



## A Decentralized Science framework

### DeSci: an Overview

In the setup of this framework, a number of existing projects have been used as references for guiding our design choices. While in our context this infrastructure should enable us to collaborate, to avoid the so-called tragedy of the anticommons and to always be reproducible, and this is a mean for us as a DAO to perform well in the financial market, the scope of this project is much broader and its potential in the public sector should not be neglected.

The entry point for us has been DeSci Labs, and their work on the development of DeSci Nodes, a new unit of knowledge going beyond PDF: “DeSci Nodes creates an inventory of research artifacts, an incentive system for replication, a mechanism for validation, and a connection point embedded into your preprint.”

Our design choices have also been driven by the lessons learned by Open Science, and Open-source Software Development: the “Open Journals” organization, on which also the Julia Ecosystem is building on, is the most relevant here.

One of the requirements here was to go beyond traditional peer review, using Web3 technologies. Reference projects, for this, have been Ants-Review (Trovò and Massari 2021), PRINCIPIA<sup>1</sup> (Mambrini et al. 2020). Worth mentioning also the “Peer Review” repository<sup>2</sup>.

Other interesting projects, in the space, are Lateral, working on the construction of knowledge graphs, Radicle, building on Git and Ethereum to “enable developers to collaborate on software over a peer-to-peer network”, DeSci World, looking into the use of Non-Fungible Tokens.

### Design Choices

The first requirements has been to expose the user as little as possible to LaTeX, giving the possibility to write in Markdown, a language developed by John Gruber and Aaron Swartz: the backend takes care of generating the unit of knowledge (not necessarily a PDF), using *pandoc*.

The paper backend lives in a repository<sup>3</sup> also containing a Python package: in this way the symbiosis between codes and plain language can be leveraged to foster reproducibility. For example, there is a command called `?????` which can be used to produce this Figure:

The paper is generated, using a docker image<sup>4</sup>, by the Actions of our repository: in this way the

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<sup>1</sup>See also <https://cordis.europa.eu/article/id/422224-principia-a-new-peer-review-platform-is-here>

<sup>2</sup><https://github.com/danielBingham/peerreview>

<sup>3</sup><https://github.com/crunchdao/desci>

<sup>4</sup><https://hub.docker.com/r/crunchdao/desci-pandoc>

principles of Continuous Integration/Continuous Development not only apply to software, but also to the overlying scientific unit of knowledge.

Finally, an intuitive User Interface is setup at <https://desci.crunchdao.com/>: contributors of these units of knowledge don't have to be skilled software developer.

- Render paper in CrunchDAO website and build UX for easy reviews/comments/pull requests.

### **The research paper(s) V1.0: Cover the CrunchDAO investment rationale**

- Start from website+documentation, 2 medium articles, CrunchDAO website.
- Study NumerAI and RocketCapital and understand differences, Judge Research.
- Layer 1 vs Layer 2 in CrunchDAO

### **Metamodeling Layer 1**

- Understand and document Udit work:
  - Barra Risk Factor Analysis;
  - Idiosyncratic Risk;
  - Risk-Adjusted Return;
  - Sharpe Ratio;
  - Spearman's rank correlation coefficient
- Digest and document "Crowdsourced Investment Research Through Tournaments" and Lopez de Prado more in general;
- How can people add different datasets?

### **Aggregate the scientific community**

Filter these in the subsections below:

- Kind of council of elders of top crunchers: identify and engage top scientific profile from the community
- Allow elders to interact with the research paper in a DeSci way
- Orchestrate the call for signal and Cherry peek the best signals
- Work on the definition of KPIs. Some ideas:

- Number of interaction on the paper
- Median signal performance (Sharpe, ROI, DD)
- Number of interaction with the podcasts.
- Some way to evaluate the engagement of the syndacate.

## NFTs

At the beginning, we gift an NFT to people we want as advisors and having one leads to being able to give a feedback on the paper. See here and here. This will allow people to join the GROUP OF COOL PEOPLE YET TO BE NAMED (Mathematical syndicate?).

The NFTs could be about stochastic processes (video+audio), and about financial models more in general.

