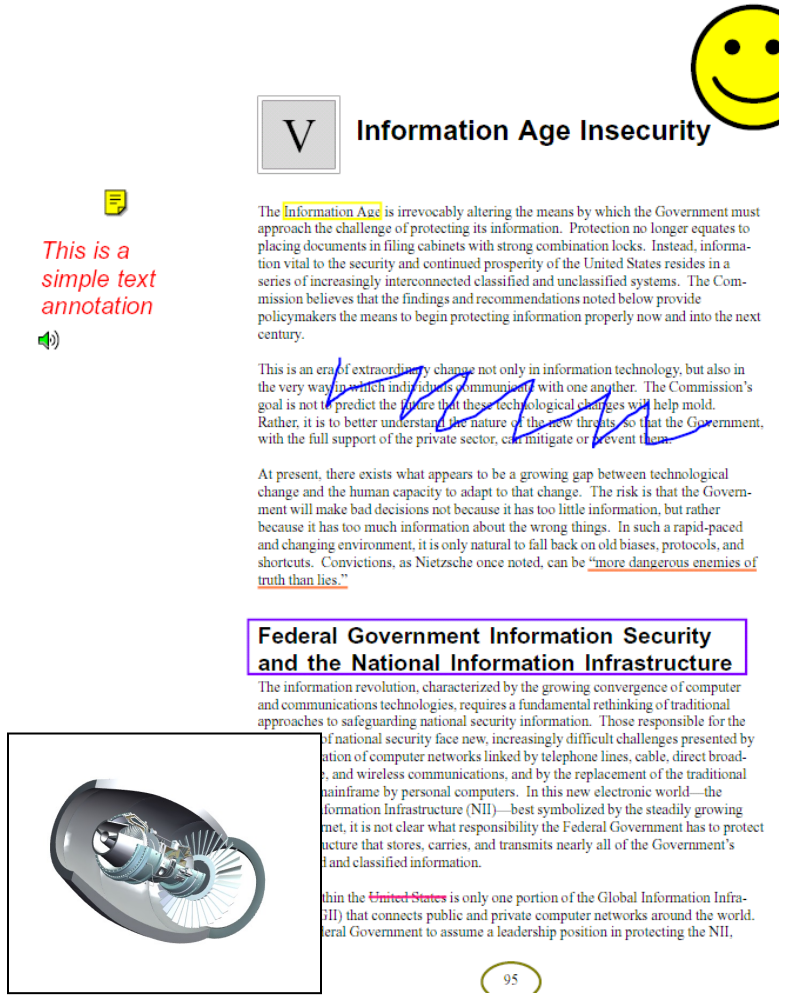
Commenting & Annotating



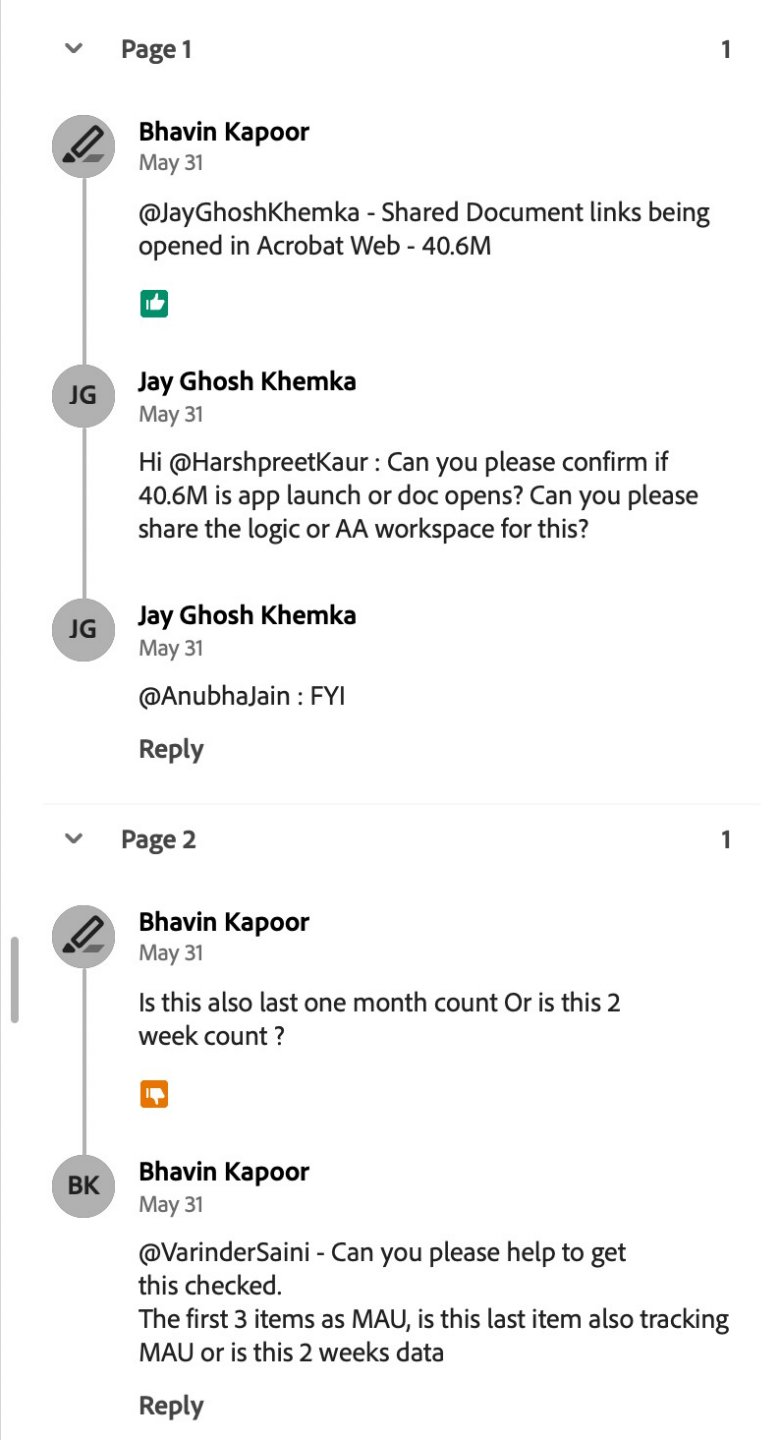
Annotations

- Text Notes
- “Mark Up”
  - Underline, strikeout, highlight
  - Circle, Rect, Pen/Scribble
  - Callout, Dimensioning
- Hypertext Links
  - Inter-document, intra-document
  - URI’s (web links)
- Stamps
- Rich Media (incl. 3D)



Markup Annotation “Extras” (1.5+)

- IRT – “In Response To”
  - Supports hierarchical relationships incl. grouping for annotations
  - Used for threaded replies
- State
  - Reviewed (i.e., approved, completed, rejected, etc.)
  - Marked

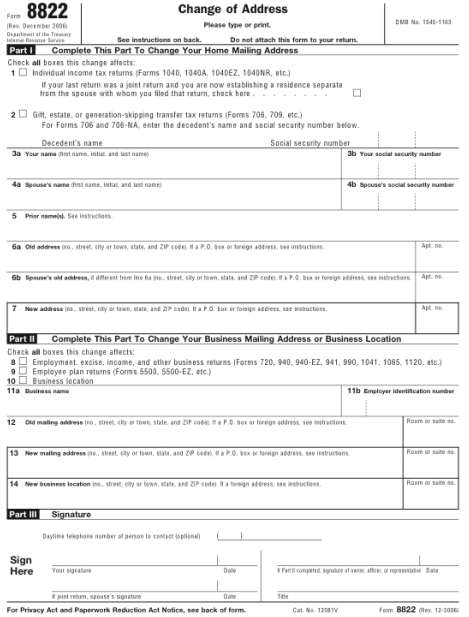


What’s Missing?

- Document level annotations
- Page level annotations
- Reactions/”Liking”/Acknowledging
  - Emojis (which may requires newer Unicode versions!)
- Multi vs. single threading

AcroForms

- A PDF file contains a single AcroForm, though that form may contain any number of fields located on any number of pages.
- There a number of predefined field types
  - Button (checkbox/radio/push)
  - Text
  - Choice (popup, combo or list)
  - Digital Signatures
- Fields can be typed (integer, string, boolean) and marked read-only
- Fields can be “calculated”



Form **8822** (Rev. December 2006) Department of the Treasury Internal Revenue Service

Change of Address

Please type or print.

