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# Practical Tools For Research in Economics: Lessons From R4R Program

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# Outline



RESEARCH, INNOVATION & IMPACT  
Data Science Institute



Arizona Institute  
for Resilience



CYVERSE®

## Brief Introduction:

- Roots for Resilience (R4R) program
- Foundational Open Science Skills (FOSS) workshop
  - Version Control: Git, GitHub
  - Documentation: GitHub Pages

## Useful Tools for Research:

- CyVerse
- Others (Data Visualization Tools, AI-powered Search)

# Roots for Resilience (R4R) Program

*“The Roots for Resilience Program provides training and support to select graduate students on open, reproducible science and computational infrastructure to enhance research focused on resiliency in the environment.”*

- This program is led by [Arizona Institute for Resilience \(AIR\)](#), [CyVerse](#), and the [Data Science Institute \(DSI\)](#)
- Cohort consists of 10 graduate students from various disciplines in UA
- Provides \$7,000 fellowship with requirements of weekly meetings (FOSS lectures, DSI workshops, discussions, etc.), learning journals, capstone project, and department presentation (5-10 hours/week)
- Next cohort is Fall 2024. Check out <https://datascience.arizona.edu/r4r> if interested!

# Foundational Open Science Skills (FOSS) Workshop

Week 0: The Unix Shell, Git and Github

Week 1: Introduction to Open Science

- Six Pillars of Open Science: Open Access Publications, Open Data, Open Educational Resources, Open Methodology, Open Peer Review, Open Source Software
- Open data does not necessarily mean publicly available
- FAIR & CARE principles

Week 2: Managing Data

- Data Management Plan
- Licenses

Week 3: Intro to Project Management

- Governance Operation document

**Week 4: Documentation & Communication**

- Build GitHub Pages website using MkDocs

**Week 5: Version Control**

- Git, GitHub

Week 6,7: Repeatability

- Containers, Docker, GitHub Codespaces



RESEARCH, INNOVATION & IMPACT  
Data Science Institute

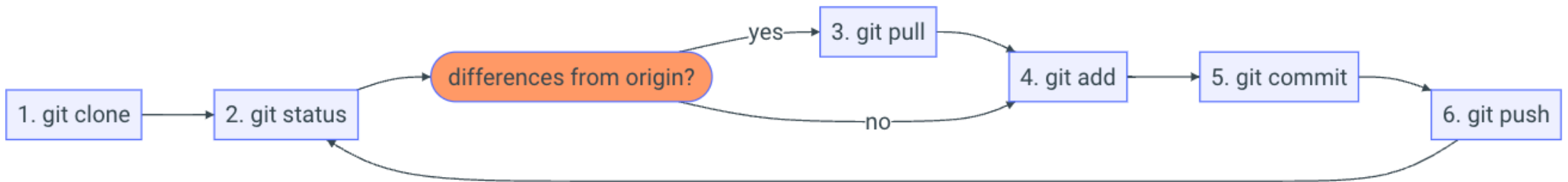
# Version Control

- Keeping track of changes you made to your files can be helpful
  - Efficient version control systems are valuable...
  - Even more valuable for collaborative work!
- **Git**: a command-line program for version control
  - Once you make a repository ('folders'), Git keeps track of changes you made to files in that repository and stores the changes in .git folder
  - Stores only the *differences* between different versions of files, instead of saving the whole files
  - Can be used on local machines alone
- **GitHub**: a cloud-based hosting service
  - Can remotely host your Git repositories
  - Can serve as a backup of the repositories, facilitate collaboration, ... etc.

# Version Control

- Basic commands (locally):
  - In Terminal, go to your folder: `cd folder_name`
  - Add changes to keep track of: `git add file_name`
  - Commit all added changes: `git commit -m "message for this change"`
  - Check status: `git status`

- Basic cycle (involving remote repositories):



Source: [https://foss.cyverse.org/05\\_version\\_control/](https://foss.cyverse.org/05_version_control/)

- More info on Git and GitHub: [https://foss.cyverse.org/05\\_version\\_control/](https://foss.cyverse.org/05_version_control/)

# Example: GitLab

The screenshot displays the GitLab interface for a repository named "Payment Adoption". The top navigation bar shows the current branch as "master" and the commit hash "936afb58". The commit history on the left lists several commits, with the most recent one being "analyze relationship between ind payment adoption and merchant acceptance" by yunting1121, authored 2 years ago. The main content area shows the diff for commit "383265cc" by yunting1121, titled "add sample definition; drop cashless subsample definition". The diff view shows changes to the file "coding/coding\_ind\_pmt\_panel.R", with 23 additions and 22 deletions. The changes are highlighted in green (additions) and red (deletions). The interface includes a sidebar with navigation options like "Project", "Pinned", "Issues", "Merge requests", "Manage", "Plan", "Code", "Merge requests", "Repository", and "Branches".

yunting1121 > Payment Adoption > Commits

master > payment-adoption

Author > Search by message

Feb 25, 2021

- analyze relationship between ind payment adoption and merchant acceptance  
yunting1121 authored 2 years ago
- analyze individual payment first usage  
yunting1121 authored 2 years ago

