2022 Sagan Summer Workshop

Exoplanet Science in the Gaia Era

Getting Started Guide: Google Colab, Glue, and Gaia

For the workshop hands-on sessions, participants can choose to run the exercises from their own installation of Python or use Google Colaboratory notebooks. These instructions are for the Google Colaboratory notebooks. In addition, participants should install the visualization tool Glue and create a Gaia Archive user account (see page 4).

Google Colaboratory allows you to execute Python in a browser without configuring Python in your local system. The Python code is run from a notebook environment similar to Jupyter notebooks with execution and text cells. For a general introduction to Colaboratory, see:

What is Colaboratory?
https://colab.research.google.com/notebooks/intro.ipynb

Overview of Colaboratory Features
https://colab.research.google.com/notebooks/basic_features_overview.ipynb

Workshop Colaboratory Instructions

You will need:
- A Google account: https://www.google.com/account/about/
- About 1 GB storage available in Google Drive for the files that will be downloaded for the hands-on sessions. *Note that Google accounts come with 15 GB of free storage, but if your personal account has insufficient storage left, then you can create a new Google account*.

Verify that you have about 1 GB storage available:
1) Log into your Google account
2) Navigate to Google Drive - either follow this link: https://drive.google.com/drive/my-drive   OR from your account click on the dot navigation and then click on the Drive icon.
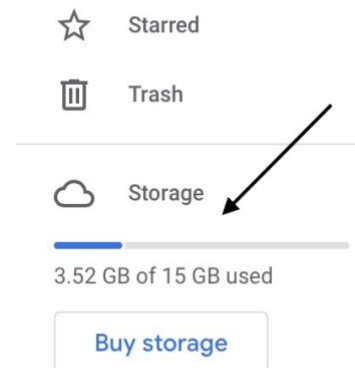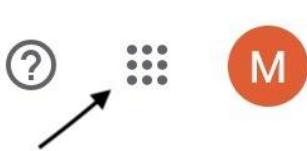
3) Once in Drive, on the left side menu, there is a section called "Storage" which will show how much space you have available. If you have insufficient storage in your Google account, we suggest creating a new account rather than purchasing storage. Note that if you hit the limit of storage, it will affect your email usage, so it is better to create a new account if you already have ~14 GB used.

SSW 2022 Google Colab notebooks

You will copy Google Colaboratory Notebooks to your Google Drive (see below).

Gaia Catalog and Visualization Hands-on Session

SSW2022_Colab_GaiaHandsOn.ipynb
https://colab.research.google.com/drive/1mqm9bYcQLd3sVTEf9gopH3ZOqfPbUKCz

➤ **Here is the notebook with answers (SSW2022_Colab_GaiaHanddsOn-Answers.ipynb):**
https://colab.research.google.com/drive/1xklaaxvKyycou7DA0GwA0_YE3buxBAFh

SSW2022_Colab_GaiaHandsOn-TransitingPlanetsDR3.ipynb
https://colab.research.google.com/drive/1TwFsLWJbvM6wNpCXHRO1cnfwxLtm9sr3

➤ **Here is the notebook with answers (SSW2022_Colab_GaiaHandsOn-TransitingPlanetsDR3-Answers.ipynb):**
https://colab.research.google.com/drive/1RT0Gai9C4lhlbUB-7bBpwup_9A9C6YQ4

Orbital Fits using Orvara Hands-on Session

SSW2022_Colab_Orvara_Tutorial.ipynb
https://colab.research.google.com/drive/1lmINMy-zJSQfrf6lXjG25pgPoz-0gVv9

SSW2022_Colab_Orvara_Projects.ipynb
https://colab.research.google.com/drive/1--a2Ex6NnJ_-COVZE7aldUEXRub0G4Aa

SSW2022_Colab_Orbital_Fit_Challenge.ipynb
https://colab.research.google.com/drive/1zkG_ug5JI4y8Ojb_ob9H6g5OIUjX5VcW

➤ **Here is the notebook with answers (SSW2022_Colab_Orbital_Fit_Challenge-Answers.ipynb):**
https://colab.research.google.com/drive/14XO0Yzgm2qAHnNH7QkQzwkdX0S_QC--Y

Follow these steps to copy the Notebooks to your Google Drive:

1) Log into your Google account with the available storage – make sure you have signed out of all other Google accounts if you have logged into more than one.

2) From the browser where you have logged into your Google account, put in the URL of the notebook (see above).

3) The notebook will open in your browser. You should see your profile/initial on the upper right side of the page. If you see "Sign in", log into your Google account.