See instructions on back. Do not attach this form to your return.

OMB No. 1545-1163

Part I Complete This Part To Change Your Home Mailing Address

Check **all** boxes this change affects:

1 ☐ Individual income tax returns (Forms 1040, 1040A, 1040EZ, 1040NR, etc.)
If your last return was a joint return and you are now establishing a residence separate from the spouse with whom you filed that return, check here . . . . . ☐

2 ☐ Gift, estate, or generation-skipping transfer tax returns (Forms 706, 709, etc.)
For Forms 706 and 706-NA, enter the decedent's name and social security number below.

Decedent's name — Social security number

3a **Your name** (first name, initial, and last name) — 3b **Your social security number**

4a **Spouse's name** (first name, initial, and last name) — 4b **Spouse's social security number**

5 **Prior name(s).** See instructions.

6a **Old address** (no., street, city or town, state, and ZIP code). If a P.O. box or foreign address, see instructions. — Apt. no.

6b **Spouse's old address,** if different from line 6a (no., street, city or town, state, and ZIP code). If a P.O. box or foreign address, see instructions. — Apt. no.

7 **New address** (no., street, city or town, state, and ZIP code). If a P.O. box or foreign address, see instructions. — Apt. no.

Part II Complete This Part To Change Your Business Mailing Address or Business Location

Check **all** boxes this change affects:

8 ☐ Employment, excise, income, and other business returns (Forms 720, 940, 940-EZ, 941, 990, 1041, 1065, 1120, etc.)
9 ☐ Employee plan returns (Forms 5500, 5500-EZ, etc.)
10 ☐ Business location

11a **Business name** — 11b **Employer identification number**

12 **Old mailing address** (no., street, city or town, state, and ZIP code). If a P.O. box or foreign address, see instructions. — Room or suite no.

13 **New mailing address** (no., street, city or town, state, and ZIP code). If a P.O. box or foreign address, see instructions. — Room or suite no.

14 **New business location** (no., street, city or town, state, and ZIP code). If a foreign address, see instructions. — Room or suite no.

Part III Signature

Daytime telephone number of person to contact (optional) ( )

Sign Here

Your signature — Date

If joint return, spouse's signature — Date

If Part II completed, signature of owner, officer, or representative — Date

Title

For Privacy Act and Paperwork Reduction Act Notice, see back of form. Cat. No. 12081V Form **8822** (Rev. 12-2006)

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How to express all this to AI?

- No common grammars/languages can express everything that our annotations support.
  - What info is most important – and does that change based on use case?

- Same for Forms – especially when you want to include business logic, formatting, etc.
  - The Forms.Next work of the PDF Association – a modern JSON grammar – could help here!

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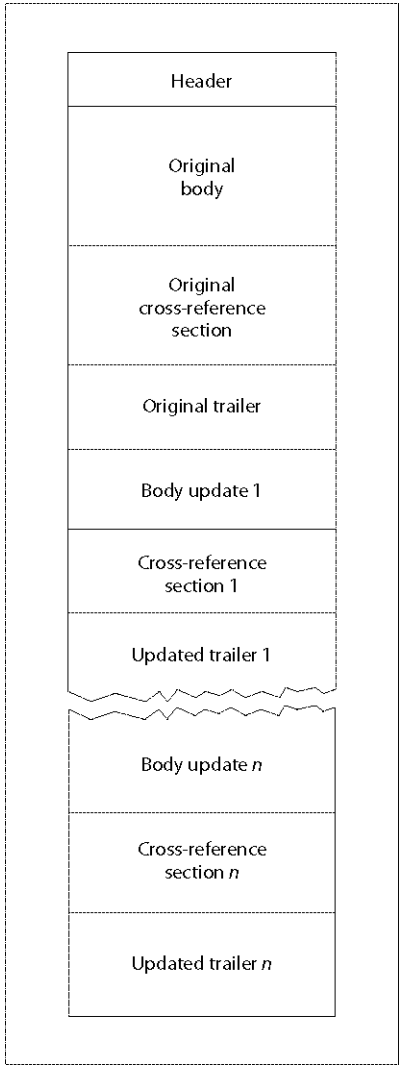
Editing

Incremental Update

- Modifications are written to the end of the file, leaving the original data intact
- A new xref table is written containing the new/modified data, and a link back to the old xref.
- Since original data is still present, support for multiple undos across save boundaries could be supported.



