FAIR Enabling Research Objects on Persistent IDs

Facilitating data/compute-intensive research, quantifying impact, streamlining knowledge management & sharing

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DeSci Labs

Global challenges facing the research community

Loss of artifacts: science is not verifiable

→ *Tax-payer-funded research is lost or inaccessible*

Not ready for the age of AI (not FAIR)

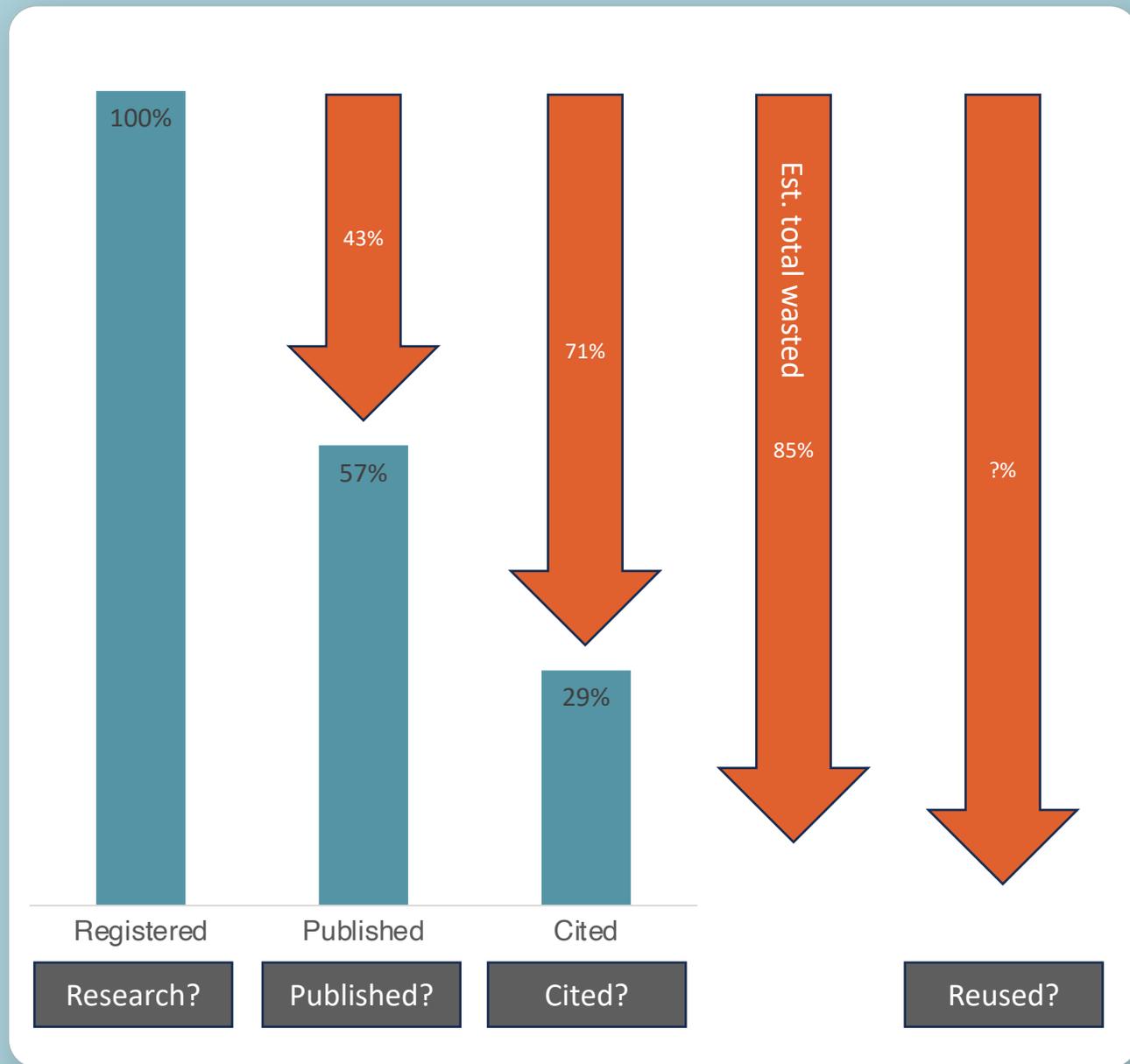→ *Extremely difficult for machines to parse the scientific record*