Feb 24, 2021

- drop observations within a week of the first observation  
yunting1121 authored 2 years ago
- add sample definition; drop cashless subsample definition  
yunting1121 authored 2 years ago
- create individual transaction level payment usage panel data  
yunting1121 authored 2 years ago

yunting1121 > Payment Adoption > Commits > 383265cc

Commit 383265cc authored 2 years ago by yunting1121

add sample definition; drop cashless subsample definition

parent 6a02ff87

Branches > Branches containing commit

No related merge requests found

Changes 1

Showing 1 changed file with 23 additions and 22 deletions

Show whitespace changes Inline Side-by-side

```
coding/coding_ind_pmt_panel.R +23 -22 View file @ 383265cc
... @@ -117,25 +117,26 @@ rm(Data_dum, Data_est, period_list)
117 mutata(first_use3 = row_number() == 1) %>% ungroup
118
119
120 - # 3. Extract individuals who use cashless after policy for the
120 + # 3. Properly define sample
121 - # create after policy indicator
121 + # check data starting date for individuals
122 - df <- df %>% mutata(after = ifelse(date >= "2019-10-01", 1, 0))
122 + id_first_ob <- df %>% select(id, date) %>% arrange(id, date) %>%
123 + group_by(id) %>% filter(row_number() == 1) %>% ungroup
124
124
125 - # summarise individual first usage before/after policy
125 + # latest date of entering sample
126 - id_usage3 <- df %>% group_by(id, after, pmt3) %>%
126 + # "2019-09-25"
127 - summarise(use = sum(first_use3)) %>% ungroup %>%
127 + max(id_first_ob$date)
128 - right_join(crossing(id = id_list, pmt3 = levels(df$pmt3)))
128
129 - # extract individuals who didn't use cashless before policy but
129 + # check month distribution
```

# Documentation

- Project documentation can be valuable for others to understand our approaches
  - Even more valuable for future ourselves (and our collaborators)!
  - Do you think you can understand your codes and data one year from now? five years from now?
- Effective documentation must consider the followings:
  - Clarity, Completeness, Accuracy, Organization, Relevance
- Public documentation: **GitHub Pages**
  - Can render website using MkDocs
  - Can create website context simply using Markdown
  - Your website will be automatically updated every time you commit a change
  - Hands-on tutorial: [https://foss.cyverse.org/04\\_documentation\\_communication/#hands-on-building-a-github-pages-website-using-mkdocs](https://foss.cyverse.org/04_documentation_communication/#hands-on-building-a-github-pages-website-using-mkdocs)



# Example: GitHub Pages Website

- Website created for FOSS Capstone Project

The screenshot shows a GitHub Pages website for a project named 'foss-capstone'. The page title is 'Data Management Plan'. The navigation menu includes 'Project Website', 'Home', 'Data Management Plan', and 'Governance Operations'. A search bar is located in the top right corner. The main content area displays the start of the '1. Data Description' section, which discusses historical business data provided by Data Axle.

**Project Website**

- Home
- Data Management Plan
- Governance Operations

## Data Management Plan

This document records data management plan for my 2<sup>nd</sup> year project, "Cost of Pollution to Firms: Water Pollution and Beverage Manufacturers' Entry". It currently focuses on the main dataset used in the project. This document will be updated to reflect changes as the project proceeds.

### 1. Data Description

Historial Business Data is provided by Data Axle, accessed through Wharton Data Service (WDS). Data includes company information for all establishments in the United States. Data includes company information for all establishments in 2021. The data is stored in csv files.

**On this page**

1. Data Description
2. Data Collection
3. Data Storage and Backup
4. Data Organization and Documentation
5. Data Preservation and Long-Term Access
6. Data Sharing and Access
7. Data Ethics and Privacy

ytzeh / foss-capstone

Code Issues Pull requests Actions Projects Wiki Security Insights Settings

foss-capstone / docs / Data\_Management\_Plan.md

ytzeh Update Data\_Management\_Plan.md ✓ 99c1ba0 · last month History

Preview Code Blame 33 lines (22 loc) · 1.83 KB Code 55% faster with GitHub Copilot Raw Download Edit

```
1 ## Data Management Plan
2 </br>
3
4 This document records data management plan for my 2nd year project, "Cost of Pollution to Firms: Water Pollution and Beverage Manufacturers' Entry".
5
6 </br>
7
8 #### 1. Data Description
9 Historial Business Data is provided by Data Axle, accessed through Wharton Data Service (WDS). Data includes company information for all establishments
10
```

# CyVerse



Website: <https://cyverse.org/>

Learning Center: <https://learning.cyverse.org/>

Self-guided Course: [https://cyverse-learning-materials.github.io/cyverse\\_mooc/](https://cyverse-learning-materials.github.io/cyverse_mooc/)

