

Research. Shared.

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### The result?

#### 50% of the links in papers are inaccessible after 10 years

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How Do Astronomers Share Data? Reliability and Persistence of Datasets Linked in AAS Publications and a Qualitative Study of Data Practices among US Astronomers

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Editor: Assen Nain-ion Golden, Albert Finstein College of Medicine, United States of America Received Neurobur 20, 2015; Accepted July 18, 2014; Published Austral 28, 2014

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No, I don't have a website where I store these data. Most of it is in various stages of mess. -An Astronomer Autropomical observations can generate very large volumes of

data, and observations taken at a particular time are by definition irreplaceable and unerpeatable. As such, making astronomical a publicly available in a structured, intelligible format is of damental importance to enable scientific transparency and long term data curation and preservation, facilitating data re-use [1]. To date, some of the most systemically planned data sharing in astronomical research has focused on the preservation and nination of observations created in so-called "sky surveys." The purpose of these surveys is to collect and measure data from extended regions of the Sky, in a systematic and controlled fashion. Modern optical sky surveys, such as the Sloan Digital Sky Survey (SDSS), the 2-Micron All-Sky Survey (2MASS), and the future

Large Synoptic Survey Telescope (LSST) generate massive databases, ranging in size from hundreds of terabytes to hundreds of petabytes [2]. Surveys that rely on spectrally-resolved observations, often made with radio-wavelength interferometers, generate
"3D Data Cubes" rather than "2D images," and they are already so large that it is not possible to keep all the raw data after analysi

Despite their sheer volume, the data collected in the context of large surveys represent only a portion of all the data generated in Astronomy. Most discoveries rely upon smaller studies, and/or are based on heavily-processed subsets of many surveys. In any field of scientific endeavor, many different levels of data exist [3]: from "raw" data to "remonseed" data from "calibration" data to "published" data. If we imagine all data in Astronomy to be nyramid, primary data from large sky surveys occuries the bottom half of the pyramid. But, as we just mentioned, these produce more specific studies, where astronomers analyze and process primary data in many ways producing **derived** data.

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#### 89% of 53 landmark cancer research papers are irreproducible

#### News in focus

people who are immune to other variants.

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and of the people who are immune to other variants. Omicron carries a large number of muta-people with no known history of infection. I Imperial College London, agrees that jacking think retaining some neutralization agrees that packing from the prime target think retaining some neutralization against up antibody levels with booster shots should of immune responses — and some of these Omicron can only be helpful." says Moore. a help ordect against Omicron, just as boosters

the ability of antibodies to recognize the virus ing on neutralization experiments. and block infection. Scientists used two types of laboratory "Omicron is scarier than

particles, typically isolated from individuals infected with Omicron. The other relies on pseudovirus particles – genetically modified versions of another virus (often HIV) that use

Africa Health Research Institute in Durban, South Africa, found that serum – the antibody-containing portion of blood - from studies: one reported by Pitzer and BioNTech in an 8 December press release, and the other released on Twitter and later posted

the Goethe University Frankfurt, Germany (A. Wilhelm et al. Preprint at medRxiv https:// doi.org/g8sz; 2021).

A fourth study, led by Murrell and virolo
By Asher Mullard

gist Daniel Sheward, also at the Karolinska titute, reported a smaller reduction in

368 | Nature | Vol 600 | 16 December 2021

assay to test how well Omicron can evade neutralizing, or virus-blocking, antibodies. One approach uses infectious SARS-Code

the SARS-CoV-2 spike protein to infect cells. way to improve antibody levels against antibodies, such as T cells, ameliorate sever The results from the four teams all suggest

Omicron. The Pfizer-BioNTech study found disease caused by infection.

Omicron blunts the potency of neutralthat Omicron blunts the potency of neutralthat people who had received a third dose of

It will also be important to see further taking antibodies more extensively than any other circulating SARS-CoV-2 variant. But against Omicron comparable to those, trig-variables such as the type of cell used can affect the magnitude of Omicron's impact varied gered by two vaccine doses, against other conclusions, says Pei-Yong Shi, a virologist between the studies, which examined blood SARS-CoV-2 variants. On the basis of those at the University of Texas Medical Branch at from people with different vaccination and results, "we expect significant protection Galveston, "In the next week or ten days, there A study led by virologist Alex Sigal, at the Omicron in individuals who have received out," he says.