Then we vote with tokens to decide whether the pull request on the paper is accepted or not. Voting on the papers shall become part of civil duties. How will be individual decisions be integrated into the final one? More token more power, one head one vote? Or something fancy like “A Flexible Design for Funding Public Goods”. Or something like this?

What is the role of SBTs here? Decentralized Society: Finding Web3’s Soul.

The outcome of the peer review changes your grade in the DAO which changes your access to the APY, Alternative idea, you stake on the pull request and if it is bad you lose.

## Social Presence (Talk with Ben for this)

- Stardust Podcast (or alternative one?) The crunch podcast ? 2 / month? Maybe call it Matteo podcast and talk about CrunchDAO. Talk about the models, talk about the results.
- LinkedIn
- Twitter
- Medium, or maybe Mirror better?
- Youtube
- Anchor

## R&D finance

- The research paper(s) V1.0: Cover the CrunchDAO investment rationale
- Iterate once every 4 weeks on a new update of the paper
- KPIs

- MM Sharpe
- Backtest
  - \* MM ROI - backtest
  - \* MM DD - backtest
  - \* Competition OWEN and Spearman

## Images

Markdown syntax for an image is that of a link, preceded by an exclamation mark !.

The main use of images in papers is within figures. An image is treated as a figure if

1. it has a non-empty description, which will be used as the figure label and
2. it is the only element in a paragraph, i.e., it must be surrounded by blank lines.

## Citations

Bibliographic data should be collected in a file `paper.bib`; it should be formatted in the BibLaTeX format, although plain BibTeX is acceptable as well. All major citation managers offer to export these formats.

Cite a bibliography entry by referencing its identifier: will create the reference “(Upper 1974)”. Omit the brackets when referring to the author as part of a sentence: “For a case study on writers block, see Upper (1974).” Please refer to the pandoc manual for additional features, including page locators, prefixes, suffixes, and suppression of author names in citations. ### Footnotes

Syntax for footnotes centers around the “caret” character `^`. The symbol is also used as a delimiter for superscript text and thereby mirrors the superscript numbers used to mark a footnote in the final text.<sup>5</sup>

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<sup>[^1]</sup>: An open license that allows reuse.

Note numbers do not have to be sequential, they will be reordered automatically in the publishing step. In fact, the identifier of a note can be any sequence of characters, like `[^marker]`, but may not contain whitespace characters.

The above example results in the following output:

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<sup>5</sup>Although it should be noted that some publishers prefer symbols or letters as footnote markers.

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## Lists

Bullet lists and numbered lists, a.k.a. enumerations, offer an additional method to present sequential and hierarchical information.

- apples
- citrus fruits
  - lemons
  - oranges

Enumerations start with the number of the first item. Using the the first two laws of thermodynamics as example.

0. If two systems are each in thermal equilibrium with a third, they are also in thermal equilibrium with each other.
1. In a process without transfer of matter, the change in internal energy,  $\Delta U$ , of a thermodynamic system is equal to the energy gained as heat,  $Q$ , less the thermodynamic work,  $W$ , done by the system on its surroundings.

$$\Delta U = Q - W$$

## Internal references

Markdown has no default mechanism to handle document internal references, often called “cross-references”. This conflicts with goal of [Open Journals] is to provide authors with a seamless and pleasant writing experience. This includes convenient cross-reference generation, which is why a limited set of LaTeX commands are supported. In a nutshell, elements that were marked with `\label` and can be referenced with `\ref` and `\autoref`.

## Tables and figures

Tables and figures can be referenced if they are given a *label* in the caption. In pure Markdown, this can be done by adding an empty span `[] {label="floatlabel"}` to the caption. LaTeX syntax is supported as well: `\label{floatlabel}`.

Link to a float element, i.e., a table or figure, with `\ref{identifier}` or `\autoref{identifier}`, where `identifier` must be defined in the float's caption. The former command results in just the float's number, while the latter inserts the type and number of the referenced float. E.g., in this document `\autoref{proglangs}` yields “??”, while `\ref{proglangs}` gives “??”.