Aging publishing infrastructure

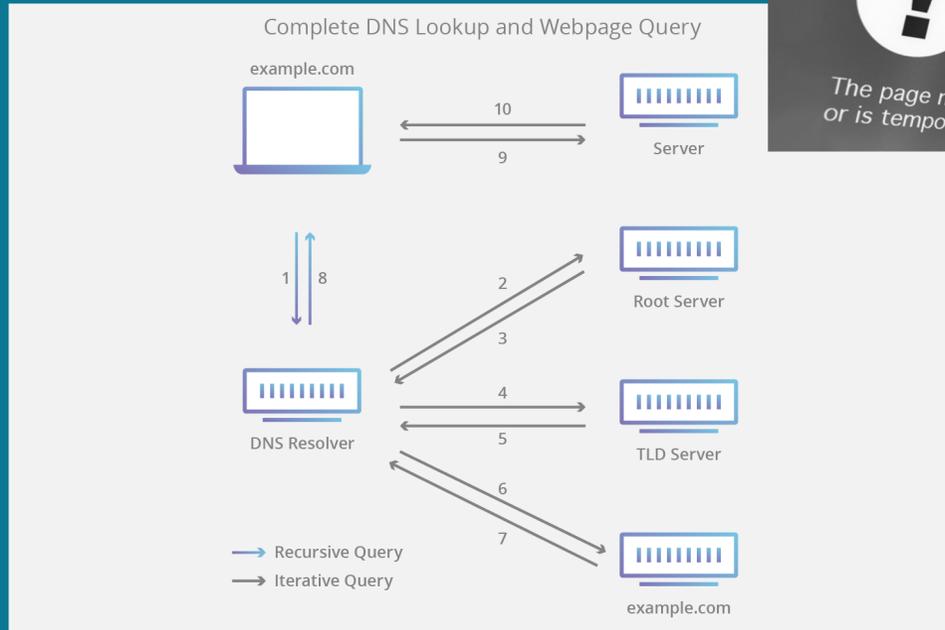→ *Data silos, poor UX, fragmentation, content drift, poor PID*

Bad incentives

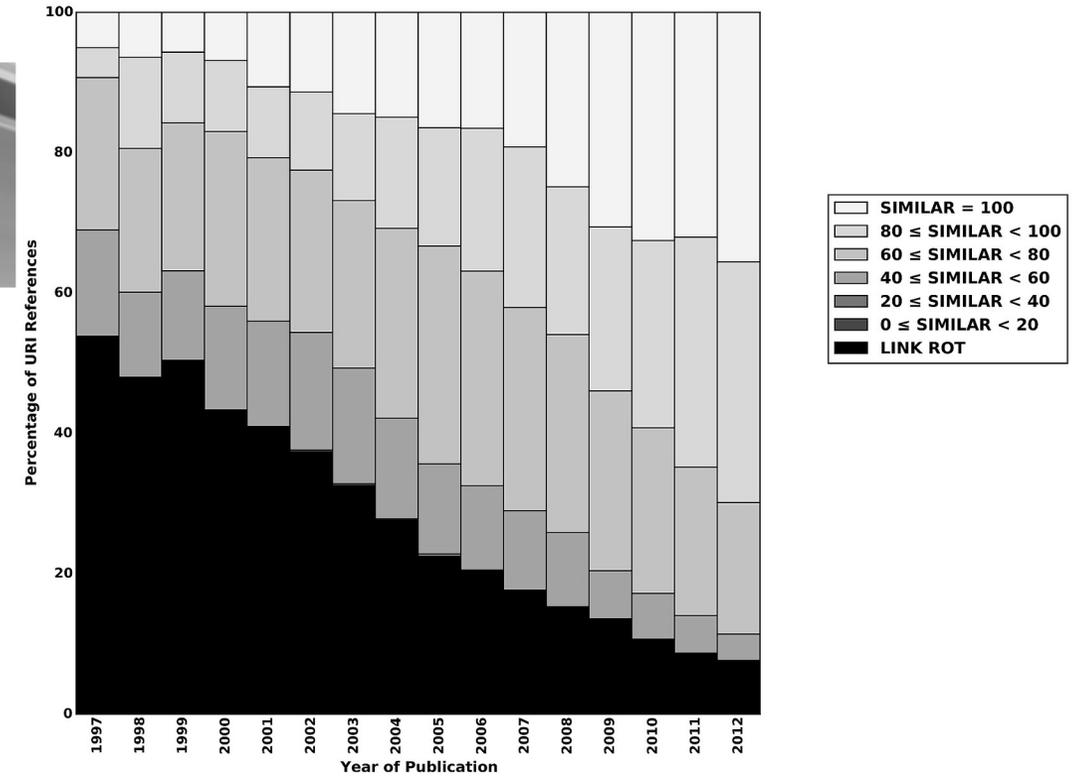→ *Lack of funder <> scientist interfaces*