Incremental update assumes single user

- Heavy weight for simple changes
  - One character change on a page impacts many objects (at least a full content stream)
- Not (PII) safe across removal operations
  - Delete Page, Redact, etc.
- Single threaded – no forks or branches

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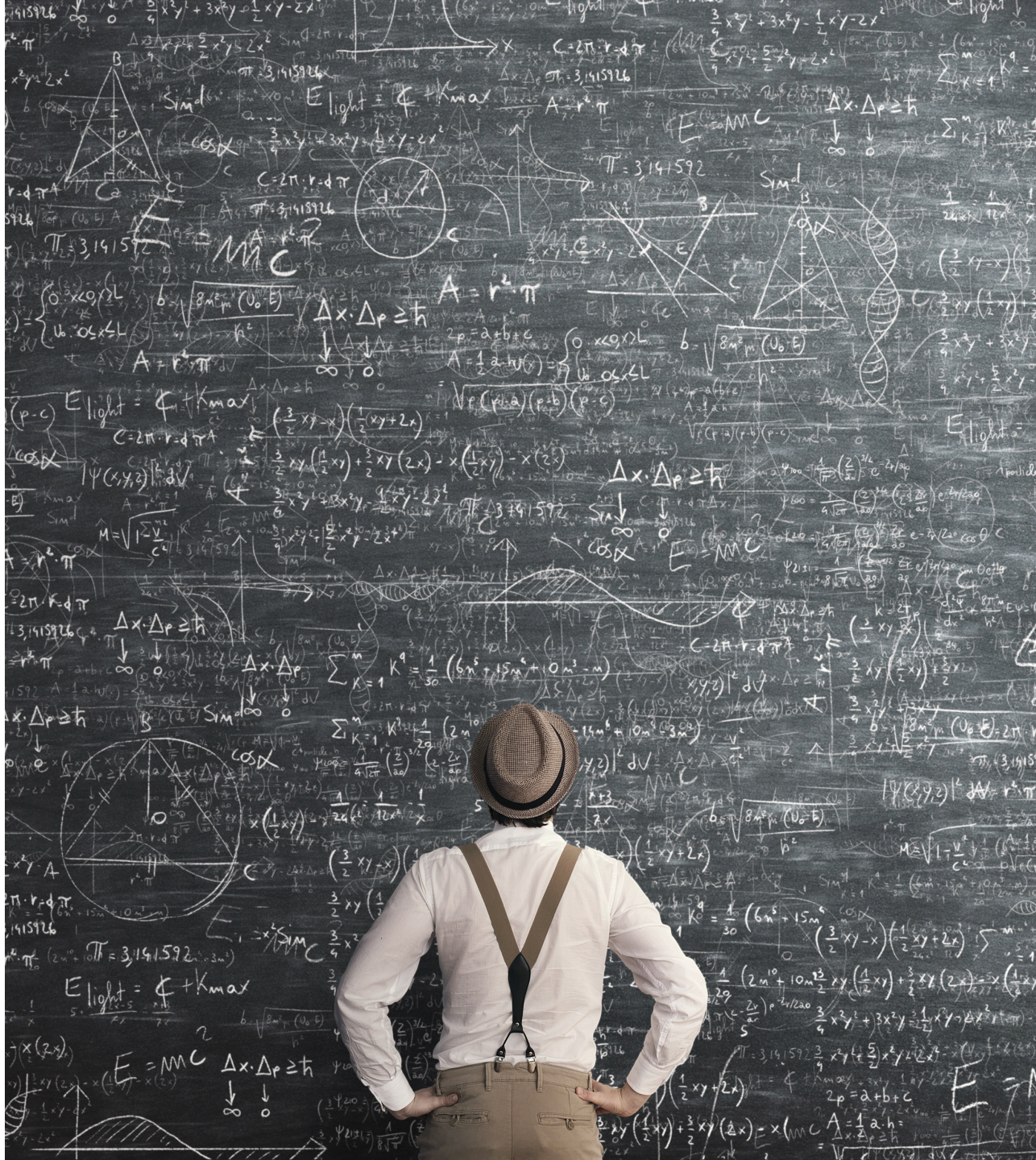
Annotations + Editing = ?!?!?