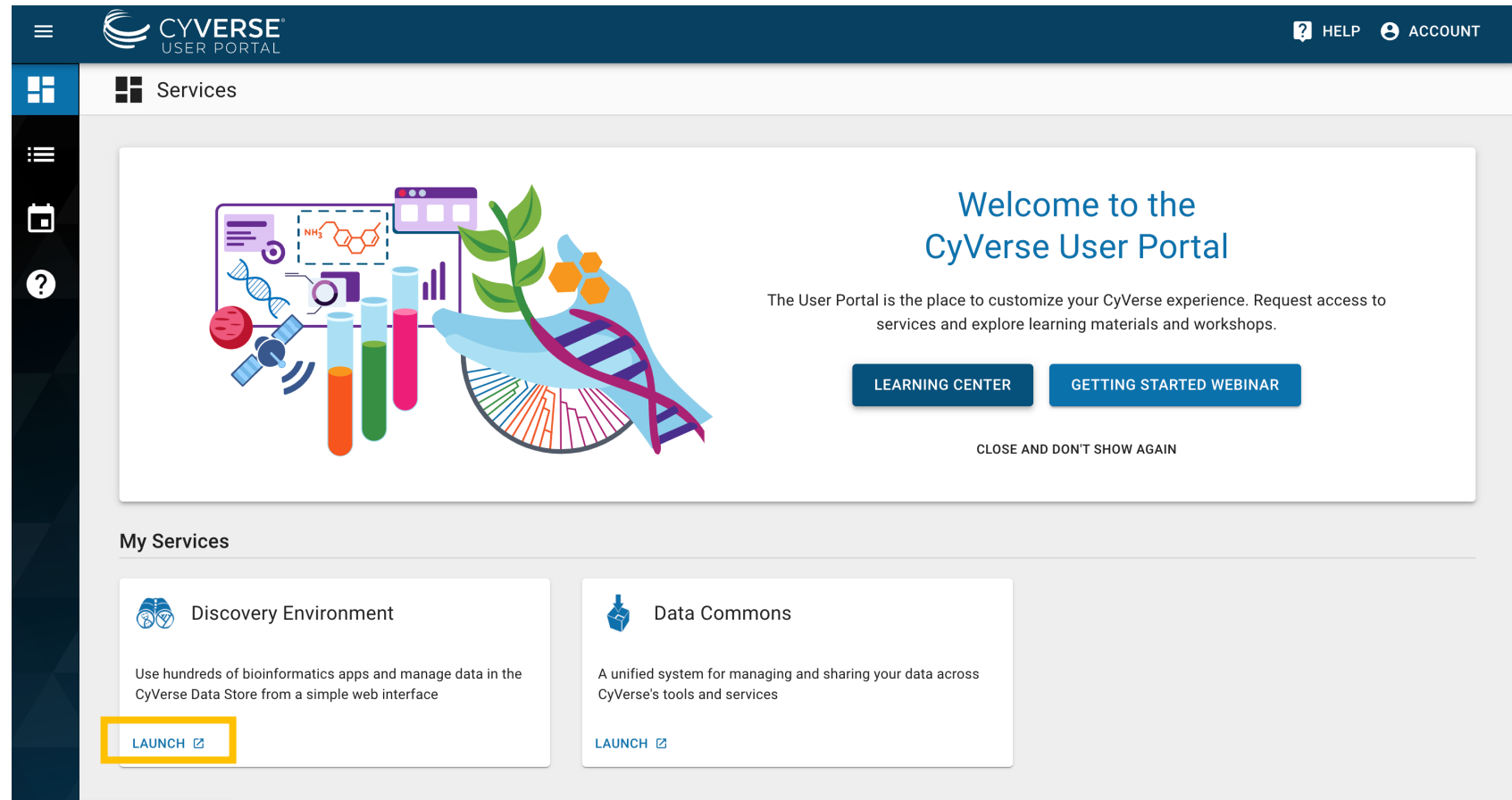
- CyVerse is a powerful computational infrastructure built to handle huge datasets and complex analyses
- Offer subscriptions with different tiers (including free tier)
- Main features
  - Data Store: cloud-based data storage
  - Discovery Environment: platform with simple web interface for managing and sharing data or running analyses
  - Classrooms...

# CyVerse: Advantages

- UA students have *free* Pro account
  - 3 TB of data storage
  - 20,000 compute units (core hours on CPU)/year
  - Access to GPU
- Easy data transfer
- Easy data sharing with other users
- Less wait on using computation resources
- Can keep the account even after graduation! (May need to pay for subscription if not using free account)

# CyVerse: Sign up

- Create account at <https://user.cyverse.org/signup> using **UA email** (to get free Pro account)
- Go to user portal



The screenshot displays the CyVerse User Portal interface. At the top, a dark blue header contains the CyVerse logo and 'USER PORTAL' text on the left, and 'HELP' and 'ACCOUNT' links on the right. Below the header, a 'Services' section is visible. A large central banner features a colorful illustration of a hand holding a DNA double helix, surrounded by icons for a computer monitor, test tubes, a satellite, and a bar chart. To the right of the illustration, the text reads 'Welcome to the CyVerse User Portal' and 'The User Portal is the place to customize your CyVerse experience. Request access to services and explore learning materials and workshops.' Below this text are two blue buttons: 'LEARNING CENTER' and 'GETTING STARTED WEBINAR'. At the bottom of the banner, there is a link that says 'CLOSE AND DON'T SHOW AGAIN'. Below the banner, a 'My Services' section lists two services: 'Discovery Environment' and 'Data Commons'. Each service card includes a brief description and a 'LAUNCH' button with an external link icon.

**CYVERSE**  
USER PORTAL

HELP ACCOUNT

Services

## Welcome to the CyVerse User Portal

The User Portal is the place to customize your CyVerse experience. Request access to services and explore learning materials and workshops.

LEARNING CENTER GETTING STARTED WEBINAR

CLOSE AND DON'T SHOW AGAIN

### My Services

**Discovery Environment**  
Use hundreds of bioinformatics apps and manage data in the CyVerse Data Store from a simple web interface  
LAUNCH

**Data Commons**  
A unified system for managing and sharing your data across CyVerse's tools and services  
LAUNCH

# CyVerse: Discovery Environment

- Click 'launch' on Discovery Environment or go to <https://de.cyverse.org/>

The screenshot displays the CyVerse Discovery Environment dashboard. The top navigation bar includes the 'DISCOVERY ENVIRONMENT' logo, a search bar, and user profile information. A sidebar on the left contains navigation icons for home, search, dashboard, and settings. The main content area features a 'Resource Usage' section with a yellow highlight around the text 'Your current subscription tier is Pro.' and a 'Buy' button. Below this, two charts show 'Data Storage' usage (0.98% of 3.0 TiB limit) and 'CPU Consumption' usage (82.82% of 20,000 Core Hours limit).