→ *Limited metrics (impact factor)*

Identifiers in the current Internet – URIs

Complete DNS Lookup and Webpage Query

ERROR 404
File not found

The page might have been removed, or is temporarily unavailable

- URLs point to where content is stored, not the content
- Link rot (file moved or deleted, 404 error)
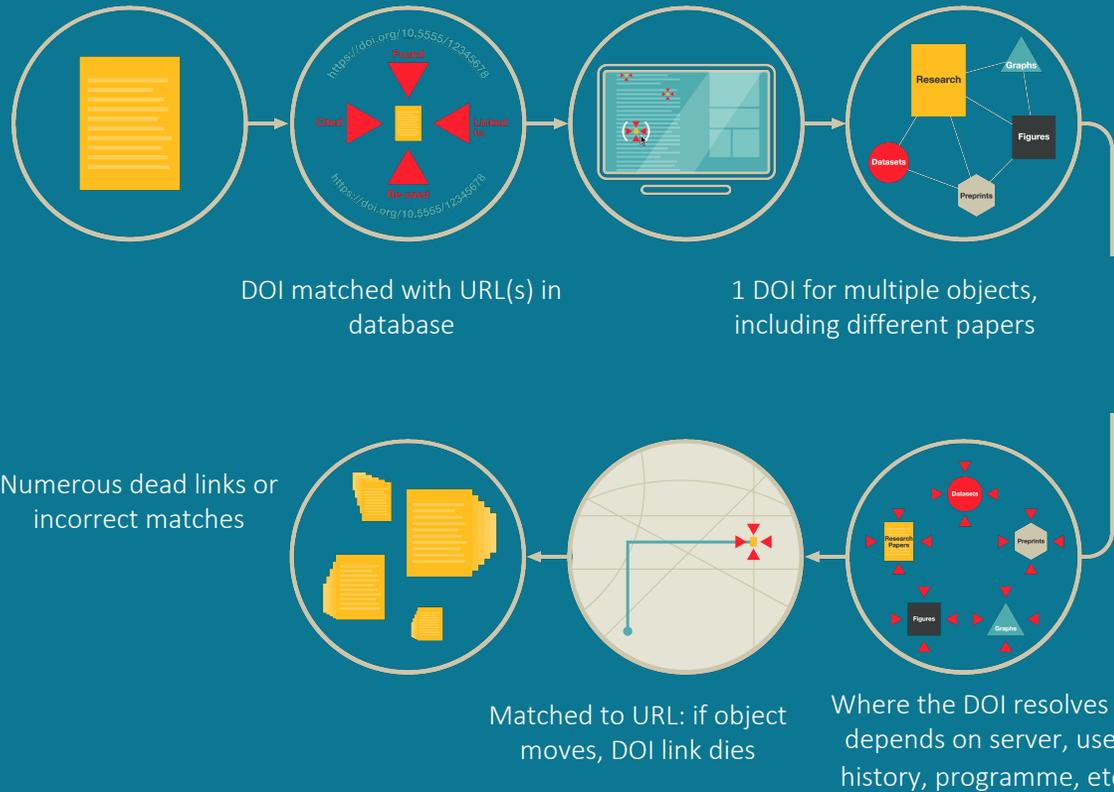- Content drift (content changes over time)
- No version control

- URI citations with link rot or content drift (>1M total, 3 publishers - Elsevier, arXiv, PMC)
- Threat to the integrity of the scientific record

Sources:
Jones, S.M., et. al. (2016). Scholarly context adrift: Three out of four URI References Lead to Changed Content. *PLoS ONE* 11(12): e0167475.

Identifiers in current Publishing – DOIs

DOI matched with URL(s) in database

1 DOI for multiple objects, including different papers

Numerous dead links or incorrect matches

Matched to URL: if object moves, DOI link dies

Where the DOI resolves to depends on server, user history, programme, etc.

Sources:
Klein, M., Balakireva, L. (2020). On the Persistence of Persistent Identifiers of the Scholarly Web. In: Hall, M., Merčun, T., Risse, T., Duchateau, F. (eds) *Digital Libraries for Open Knowledge*. TPDL 2020. Lecture Notes in Computer Science, vol. 12246. Springer.
CrossRef: https://www.crossref.org/documentation/reference-linking/

- DOIs were a great solution when they were developed, offering an easy way to file and track publications and other related objects

- However, nowadays DOIs struggle: in ~50% of all cases they do not correctly resolve to their target resource (aging)

- DOIs are neither persistent nor unique identifiers
  - Different results for same DOI depending on request method and network environment
  - Link rot

- DOIs are matched to URLs in a database
  - Lots of manual updating work for publishers

- With new developments, it is becoming a more costly system for publishers - room for optimisation

Antiquated publishing infrastructure
Poor UX

Loss of artifacts: science is not verifiable & Not ready for the age of AI (not FAIR)

Fragmentation x³

Add File / Folder

Select the method you want to use for adding your research component.