Africa and elsewhere suggest that the variant is highly transmissible – spreading several times already been infected before vaccination executive, Ugur Şahin, at a press conference

changes, when present in other variants, affect co-author on the study, whose lab is also work have improved protection against the Delta variant, "Omicron is scarier than anything we've known before, because it's a little bit worse still than Delta. But we were in quite a bad situation with Delta in unboosted popu

> Jesse Bloom, an evolutionary biologist at the Fred Hutchinson Cancer Research Center in Seattle, Washington, says that it will be important to determine the extent to which

against any type of COVID-19 mediated by will be a lot of confirmatory results coming

### 12 people who received the Pitzer-BaoYitech vaccine was around 40 times less potent against Comicon, on average, than against an earlier strain of SARS-COV2. That find fleg was similar to the results from too be fall thing.

on medRxiv by virologist Sandra Clesek at Barriers to reproducing preclinical results included unhelpful author communication.

levels of Omicron neutralizing antibodies replicate influential preclinical cancer in Cambridge, Massachusetts, who was not in two groups of participants: If Neuth-care workers, who had all been previously infected, and If Swedish blood donors. The research-lamb and If Swedish blood donors. The researchers cannot determine the vaccine status of stood up to scrutiny, reports the Reproducite mhelped to draw attention to growing evi the anonymous blood donors, but say they | bility Project: Cancer Biology (RPCR) team in | dence of a reproducibility crisis; the concert will soon update their paper with vaccination et  $\ell \ell \ell'$  information from the health-care workers.  $\ell \ell \ell' \ell'$  information from the health-care workers.  $\ell \ell \ell' \ell'$  information from the health-care workers.  $\ell \ell \ell' \ell'$  information from the health-care workers.

"The magnitude is still a little up for question." taneously, they're shocking," says Brian Nosek, drug discovery, neuroscience and psychology an RPCB investigator and executive director of the Center for Open Science in Charlottesville. Double take The results suggest that vaccines' effective- Virginia. Although initially planning to repeat The RPCB – a partnership between the Center ness is likely to be significantly modified by 193 experiments from 53 papers, the teamran for Open Science and Science Exchange, a but precisely how much is hard to just 50 experiments from 23 papers.

outrageous", says Glenn Begley, an oncologisi US\$2-million, 8-year attempt to and co-founder of Parthenon Therapeutics Despite differences in results – which are documented how hurdles including vague tology and oncology team had been able to common in such virus-neutralization assays – research protocols and uncooperative authors confirm the results of only 6 of the 53 (11%) the labs' conclusions are similar, and show that delayed the initiative by five years and halved landmark napers it assessed, despite working are "not complete knockouts", says Murrell. "These results aren't surprising. And, simular analyses have reported low replication rates in

### What to improve?

50% of the links in papers are <u>inaccessible</u> after 10 years

**Disseminate & Archive** 

89% of 53 landmark cancer research papers are <u>irreproducible</u>

Reproducibility

Ships logs from the 18th century used for <u>climate research</u>

Reusability

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Reproducibility

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Reusability

Science = Explain + Repeat

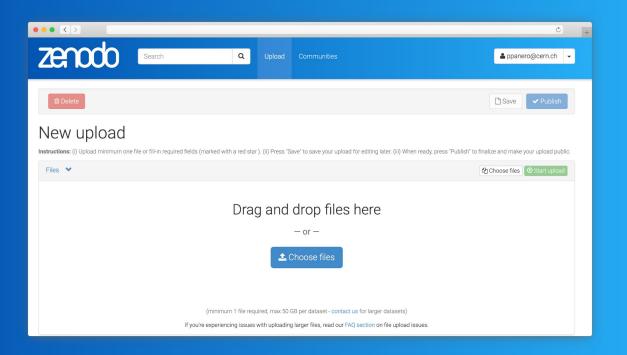
# How do we prevent this?

## Zenodo!

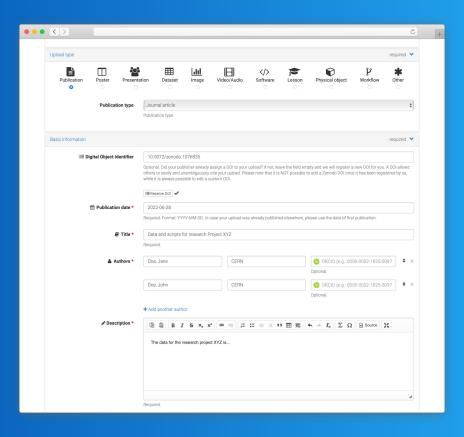


# How do I use Zenodo?

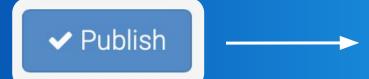
## Upload files

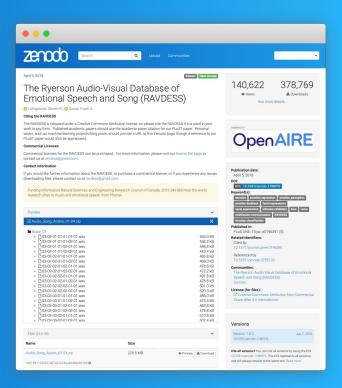


### Describe



### Done!

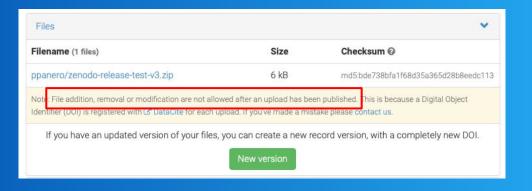




### **Archive**

### After publishing...

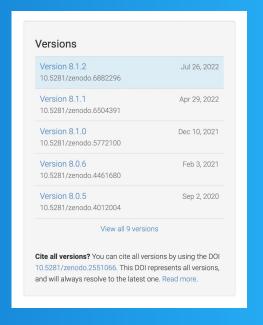
- You can edit the metadata
- You cannot edit the files