4) Under the name of the notebook, there will be "File, Edit, View" etc. Click on "File" and then select "Save a Copy in Drive" (see image on the right).

5) You will be prompted to open the notebook in a new tab or window, and the notebook name will be prefaced with "Copy of". You can rename the notebook by clicking on the name. The notebooks will be saved in your Google Drive https://drive.google.com/drive/my-drive in a directory called "Colab Notebooks".
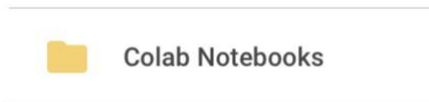
6) Close the notebook browser windows.

7) Repeat this process to save all the Google Colab notebooks to your Google Drive.
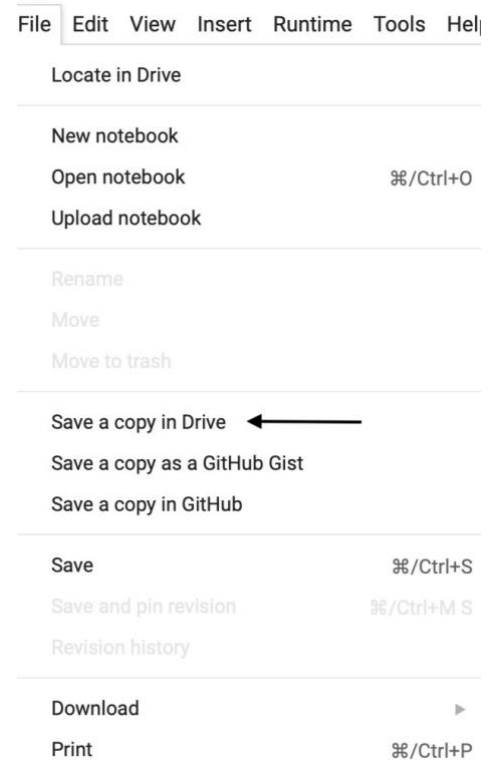
Instructions for Using Google Notebooks

Launching the Google Notebook

1) Login to your Google account where you have saved the notebooks.
2) Go to your Google drive: https://drive.google.com/drive/my-drive
3) Click on Colab Notebooks directory
4) Click on the Google notebook.

Running the Notebooks

For the hands-on activities notebooks, you should step through each cell individually by clicking on the right-facing triangle to the left of each cell (▶). Be sure to run all the initialization cells before the exercise cells.

Useful Colab Top Menu items

- **File** -> Save   Saves the file to your Google Drive
- **File** -> Download   Downloads a .ipynb (Jupyter Notebook) or .py (Python) version to your local machine
- **Edit** -> Clear all outputs   Clears the output from all cells
- **Runtime** -> Run all   Run all the cells. Can be run multiple times.

- **Runtime** -> Disconnect and delete runtime   Disconnects and exits the runtime and resets the notebook variables back to its original state and only useful if the notebook gets into an odd state. It does not affect the files that have been downloaded to your drive. To restart the notebook, use the "Reconnect" button on the right.
- **Table of contents** – the 3 orange horizontal lines at the top left; clicking on them shows/hides the Table of contents.
- Closing the browser window stops the Colab instance.

Gaia Catalog and Visualization Hands-on Session

Creating a Gaia Archive User Account

Some of the exercises in this hands-on session will require you to be registered as a user of the Gaia Archive (if you plan on making use of Gaia data regularly, this is in any case a good idea). The registration is easy and quick (and free) and offers the following features:

- 20 GB of space to store query results
- the option to create and share your own tables ('user tables')
- longer timeout for large or complex query jobs

Follow this link to register: https://www.cosmos.esa.int/web/gaia-users/register.

Installing Glue and Downloading Catalogs

Glue is a visualization tool to explore datasets. You can find more information here:
https://glueviz.org/index.html

Install the standalone application (available for MacOS X and Windows):
https://glueviz.readthedocs.io/en/stable/installation/standalone.html

Once installed, Glue is launched by clicking on the Glue icon of the GlueViz application.

Basic GUI features are described here:
https://docs.glueviz.org/en/stable/getting_started/index.html

Glue visualizations: Gaia Catalog of Nearby Stars and Exoplanet Archive

Download these three files and unzip them (note that the first two files are fairly large, 100-300 MB):

- https://catcopy.ipac.caltech.edu/ssw/hands-on/GCNS_cat.fits.zip
- https://catcopy.ipac.caltech.edu/ssw/hands-on/GCNS-Matched-DR3.fits.zip
- https://catcopy.ipac.caltech.edu/ssw/hands-on/Exoplanet-Archive-GCNS-Matched.fits.zip