Cloud Storage

Drive

Dropbox

OneDrive

Repository

Github

Gitlab

Bitbucket

JupyterLab

Code Ocean

Colab

Replit

IPFS

Import from IPFS

Local Storage

Choose File

FAIR Research Object stored Open State
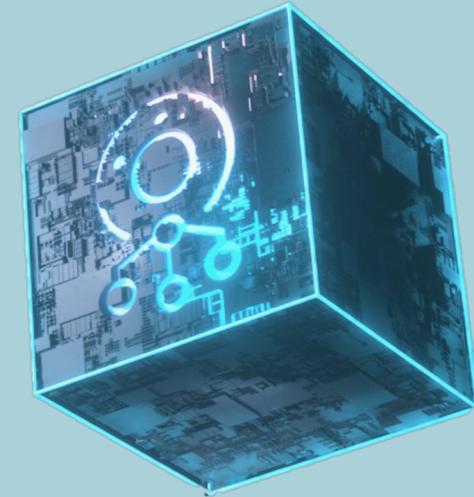
NODE

FAIR unit of reproducible knowledge
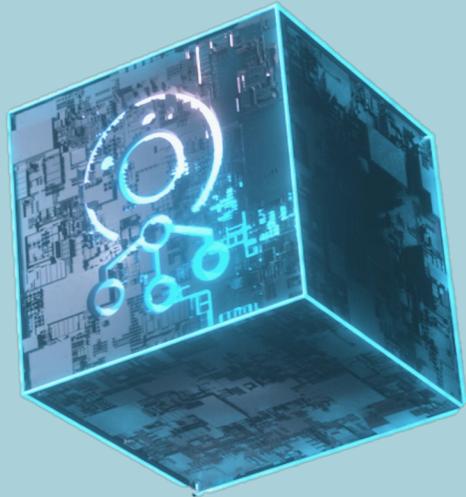
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OBJECTIVES

Enhance trust in science

Verifiable research requires reproducibility of computational artifacts

Increase fundamental research ROI

Publications with access to code, data, and compute make re-use and reproducibility possible

Metascience proving grounds

Interfaces to connect funders and scientists with new metrics based on metascience research

Future-proof: Machine actionability

Scientific outputs need to be machine actionable.

Equip our scientists with a modern publication OS

- *Combine papers, code, data into FAIR unit of reproducible knowledge*

- *Compute-enabled publications*

- *Verifiable attestations*

- *Translate to machine language for AI-readiness*

- *Tamper-proof data (hash-based) and decentralized storage*

Open State storage and information security

Rich research objects with hash-PIDs, stably indexed on a blockchain

DO_1$_{v1}$
+Metadata

DO_2$_{v1}$
+Metadata

DO_3$_{v1}$
+Metadata

Data nodes

Manuscript
Hash1

Code
Hash2

Data
Hash3

Merkle leaves
(leaf hash)

Research Object: 1
Hash123

RO1

Merkle root
(root hash)

RO PID
{ID: 1; Hash: 123}
Ledger entry

Blockchain
Filecoin/Ethereum

dPID registry

DATA LAYER

APPLICATION LAYER

Granular and consistent PID resolution
{Resolver}/{PID}/{VERSION}/{COMPONENT}/{PATH}

Open Read / Open Write

Applications

Open State storage and information security

Rich research objects with hash-PIDs, stably indexed on a blockchain

DO_1$_{v1}$ +Metadata

DO_2$_{v1}$ +Metadata

DO_3$_{v1}$ +Metadata

DO_4$_{v1}$ +Metadata

Data nodes

Manuscript Hash1

Code Hash2

Data Hash3

Video Hash4

Merkle leaves (leaf hash)

Research Object: 1 Hash1234

RO1

Merkle root (root hash)

RO PID {ID: 1; Hash: 1234} Ledger entry

Blockchain Filecoin/Ethereum

dPID registry

DATA LAYER

APPLICATION LAYER

Granular and consistent PID resolution {Resolver}/{PID}/{VERSION}/{COMPONENT}/{PATH}

Open Read / Open Write

Applications

Open State storage and information security

Rich research objects with hash-PIDs, stably indexed on a blockchain

DO_1$_{v2}$
+Metadata

DO_2$_{v1}$
+Metadata

DO_3$_{v1}$
+Metadata

DO_4$_{v1}$
+Metadata

Data nodes

Manuscript
v2 Hash5

Code
Hash2

Data
Hash3

Video
Hash4

Merkle leaves
(leaf hash)