**Resource Usage**

Your current subscription tier is **Pro**. [Buy](#)

Effective Period: 2023-09-18 23:00:41 - 2024-09-18 23:00:41

**Data Storage**  
Using 0.98% as of 2023-11-29 18:55:34

Usage	Limit
0.98%	3.0 TiB (Limit)

**CPU Consumption**  
Using 82.82% as of 2023-11-29 02:11:30

Usage	Limit
16563.78	20000 Core Hours (Limit)

# CyVerse: Data Store

- Click the second icon on the left panel

DISCOVERY ENVIRONMENT

Search: Data

Home | Home | Home | Home | Home | Home | Home | Home | Home | Home

ytyeh

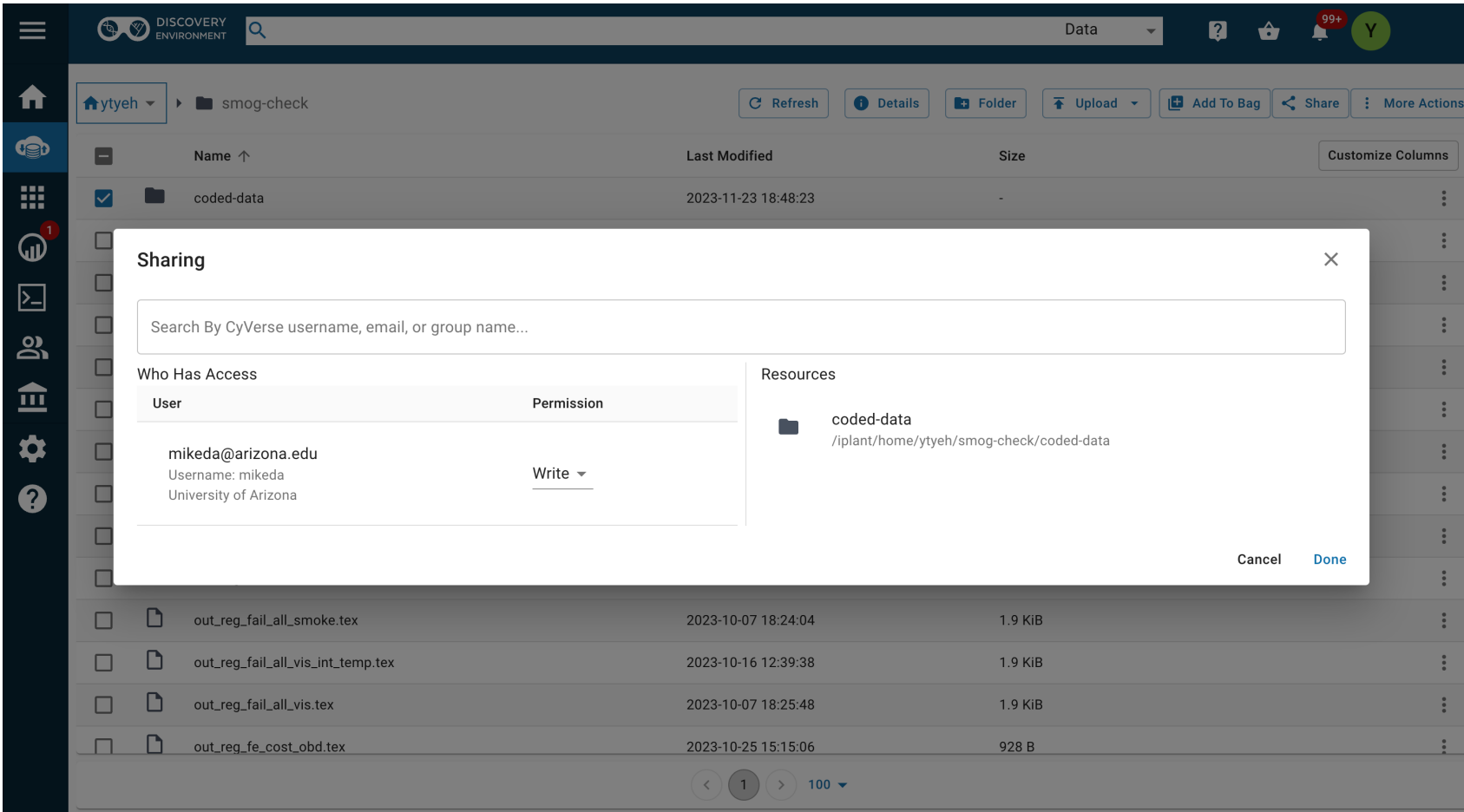
Refresh Folder Upload More Actions

<input type="checkbox"/>	Name ↑	Last Modified	Size	Customize Columns
<input type="checkbox"/>	analyses	2023-09-19 12:00:32	-	⋮
<input type="checkbox"/>	smog-check	2023-09-26 14:27:13	-	⋮

< 1 > 100

# CyVerse: Data Store

- Can easily share files/folders with other users (You'll need to know their username) and give permissions (Read/Write/Own)



The screenshot displays the CyVerse Data Store interface. At the top, the navigation bar includes the 'DISCOVERY ENVIRONMENT' logo, a search bar, and a dropdown menu set to 'Data'. The main content area shows a file browser view for the user 'ytyeh' in the 'smog-check' directory. A 'Sharing' dialog box is open, allowing the user to share the 'coded-data' folder. The dialog includes a search field for users, a table of current access permissions, and a list of resources.

**Sharing Dialog Details:**

Search By CyVerse username, email, or group name...

