



ArcGIS Notebooks in ArcGIS Online



Table of Contents

Introduction

| | |
|--------------------------------------|---|
| What are ArcGIS Notebooks? | 4 |
| Sample notebooks | 5 |

Author a notebook

| | |
|---|----|
| Create a notebook | 8 |
| Components of the notebook editor | 10 |
| Essential notebook commands | 14 |
| Add layers and web tools to a notebook | 18 |
| Work with content in the user workspace | 21 |
| Specify the runtime of a notebook | 22 |

Analyze and share

| | |
|--|----|
| Perform analysis using notebooks | 25 |
| Share a notebook | 26 |

Introduction

What are ArcGIS Notebooks?

ArcGIS Notebooks provide a versatile web-based interface for powerful geospatial data analysis. With notebooks, you can perform analysis, automate workflows, and immediately visualize data and analysis results in a geographic context.

Notebooks are an efficient, modern environment that combine code, on-the-fly visualizations and maps, and data tools. In the notebook editor, you can write, document, and run Python code in one place.

ArcGIS Notebooks provide an integrated platform to create, share, and run data science, data management, and administrative scripts. Notebook authors can use Esri's Python resources — the ArcGIS API for Python and ArcPy — and popular open-source analytical, statistical, and machine learning libraries.

Python has long been a vibrant part of the ArcGIS platform, and ArcGIS Notebooks bring the power and versatility of Python directly into ArcGIS Online. The API allows you to incorporate dynamic maps and geospatial data tools into your notebooks.

A notebook can be created just like a layer or a web app from the portal website. ArcGIS Notebooks use identity-based security as any other item - administrators have control over who can create, share, edit, and view them.

ArcGIS Notebooks open up new data science, spatial analysis, and administrative possibilities for your organization, from a centrally accessible and intuitive interface.

Harness a robust data science toolkit

ArcGIS Notebooks run the most powerful spatial data science tools available. Using your expertise, skill, and imagination, you can leverage hosted notebooks to answer new questions, drive surprising insights, and create beautiful visualizations of your data. ArcGIS Notebooks include hundreds of Python libraries, enabling a full range of capabilities. This united platform allows you to create end-to-end analytical workflows that do it all:

- Automate data collection and cleaning, so you can get right to work.
- Build predictive models to inform your organizational strategy and direction.
- Apply advanced statistical tools such as tree-based methods, neural networks, and Bayesian techniques.
- Harness popular machine learning libraries such as scikit-learn and TensorFlow.
- Integrate your analyses with the full suite of ArcGIS mapping capabilities.
- Promote transparency and reproducibility by sharing and documenting your code.

Perform administrative and content management tasks

ArcGIS Notebooks offer administrators and content managers the ability to automate tasks in their Web GIS. Using notebooks, you can perform workflows such as:

- Check items for insecure URLs and broken links.
- Remove users who have been inactive for a certain period of time.
- Set up notifications for expired licenses.

Get started using ArcGIS Notebooks

Once you [create your first notebook](#), get familiar with the [components of the notebook editor](#).

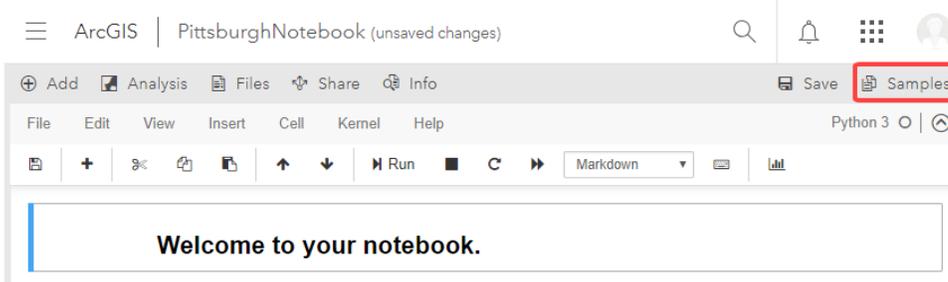
Sample notebooks

Several sample notebooks illustrate the range of capabilities and applications available in ArcGIS Notebooks . Each sample notebook demonstrates a workflow in a functional category, such as data science, spatial analysis, content management, or GIS administration.