Research Object: 1
Hash5234

RO1

Merkle root
(root hash)

RO PID
{ID: 1; Hash: 5234}
Ledger entry

Blockchain
Filecoin/Ethereum

dPID registry

DATA LAYER

APPLICATION LAYER

Granular and consistent PID resolution
{Resolver}/{PID}/{VERSION}/{COMPONENT}/{PATH}

Open Read / Open Write

Applications

Verification

Attested rich research objects with hash-PIDs

DO_1_{v2} +Metadata	

Data nodes

DO_1ᵥ₂ +Metadata

DO_2ᵥ₁ +Metadata

DO_3ᵥ₁ +Metadata

DO_4ᵥ₁ +Metadata

Manuscript v2 Hash5

Code Hash2

Data Hash3

Video Hash4

Merkle leaves (leaf hash)

Research Object: 1 Hash5234

Merkle root (root hash)

RO1

RO PID {ID: 1; Hash: 5234} Ledger entry

Blockchain Filecoin/Ethereum
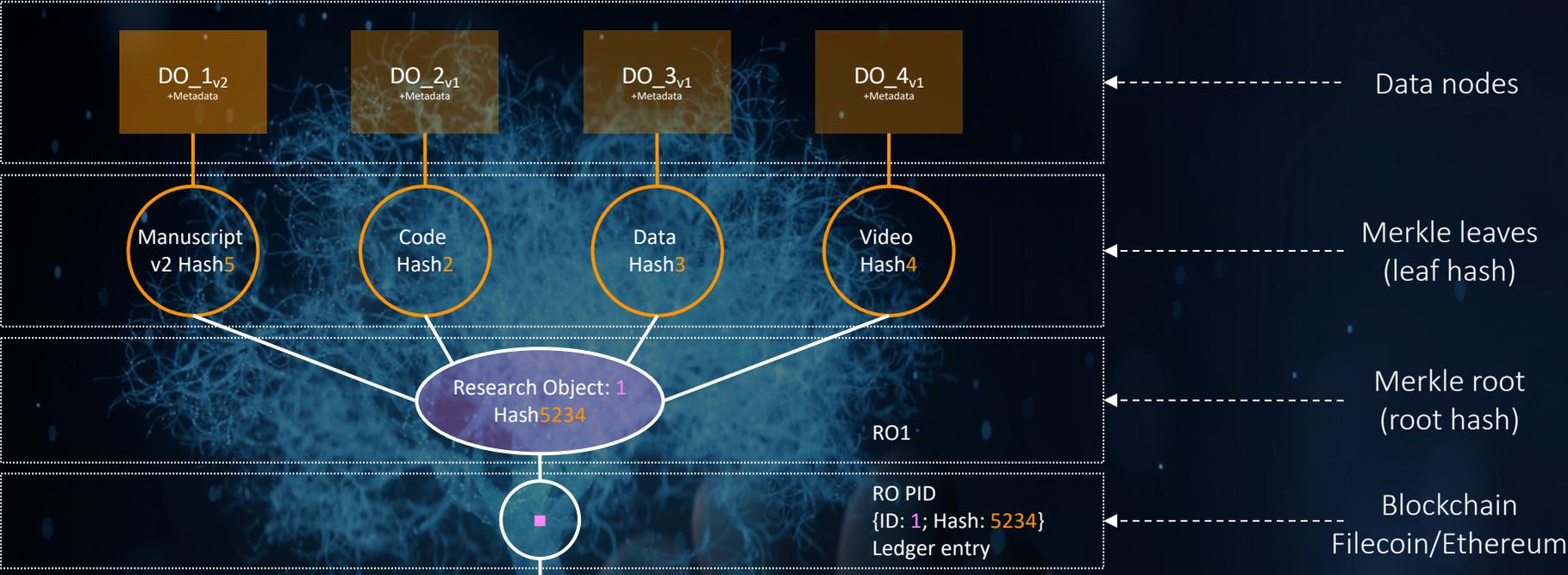
Org/individual signs a *revocable attestation* on the Node:

{Reproducibility verified}

{FAIR compliant}

{Provenance verified}

{OSTP memo compliant}

{Manuscript peer-reviewed}

EXPLORING LUPUS CLOUDS
M. ANSDELL ET AL. · DPID 46

Node Drive   History   Contributors

Pinned 5

Read The Paper
/exploring-lupus-report.pdf ✶

Explore The Code
/exploring-lupus ✶

Browse The Data
/data ✶

Go To Publisher Site

Home 572   Version 5 ⌄

COMPONENT NAME	SIZE
📄 exploring-lupus-report.pdf ✶	3 MB
📁 exploring-lupus ✶	535 MB
📁 External Links	0