**Table 1:** Comparison of programming languages used in the publishing tool.

Language	Typing	Garbage Collected	Evaluation	Created
Haskell	static, strong	yes	non-strict	1990
Lua	dynamic, strong	yes	strict	1993
C	static, weak	no	strict	1972

## Equations

Cross-references to equations work similar to those for floating elements. The difference is that, since captions are not supported for equations, the label must be included in the equation:

`$$a^n + b^n = c^n \label{fermat}$$`

Referencing, however, is identical, with `\autoref{eq:fermat}` resulting in “subsection 5”.

$$a^n + b^n = c^n$$

Authors who do not wish to include the label directly in the formula can use a Markdown span to add the label:

`[$$a^n + b^n = c^n$$]{label="eq:fermat"}`

Hi Benjamin, this equations is about the work we did today:

$$\rho(x) = 3$$

Wow, also Joseph is here! I am showing you how we can discuss about fractional calculus in html!

## Pandoc

Readers may wonder about the reasons behind some of the choices made for paper writing. Most often, the decisions were driven by radical pragmatism. For example, Markdown is not only nearly ubiquitous in the realms of software, but it can also be converted into many different output formats. The archiving standard for scientific articles is JATS, and the most popular publishing format is PDF. Open Journals has built its pipeline based on pandoc, a universal document converter that can produce both of these publishing formats – and many more.

A common method for PDF generation is to go via LaTeX. However, support for tagging – a requirement for accessible PDFs – is not readily available for LaTeX. The current method used ConTeXt, to produce tagged PDF/A-3, a format suited for archiving (“Document Management – Electronic Document File Format for Long-Term Preservation – Part 3: Use of ISO 32000-1 with Support for Embedded Files (PDF/A-3)” 2012).

## Codes

```
public class Example implements LoremIpsum {
    public static void main(String[] args) {
        if(args.length < 2) {
            System.out.println("Lorem ipsum dolor sit amet");
        }
    } // Obscura atque coniuge, per de coniunx
}
```

$$p_{ij}(t) = \frac{\ell_j(t) - \ell_i(t)}{\sum_{k \in N_i(t)} \ell_k(t) - \ell_i(t)} \quad (1)$$

Test Nr.	Position	Radius	Rot	Grün	Blau	beste Fitness	Abweichung
1	20 %	20 %	20 %	20 %	20 %	7,5219	0,9115
2	0 %	25 %	25 %	25 %	25 %	8,0566	1,4462
3	0 %	0 %	33 %	33 %	33 %	8,7402	2,1298
4	50 %	20 %	10 %	10 %	10 %	6,6104	0,0000
5	70 %	0 %	10 %	10 %	10 %	7,0696	0,4592
6	20 %	50 %	10 %	10 %	10 %	7,0034	0,3930



Test Nr.	Position	Radius	Rot	Grün	Blau	beste Fitness	Abweichung
7	40 %	15 %	15 %	15 %	15 %	6,9122	0,3018

```

a = 3
for i in range(6):
    print(a)

```

## References

“Document Management – Electronic Document File Format for Long-Term Preservation – Part 3: Use of ISO 32000-1 with Support for Embedded Files (PDF/A-3).” 2012. Standard. Geneva, CH: International Organization for Standardization.

Mambrini, Andrea, Andrea Baronchelli, Michele Starnini, Daniele Marinazzo, and Manlio De Domenico. 2020. “PRINCIPIA: A Decentralized Peer-Review Ecosystem.” arXiv. <https://doi.org/10.48550/ARXIV.2008.09011>.

Trovò, Bianca, and Nazzareno Massari. 2021. “Ants-Review: A Privacy-Oriented Protocol for Incentivized Open Peer Reviews on Ethereum.” In *Euro-Par 2020: Parallel Processing Workshops*, 18–29. Cham: Springer International Publishing.

Upper, D. 1974. “The Unsuccessful Self-Treatment of a Case of "Writer's Block"." *Journal of Applied Behavior Analysis* 7 (3): 497. <https://doi.org/10.1901/jaba.1974.7-497a>.