Access the sample notebook library

To access the Esri Sample Notebooks library, complete the following steps:

1. In the notebook editor, click **Samples**.



2. Click a notebook title to view its item page. This provides additional information about the sample, and gives you options to preview, open, download, or share the sample.
3. Optionally click the favorites button to add a notebook to **Favorites**.

Available sample notebooks

The following sample notebooks are available in your ArcGIS Online organization, arranged by category:

- Administration: Deploy automatic notifications
- Administration: Manage inactive users
- Administration: Manage and allocate credits
- Administration: Validate user profiles
- Aggregation analysis: Which college district has the fewest low-income families
- Content Management: Check for broken URLs
- Content Management: Identify insecure items
- Content Management: Validate item metadata
- Crime Analysis: Boston Police
- Data Summarization: Construction permits, part 2/2
- Data Visualization: Construction permits, part 1/2
- Deep Learning: Downscale climate models
- Deep Learning: Predict El Niño-southern oscillation
- EBK Regression: Identify urban heat islands
- Forest-based Classification: Predict asthma rates
- Network Analysis: Investigate Chennai floods

- Network Analysis: Track river pollutants
- Routing: Find the nearest hospital
- Site Selection: Health clinics
- Site Selection: Restaurant clusters

Author a notebook

Create a notebook

You can create a blank ArcGIS Notebook or a copy of an existing [sample notebook](#) in your ArcGIS Online organization if you [have the privileges](#) to create and edit notebooks. You can also add an existing notebook from your computer.

To create a blank notebook or a copy of a sample notebook, follow these steps:

1. Log in as a user with privileges to create ArcGIS Notebooks.
2. On the **My Content** tab of the **Content** page, click the **Create** drop-down menu. The **Create a Notebook** dialog box appears.
3. Choose to create a blank notebook, or to create a copy of an existing sample notebook from the options provided.
4. Specify a title for your new notebook, at least one tag, and, optionally, a summary of the notebook. If you're creating a blank notebook, choose which notebook runtime you want the notebook to use from the drop-down list. Designate a folder where the notebook will be saved.



Tip:

It's a best practice to include several tags and a descriptive summary so members can search for your notebook.

Click **Add Notebook**, and your new notebook opens.

5. There is also a one-click option to create a notebook. On the top ribbon of the organization website, click **Notebook**. If prompted, [select a runtime](#) for your notebook and click **Open**. This will create and open a notebook and assign it a temporary title. You can add a title, tags, and summary on the notebook's item details page.

Add a notebook from your computer

If you have a notebook file (.ipynb) saved to your computer, you can upload it to your content. It will become an item, and its new item details page will open.

1. Verify that you are signed in and have [privileges](#) to create content.
2. From the **My Content** tab of the content page, click **Add Item** and click **From my computer**.
3. Click the browse button and choose the notebook file on your computer.
4. Type a title.
5. If your organization's administrator has configured content categories, click **Assign Category** and select up to 20 categories to help people find your item. You can also use the **Filter categories** box to narrow the list of categories.
6. Type tags that describe your item. Separate the terms with commas (for example, `Data analysis` is considered one tag; `Data, analysis` is considered two tags). As you type, you can select any of the suggested tags that appear; suggestions are generated from tags you have added previously.
7. Click **Add Item**.

Once you've added your notebook file, you will be taken to its item details page, and you can edit the [item details](#) and [share it](#) (if you have sharing [privileges](#)).