Exploring Lupus Clouds

Megan Ansdell   Jonathan Williams   Nienke van der Marel   James Carpenter

Greta Guidi   ...   Michiel Hogerheijde   + 9 more

We present the first high-resolution sub-mm survey of both dust and gas for a large population of protoplanetary disks. Characterizing fundamental properties of protoplanetary disks on a statistical level is critical to understanding how disks evolve into the diverse exoplanet population. We use ALMA to survey 89 protoplanetary disks around stars with $M_*>0.1$ $M_\odot$ in the young (1--3~Myr), nearby (150--200~pc) Lupus complex. Our observations cover the 890~μm continuum and the 13CO and C18O 3--2 lines. We use the sub-mm continuum to constrain Mdust to a few Martian masses (0.2--0.4~$M_\oplus$) and the CO isotopologue lines to constrain Mgas to roughly a Jupiter mass (assuming ISM-like [CO]/[H2] abundance). Of 89 sources, we detect 62 in continuum, 36 in 13CO, and 11 in C18O at >3σ significance. Stacking individually undetected sources limits their average dust mass to ≤6 Lunar masses (0.03~$M_\oplus$), indic ...see more

Pinned Components

Read The Paper   Explore The Code

Browse The Data   Go To Publisher Site

Community Curated Nodes
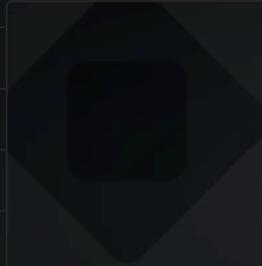
BlockScience

DeSci Foundation

Gridcoin

Longevist

MoonDAO

The Behavioral Geneticist

+ CREATE DESCI COMMUNITY

All Communities

The Nodes below meet the curation criteria of at least one DeSci community on the network. Select a specific community to view the Nodes they have curated.

20

📦 CURATED NODES

DPID://180/V3

A Weighted Cellular Automata for Flood Modelling
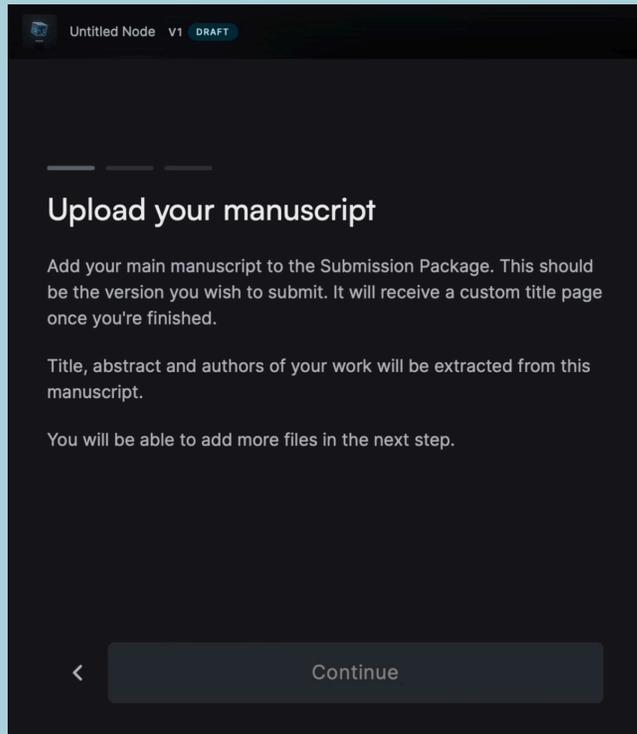
◯ Andre Vacha   ◯ Sina Iman
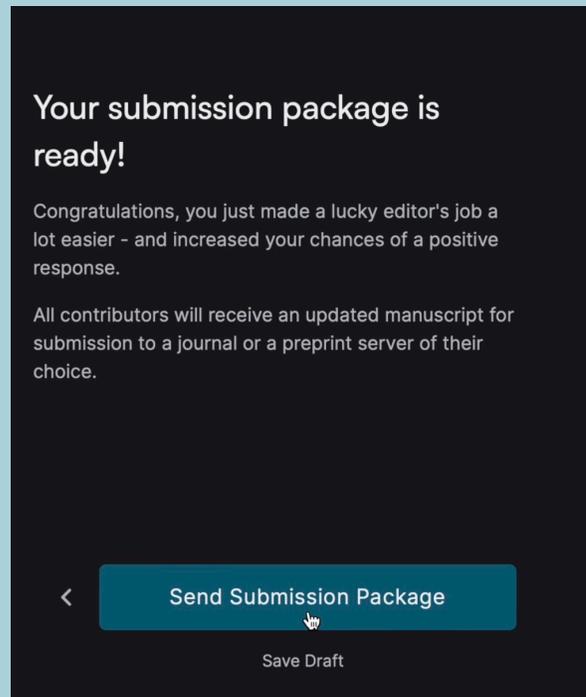
26 / 02 / 2024   35   14 →