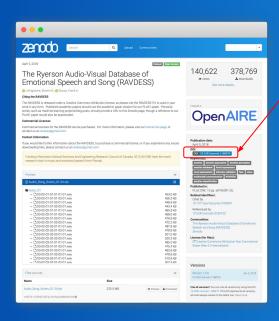
### Versioning

### To edit data, create a new version

Same as with code



### Citable DOIs



### DOI:

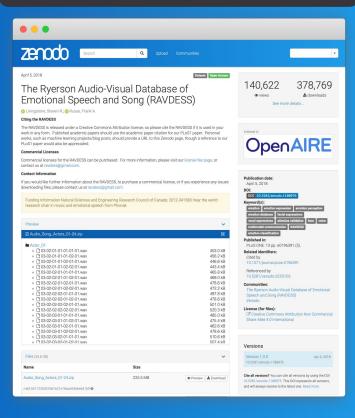
DOI 10.5281/zenodo.1188976

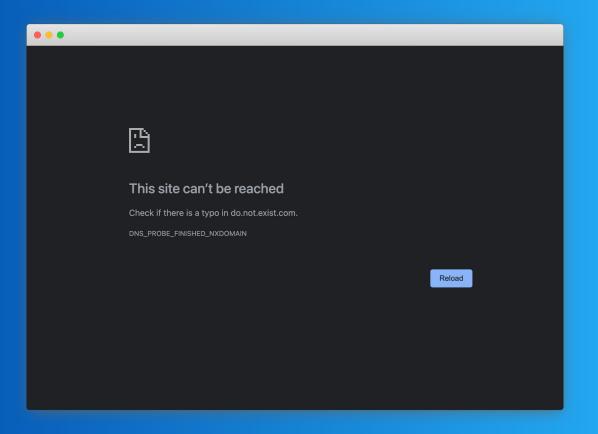
#### Cite as

Livingstone, Steven R., & Russo, Frank A. (2018). The Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS) [Data set]. In PLoS ONE (1.0.0, Vol. 13, Number 5, p. e0196391). Zenodo. https://doi.org/10.5281/zenodo.1188976

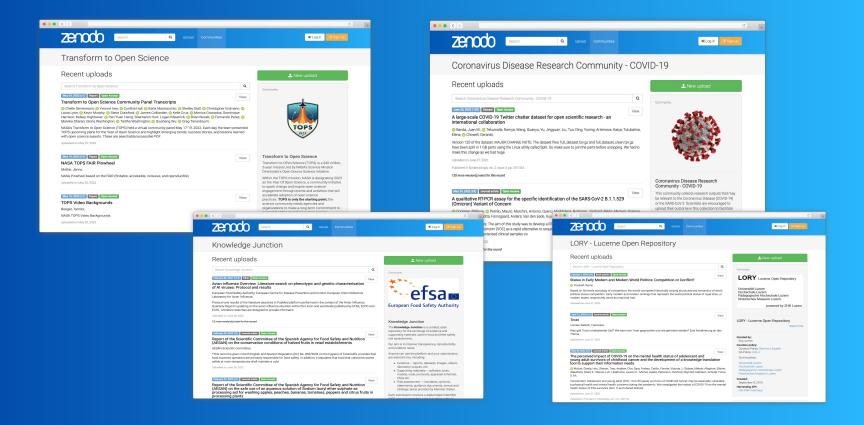
American Psychological Association 7th edition

### https://doi.org/10.5281/zenodo.1188976





### Communities

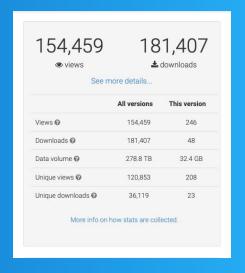


### Metrics and statistics

### When data is disseminated...

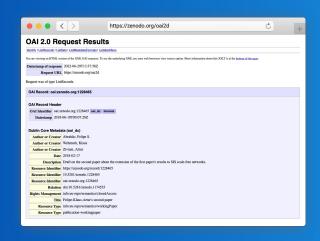
- We can compare to other sites
- They can be aggregated