- Having things like links and markup separated from the content significantly complicates allowing it to be (a) extracted and (b) edited.



Content Provenance

ISO 22144: Content Credentials

- An open standard for storing and accessing cryptographically verifiable and tamper-evident information whose trustworthiness can be assessed based on a defined trust model.

content credentials

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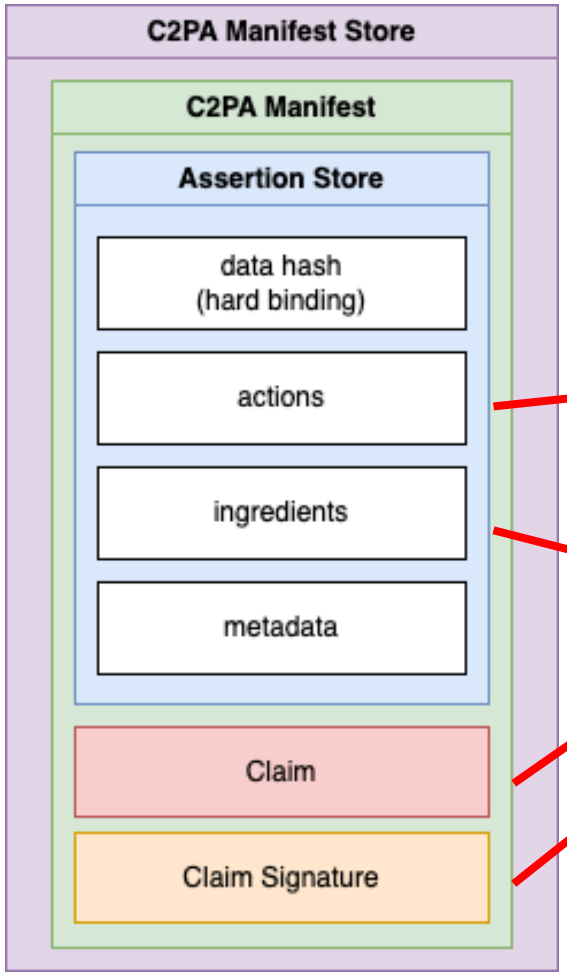
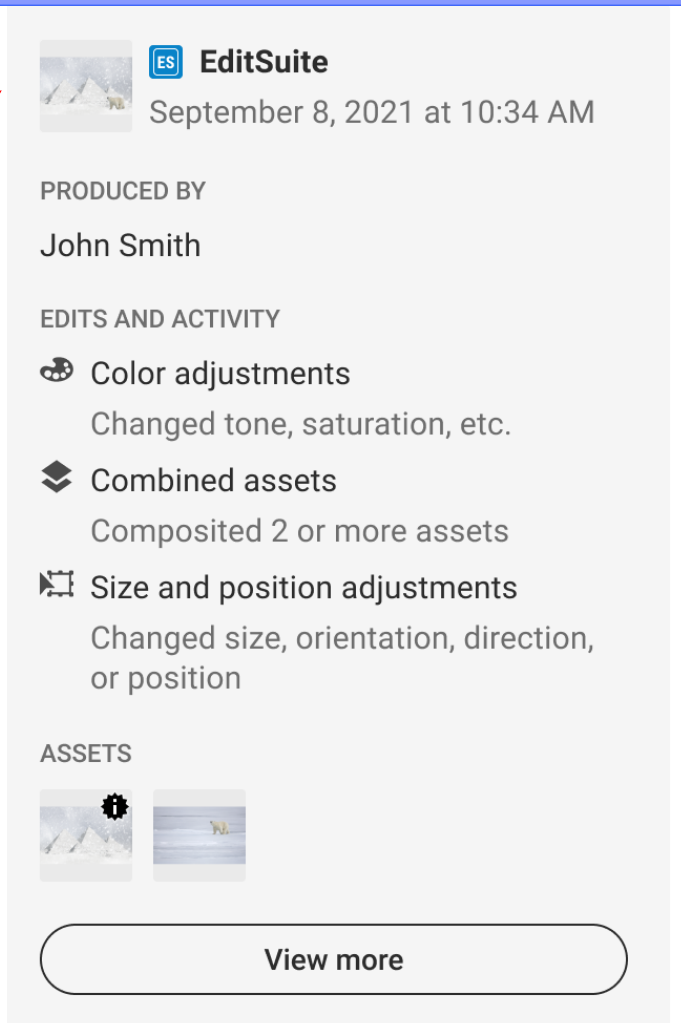
A look inside of Content Credentials