DPID://192/V2

Report problem

Support classic publishing
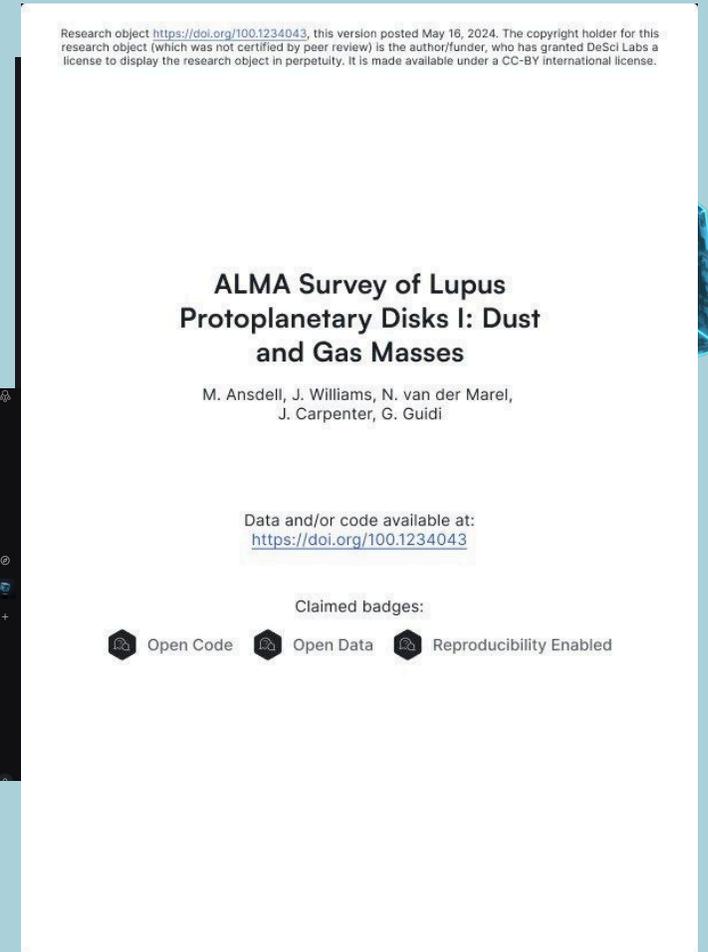
Ensure the system supports current systems

Guided upload of publication-related materials

Collation of materials into an easy format that gives editors transparency

Creation of submission package and a Node (Research Object)

Upload your manuscript

Add your main manuscript to the Submission Package. This should be the version you wish to submit. It will receive a custom title page once you're finished.

Title, abstract and authors of your work will be extracted from this manuscript.

You will be able to add more files in the next step.

Continue

Your submission package is ready!

Congratulations, you just made a lucky editor's job a lot easier - and increased your chances of a positive response.

All contributors will receive an updated manuscript for submission to a journal or a preprint server of their choice.

Send Submission Package

Save Draft

ALMA Survey of Lupus Protoplanetary Disks I: Dust and Gas Masses

M. Ansdell, J. Williams, N. van der Marel, J. Carpenter, G. Guidi

Data and/or code available at:
https://doi.org/100.1234043

Claimed badges:

Open Code   Open Data   Reproducibility Enabled

DeSci Pub

Exploring Lupus Clouds DPID://46

M. Ansdell J. Williams + 9

Manuscript
EXPLORING-LUPUS-REPORT.PDF

8

Blog Post   Pre-Registered Report   Blog P

CURATED BY

DeSci Foundation   + 3
MoonDao   + 3
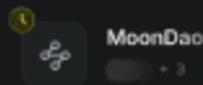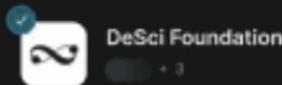
Create your Submission Package

Increase the chance to get published in the journal of your choice by submitting a full Submission Package, including your paper, data and code.

At the end of this process, you will receive a submission version of your paper that provides access to all resources.

You can also make verifiable claims to get editors' attention and accelerate the process of peer review.