User	Permission
miked@arizona.edu Username: miked University of Arizona	Write

**Resources:**

- coded-data  
/iplant/home/ytyeh/smog-check/coded-data

Buttons: Cancel, Done

# CyVerse: Data Store

- Click 'Shared With Me' and find the user that shares data with you

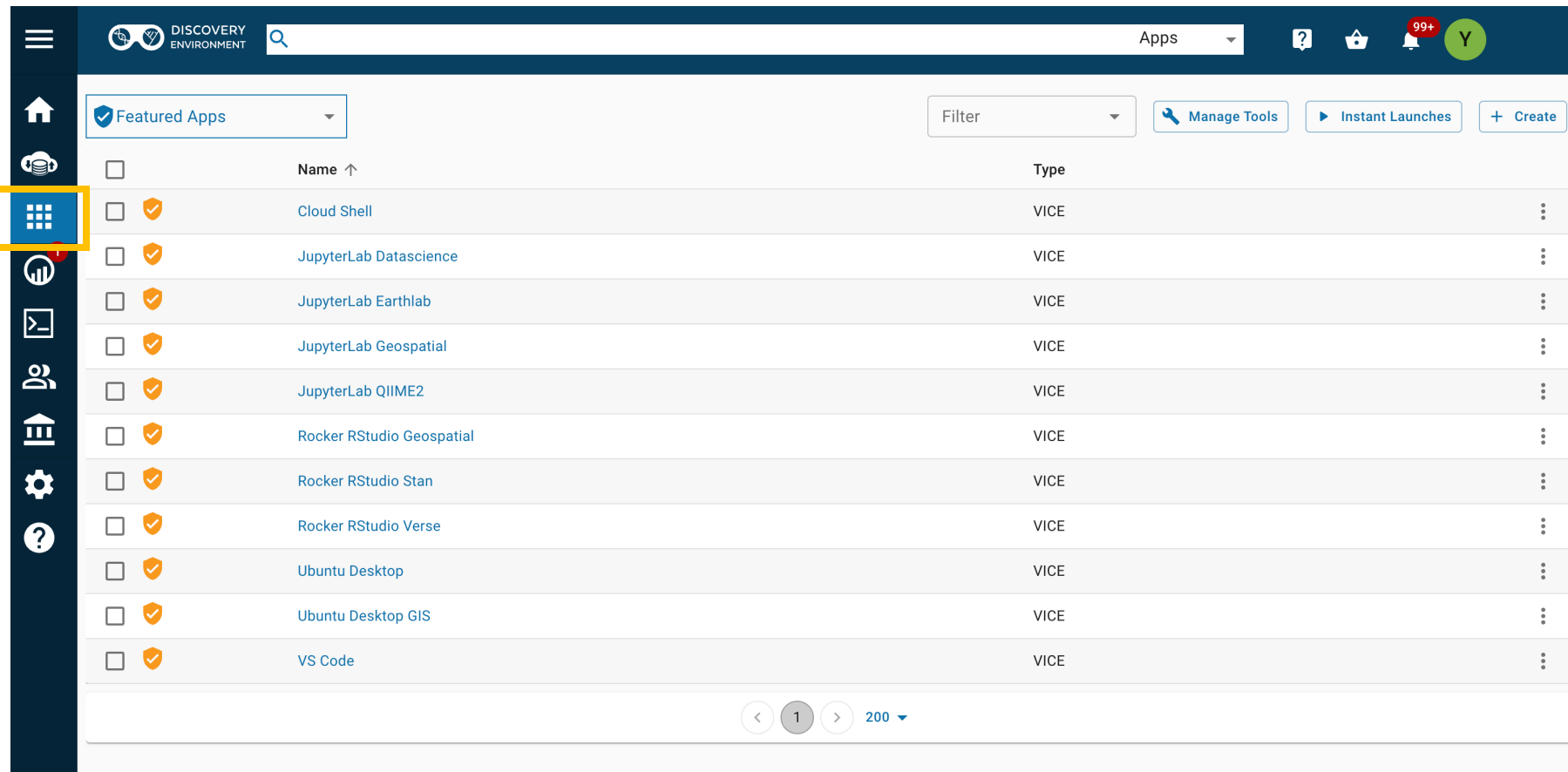
The screenshot shows the CyVerse Data Store interface. At the top, there is a navigation bar with the Discovery Environment logo, a search bar, and a dropdown menu set to 'Data'. On the left, a sidebar contains various navigation icons, with the 'Shared With Me' icon highlighted in a yellow box. The main content area displays a table of shared folders. The table has columns for 'Name', 'Last Modified', and 'Size'. The folder 'mikeda' is selected, indicated by a blue checkmark in the first column. Below the table, there are pagination controls showing page 1 of 100.

	Name ↑	Last Modified	Size	
<input type="checkbox"/>	Imcguire	2018-10-23 18:48:11	-	⋮
<input type="checkbox"/>	lwang	2022-03-01 18:31:59	-	⋮
<input type="checkbox"/>	maizecode	2015-10-13 22:03:19	-	⋮
<input type="checkbox"/>	mian	2023-03-13 10:58:29	-	⋮
<input checked="" type="checkbox"/>	mikeda	2023-09-22 17:54:38	-	⋮
<input type="checkbox"/>	moontree1985	2017-11-15 12:39:18	-	⋮
<input type="checkbox"/>	mtruncatula	2014-08-18 08:55:36	-	⋮
<input type="checkbox"/>	mwoodhouse	2022-02-18 05:06:51	-	⋮
<input type="checkbox"/>	nevp	2022-09-09 10:59:25	-	⋮
<input type="checkbox"/>	nimkulip	2014-05-07 13:40:30	-	⋮
<input type="checkbox"/>	nirav	2022-07-09 10:27:14	-	⋮
<input type="checkbox"/>	nmiller	2022-01-24 17:37:19	-	⋮
<input type="checkbox"/>	nowlanf	2022-11-09 08:38:02	-	⋮
<input type="checkbox"/>	okamuralab	2019-04-02 19:46:01	-	⋮



# CyVerse: Apps

- Various apps to choose from for analyses, including interactive ones
- Ex. Command line Interface, R, Python (probably not Stata...)