Content Credentials



https://contentcredentials.org/



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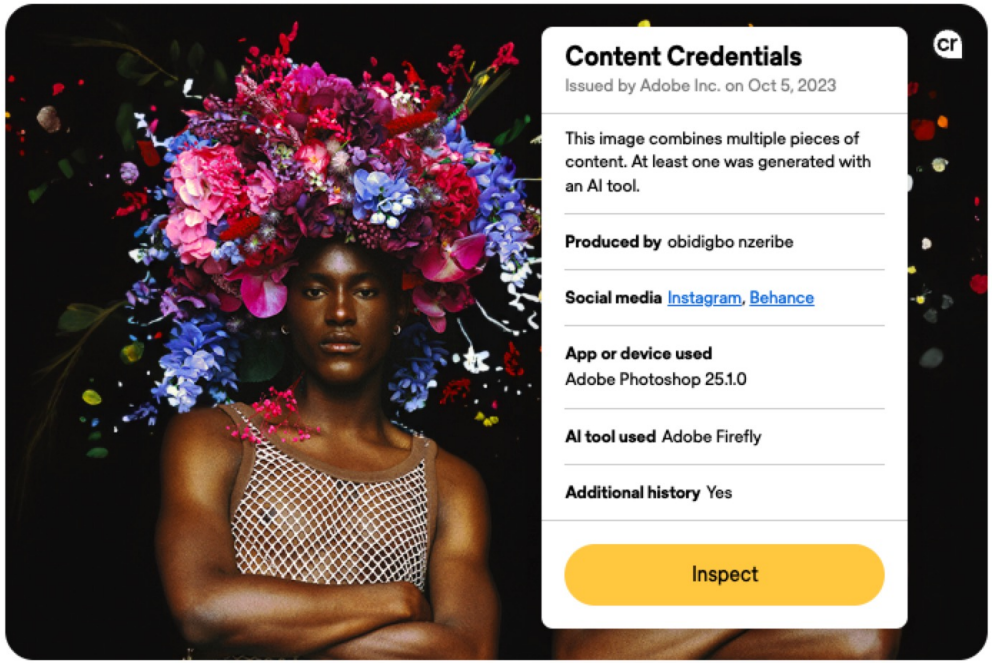
Functionality around Generative AI

Identifying assets & regions of interest that have been created/modified by AI

Information about the "recipe"

Allow creators to label content “**Do Not Train**”



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ISO 32008: PDF Extensions to Content Credentials

- Extending 22144 & the C2PA spec for more PDF-isms
- New Actions
  - Over 20 proposals to discuss this week!
- Better support for Certifying Signatures
- Handling C2PA Manifests in encrypted PDFs
- Handling of C2PA Manifest with Protected Wrappers (AU).
- Guidance on image placement & transcoding

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ISO 21617 (JPEG Trust): Extensions to Content Credentials for identity, authorship, ownership & digital rights

- Assert human and organizational identities using standard models
  - X.509
  - Verifiable Credentials
  - Social Media accounts
  - Well known ID systems
- Describe role(s) involved in the production of the asset
- Provide rights declarations (ODRL) about the asset & its content