Get Started
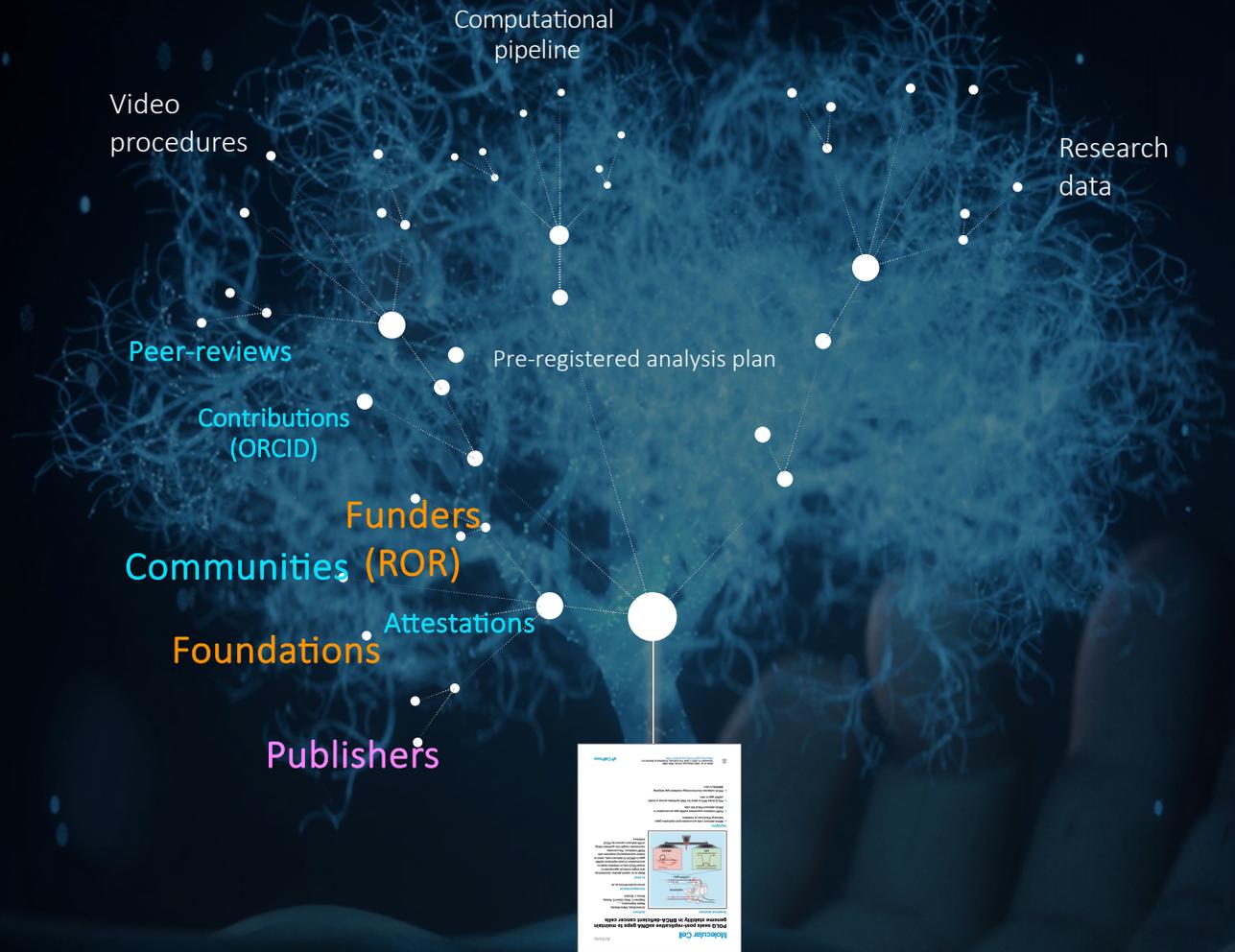
Start New Project

ne_Publication.pdf   12 Feb
980till17...JochemToxV1_6c   8 Janu
980till17...JochemToxV1_6b   8 Janu
980till17...JochemToxV1_6a   8 Janu
980till17...JochemToxV1_6d   8 Janu
q   2 Janu
res.release.csv   2 Janu
ykp2h2...5i4c4yomap4.csv   20 Oct
mufzyq...dnfjflpsy367q.csv   20 Oct
jt662g...7helsu2jotaby3iju   20 Oct
Gene-di...code overview.pdf   16 Oct
980till17...eJochemToxV1_6   20 Aug

Report problem

Verification

Machine-actionable PID-graph based on cryptographic hashes

Computational pipeline

Video procedures

Research data

Peer-reviews

Pre-registered analysis plan

Contributions (ORCID)

Funders (ROR)

Communities

Attestations

Foundations

Publishers

PID + Resource + Metadata + Methods for every connected DO

Help us help you & fellow researchers

Explore a demo:

Explore and make a Node in Nodes Beta:

Note: not currently phone-friendly