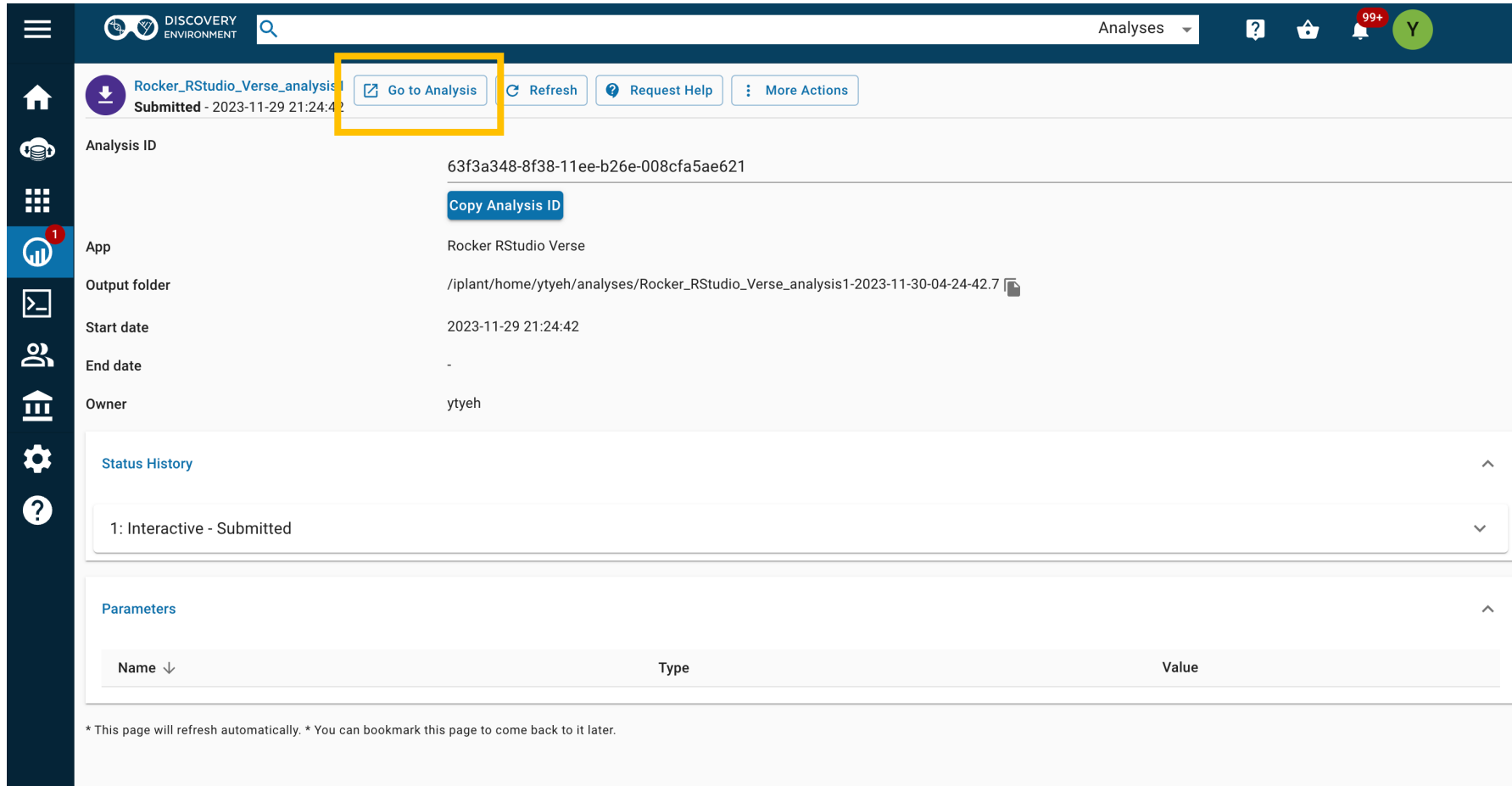


The screenshot displays the CyVerse Apps interface. At the top, there is a navigation bar with the 'DISCOVERY ENVIRONMENT' logo, a search bar, and user profile information. Below the navigation bar, a sidebar on the left contains various icons, with a grid icon highlighted by a yellow box. The main content area shows a list of 'Featured Apps' with columns for 'Name' and 'Type'. The list includes applications like Cloud Shell, JupyterLab variants, and RStudio variants, all categorized as 'VICE'. A pagination bar at the bottom indicates the current page is 1 of 200.

<input type="checkbox"/>	Name ↑	Type
<input type="checkbox"/>	Cloud Shell	VICE
<input type="checkbox"/>	JupyterLab Datascience	VICE
<input type="checkbox"/>	JupyterLab Earthlab	VICE
<input type="checkbox"/>	JupyterLab Geospatial	VICE
<input type="checkbox"/>	JupyterLab QIIME2	VICE
<input type="checkbox"/>	Rocker RStudio Geospatial	VICE
<input type="checkbox"/>	Rocker RStudio Stan	VICE
<input type="checkbox"/>	Rocker RStudio Verse	VICE
<input type="checkbox"/>	Ubuntu Desktop	VICE
<input type="checkbox"/>	Ubuntu Desktop GIS	VICE
<input type="checkbox"/>	VS Code	VICE