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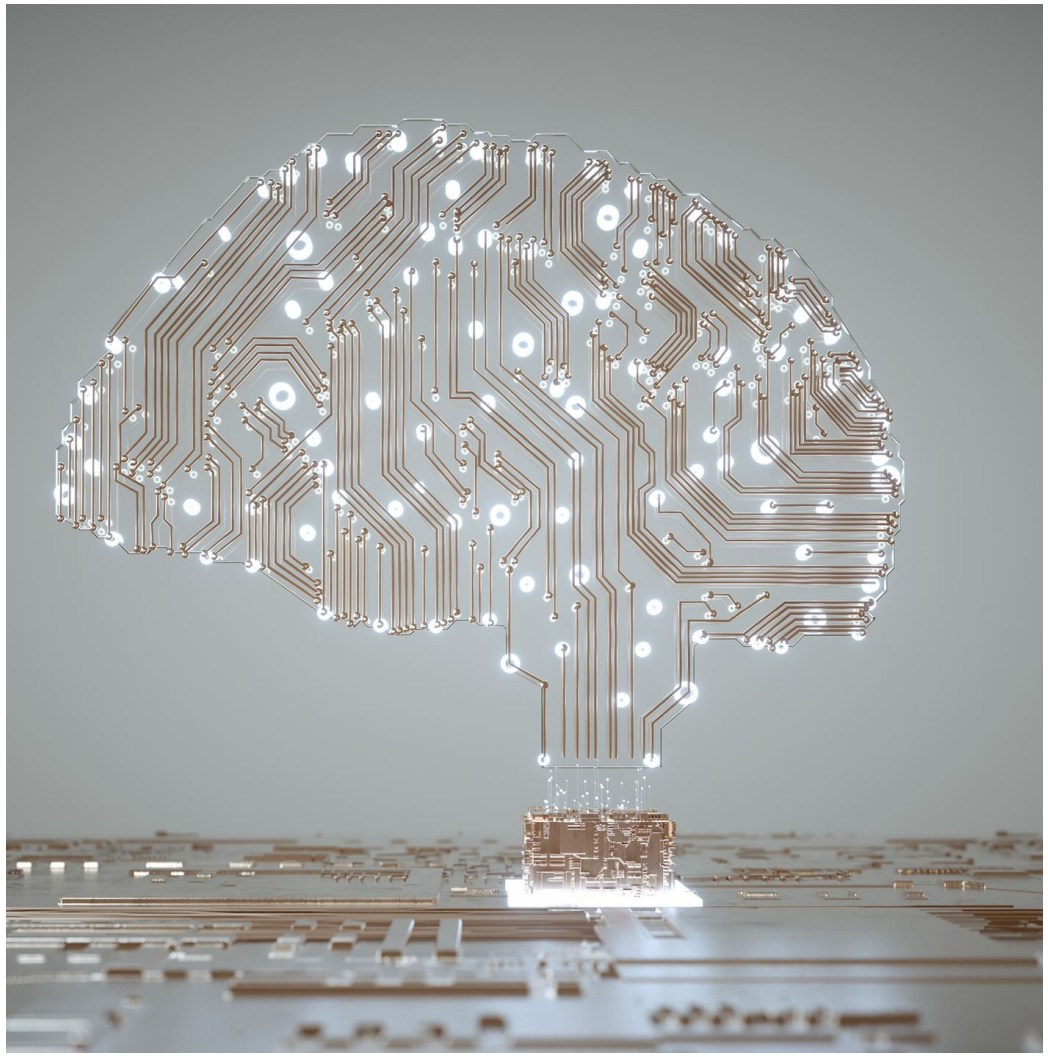
Agents

AI Agents Transforming PDF Comprehension and Processing



- AI agents analyze PDF structure for enhanced content understanding.
- They extract text, images, and annotations efficiently.
- Enable automated commenting, editing, and metadata management.
- Improve accessibility through semantic tagging and format conversion.
- Facilitate content provenance and collaboration in PDFs.

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Conclusion

Conclusion

- PDFs are the ”next frontier” for content consumption
- But **WE UNDERSTAND** they are so much more than content
- How do we help the world get there?

- It’s not just about improving the file format (we need that too) – but about finding ways to helps users better use it!
  - Both creation and consumption

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Thank you!

Questions


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- In a world where users expect to collaborate when authoring or editing content, where AI agents are out there performing actions on behalf of their users (or even themselves!), what does it mean for PDF – a file format designed to allow a single user to do their work?
- I'll talk about what the modern collaborative era means to PDF – from the file format, to attribution and provenance. That is, assuming that I don't send my Agent to present on my behalf!
-

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