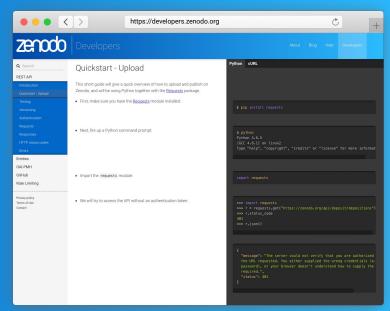




### OAI-PMH and RESTful API

- Features developed with "REST API"-first mindset
- OAI-PMH for harvesting parts of Zenodo (open access, communities)



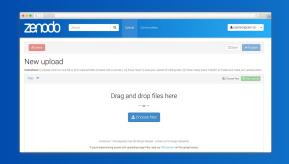


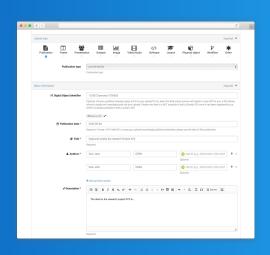
## 3 simple steps!

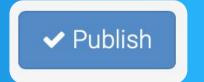
Upload files

Describe

Publish!



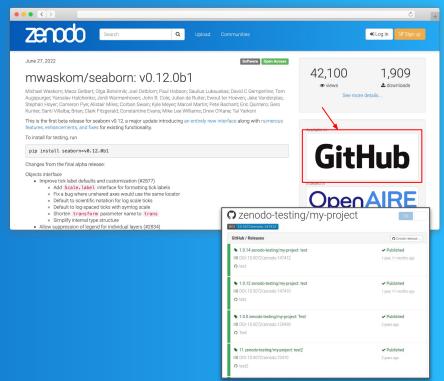




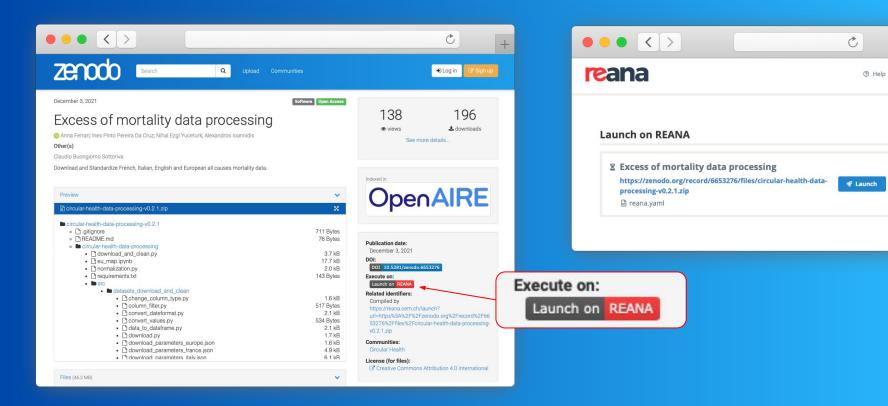
# What about software?

### GitHub integration





### **REANA** integration



# Why use Zenodo?

## Why not...?

#### Prevent research invalidation

- Data cannot be changed
- Data cannot be removed

### Improve citability and findability

• DOI, URLs do not change



# Why use Zenodo?

## Why use Zenodo?

**Trust** 

+10y of experience





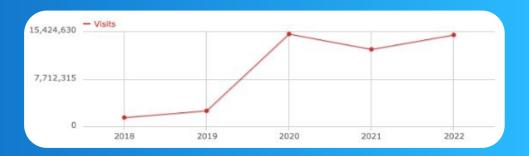


**Sustainability / Archiving plan** 

**Open Source** 

### Zenodo in numbers

- ~2.8M records
  - 1.5M text
  - o 750k images
  - 200k software
  - 200k datasets
- ~1PB data, ~8M files
- 15M visitors/year
  - Already 14.8M as of June 2022



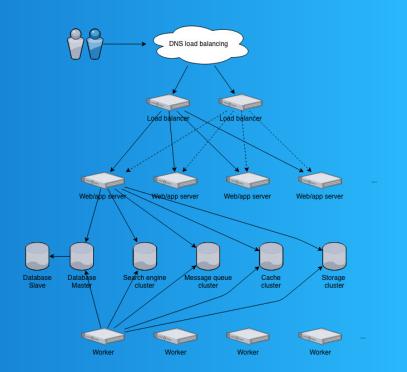


## How does Zenodo look?

### Architecture

- Monolith, no microservices
- Layered architecture
- Operations and incident response





## Technology stack













# Coming soon!

### Zenodo clones













### InvenioRDM

- Turn-key RDM solution
- Based on Invenio and Zenodo's
- 21+ partners
- Maximize impact
- Minimize costs
- Optimize Efforts





- Archive your data and software...
- Make it citable...
- Do it easily!