# CyVerse: Apps

- Click the app, set maximum cores you need, and click launch

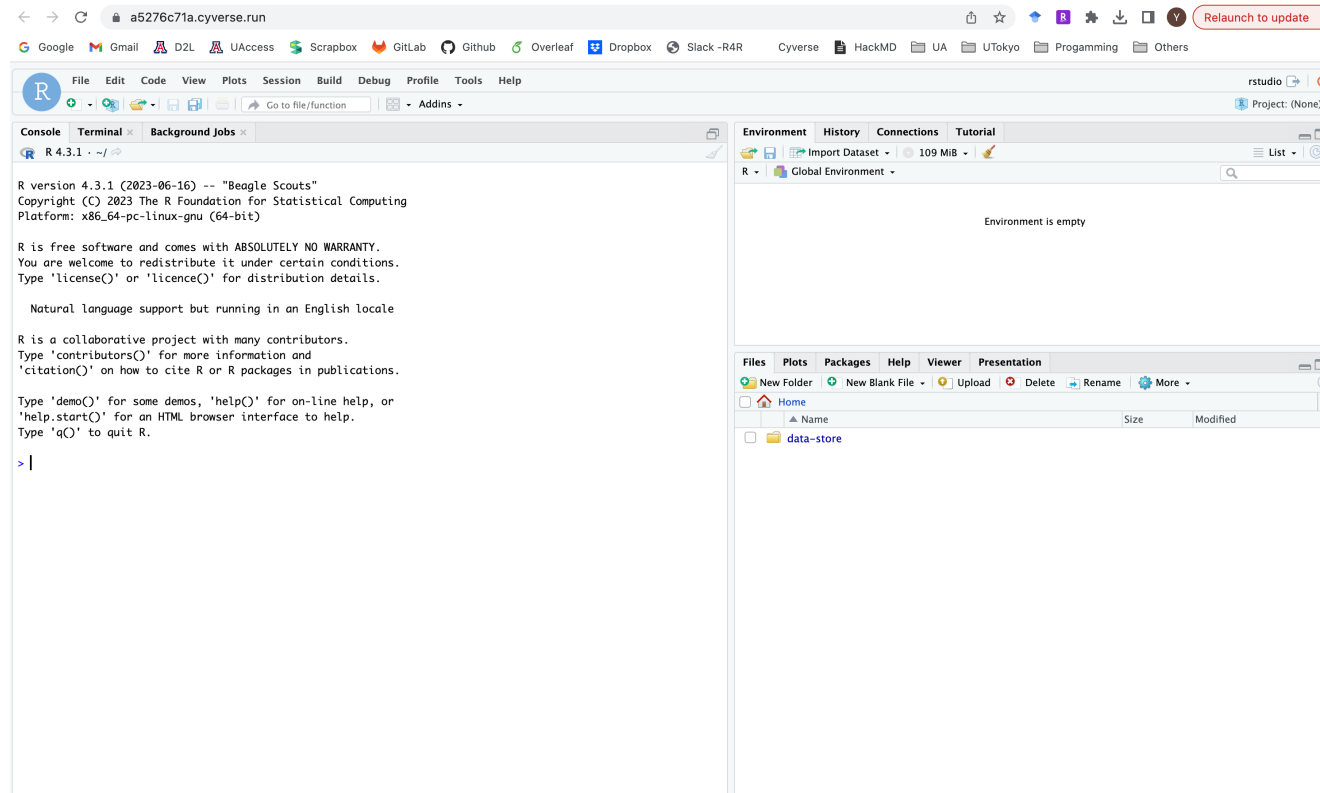


The screenshot displays the CyVerse Discovery Environment interface. The top navigation bar includes the 'DISCOVERY ENVIRONMENT' logo, a search bar, and a dropdown menu for 'Analyses'. A sidebar on the left contains various navigation icons, with the 'App' icon highlighted in blue and marked with a red '1'. The main content area shows details for an analysis titled 'Rocker\_RStudio\_Verse\_analysis1', which was submitted on 2023-11-29 at 21:24:42. A yellow box highlights the 'Go to Analysis' button. Below the title, there are buttons for 'Refresh', 'Request Help', and 'More Actions'. The analysis ID is 63f3a348-8f38-11ee-b26e-008cfa5ae621, and a 'Copy Analysis ID' button is provided. The 'App' is identified as 'Rocker RStudio Verse'. The 'Output folder' is /iplant/home/ytyeh/analyses/Rocker\_RStudio\_Verse\_analysis1-2023-11-30-04-24-42.7. The 'Start date' is 2023-11-29 21:24:42, and the 'End date' is '-'. The 'Owner' is ytyeh. A 'Status History' section shows '1: Interactive - Submitted'. A 'Parameters' section is partially visible with a table header: Name ↓, Type, and Value. A footer note states: '\* This page will refresh automatically. \* You can bookmark this page to come back to it later.'

Name ↓	Type	Value
--------	------	-------

# CyVerse: Apps

- Launch an R Studio session on your browser!
- Can access Data Store to load/save your data and codes
- Will need to install packages every time you open a new session...



# CyVerse: Analyses

- Can check or terminate analyses here

DISCOVERY ENVIRONMENT

Analyses

View: My Analyses Filter

Refresh Terminate Details Add To Bag Share More Actions

Name	Status	Start date ↓	Duration
Rocker_RStudio_Verse_analysis1	Completed	2023-11-29 21:24:42	2 minutes
Rocker_RStudio_Geospatial_analysis1	Completed	2023-11-29 02:06:19	5 minutes
Rocker_RStudio_Verse_analysis1	Completed	2023-11-29 01:55:29	11 minutes
Rocker_RStudio_Geospatial_analysis1	Completed	2023-11-28 21:13:14	about 5 hours
<input checked="" type="checkbox"/> Rocker_RStudio_Verse_analysis1	Running	2023-11-28 12:12:03	1 day
Rocker_RStudio_Verse_analysis1	Completed	2023-11-28 12:01:16	about 9 hours
Rocker_RStudio_Verse_analysis1	Completed	2023-11-28 11:31:14	41 minutes
Rocker_RStudio_Geospatial_analysis1	Completed	2023-11-27 12:35:19	about 7 hours
Rocker_RStudio_Verse_analysis1	Completed	2023-11-27 11:51:37	1 day
Rocker_RStudio_Verse_analysis1	Completed	2023-11-26 17:59:37	about 4 hours
Rocker_RStudio_Verse_analysis1	Completed	2023-11-24 15:10:13	about 21 hours
Rocker_RStudio_Verse_analysis1	Completed	2023-11-23 18:37:44	38 minutes
Rocker_RStudio_Verse_analysis1	Completed	2023-10-26 13:17:27	about 4 hours
Rocker_RStudio_Geospatial_analysis1	Completed	2023-10-25 12:50:36	1 day
Rocker_RStudio_Verse_analysis1	Completed	2023-10-25 12:21:02	1 day
Cloud_Shell_analysis1	Completed	2023-10-23 21:54:50	about 12 hours

1 100

# CyVerse: Data Transfer

- Move data between Data Store and your local computers
  - Discovery Environment web interface (limit: <2GB upload)
  - Cyberduck desktop app (similar to Globus for UA HPC)
  - **GoCommands**
- GoCommands
  - Command line tool which is operated in terminal
  - For Windows, use PowerShell or CommandPrompt
  - Once installed with configurations set up, very handy to transfer data

# CyVerse: Data Transfer

- GoCommands

- Follow <https://learning.cyverse.org/ds/gocommands/> for installation and configuration setup

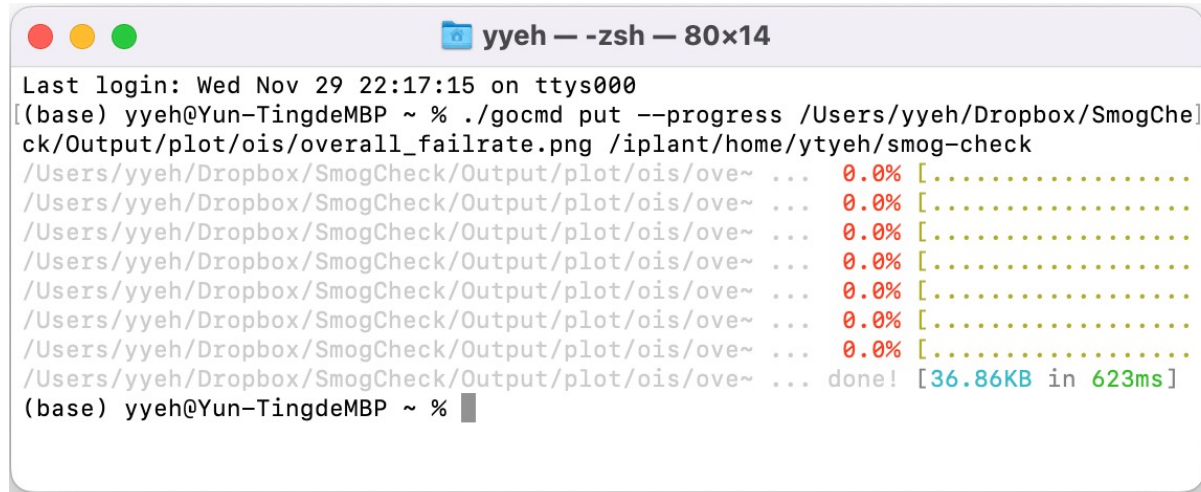
- Upload data using put subcommand:

```
./gocmd put --progress /local_directory /iplant/home/cyverse_username/destination_folder
```

- Download data using get subcommand:

```
./gocmd get --progress /iplant/home/cyverse_username/target_file /local_destination
```

- Can easily transfer files or folders!



```
yyeh — -zsh — 80x14
Last login: Wed Nov 29 22:17:15 on ttys000
[(base) yyeh@Yun-TingdeMBP ~ % ./gocmd put --progress /Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/overall_failrate.png /iplant/home/ytyeh/smog-check
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... 0.0% [.....]
/Users/yyeh/Dropbox/SmogCheck/Output/plot/ois/ove~ ... done! [36.86KB in 623ms]
(base) yyeh@Yun-TingdeMBP ~ %
```

# More Tools...

## Data Visualization Tools

- Voyager: <https://vega.github.io/voyager/>
- RAWGraphs: <https://www.rawgraphs.io/>

## Generative AI in Google Search

- Only need Chrome browser & Google account
  - Click 'Lab icon' on a new page and turn on SGE (Search Generative Experience)
  - Only available for users in the US
- For some search, you'll have an option to generate an AI-powered overview
  - Additional option to enter a new conversation model and ask follow up questions

# Example: Generative AI in Search

- Particularly helpful in *locating* policy documents...
- Comes with links to references!

Google why did california bar introduce ois technology for smog inspection? x

Perspectives News Images Qui Videos Shopping Books Maps Flights All filters Tools SafeSearch

Generative AI is experimental. Info quality may vary. Learn more

The Bureau of Automotive Repair (BAR) introduced the BAR On-Board Diagnostic Inspection System (BAR-OIS) to improve vehicle emissions testing. The BAR-OIS is required for the following vehicles:

- Most gasoline vehicles from 2000 and newer
- Hybrid vehicles
- Alternative-fuel vehicles
- Most diesel vehicles from 1998 and newer

The BAR-OIS aims to:

- Improve air quality
- Reduce the cost of Smog Checks
- Reduce the time it takes to get a vehicle inspected

The BAR also introduced a Continuous Testing Program (CTP) Pilot program. This program uses telematics to reduce the need for in-person Smog Checks.

Department of Consumer Affairs  
**BAR**  
Bureau of Automotive Repair  
BAR On-Board Diagnostic...

Geotab and the California BAR: What...  
Nov 17, 2020  
Geotab

Smog Check program legislation aims for clean air benefits ...  
Feb 23, 2010  
Califor...

What is California Bar OIS? What is the new smog law in California in 2023? Will California get rid of smog checks?

Ask a follow up...



# Resources

- Prompt Engineering (GPTs): [https://ua-data7.github.io/introllms/chatgpt\\_prompts/](https://ua-data7.github.io/introllms/chatgpt_prompts/)
- Find AI Tools: <https://github.com/ua-data7/LearningResources/wiki/AI-Tools-Landscape>
- Data Service at Library: <https://data.library.arizona.edu/data-management>
- FOSS materials: <https://foss.cyverse.org/>
- DataLab workshops by DSI: <https://www.datascience.arizona.edu/calendar>
- Workshop recordings: <https://www.youtube.com/c/CyverseOrgProject/videos>
- Events for researchers: <https://researchbazaar.arizona.edu/>
  - Coffee and Code, Hacky Hour, Community Events, ... etc.

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# Thank you!

Contact me at [yyeh@arizona.edu](mailto:yyeh@arizona.edu) if you have any questions 😊

## Reference:

This material is based upon work supported by the National Science Foundation under Award Numbers DBI-0735191, DBI-1265383, and DBI-1743442. URL: [www.cyverse.org](http://www.cyverse.org)