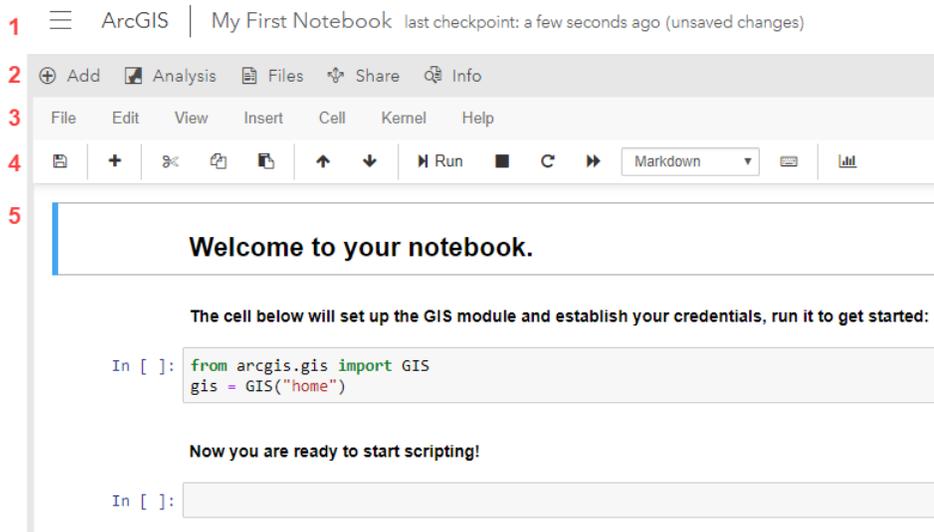
As with any other item, ArcGIS Notebooks have an [item page](#), where you can view and edit item details, modify settings, and share the item.

Components of the notebook editor

ArcGIS Notebooks are authored in the notebook editor, which is opened from ArcGIS Online. This topic introduces the components and menus in the notebook editor.

Interface basics

The notebook editor has the following five basic components:



1. Navigation bar—Browse the website, open other apps from the app launcher, view help resources, and sign in or out of your profile. The navigation bar also displays the title of your notebook and indicates whether you have unsaved changes to the notebook.
2. Top ribbon—Perform various tasks involving your notebook. This ribbon has the following buttons:
 - **Add**—Add layers and web tools to your notebook.
 - **Analysis**—Access analysis tools to use in your notebook.
 - **Files**—Browse files in your ArcGIS workspace and the data from sample notebooks.
 - **Share**—Share your notebook.
 - **Info**—Get information about the notebook. Starting at 10.7.1, you can edit the notebook's metadata (title, tags, description, terms of use, and credits) here.
 - **Save**—Saves the notebook in its present state. When you open a [shared notebook](#), this button reads **Save As**.
 - **Samples**—Opens a new tab to the sample notebook gallery.
3. Notebook menu ribbon—The actions on this ribbon are for working directly in your notebook. You can add and delete cells, change the notebook appearance, return the notebook to a previous checkpoint, and so on. This ribbon also displays whether the notebook is trusted and the version of Python being run.
4. Toolbar—Use the tools for common tasks in your notebook.
5. Workspace—Your notebook content is displayed here, and you can modify the content here as well.

Items in the notebook menu ribbon

The following actions are available from the drop-down lists in the notebook menu ribbon.

File

- **Print Preview**—Opens a new tab and displays an HTML rendering of your notebook workspace. Note that spatially enabled data frames will not display in this preview.
- **Download as**—Gives you the option to download your notebook in several formats:
 - Python code (.py)
 - Python notebook (.ipynb)
 - HTML (.html)
 - Reveal.js slides (.html)
 - Markdown (.md)
 - Text file (.txt)
 - Slides (.slides.html)
 - Custom (.txt or .html)

You can also download the notebook in .ipynb format from the notebook's item details page.

Edit

- **Cut Cells**—Cuts the currently selected cells from the notebook workspace.
- **Copy Cells**—Copies the currently selected cells in the notebook workspace.
- **Paste Cells Above**—Pastes the copied cells above the currently selected cell.
- **Paste Cells Below**—Pastes the copied cells below the currently selected cell.
- **Paste Cells & Replace**—Pastes the copied cells and replaces the currently selected cell with the copied cells.
- **Delete Cells**—Deletes the currently selected cells.
- **Undo Delete Cells**—Reverses the delete cell actions you've performed in reverse order; the most recent delete is undone first.
- **Split Cell**—Divides one cell into two by splitting the content within the cell at the pointer's current location.
- **Merge Cell Above**—Merges the currently selected cell with the one above it.
- **Merge Cell Below**—Merges the currently selected cell with the one below it.
- **Move Cell Up**—Moves the currently selected cell up one position in the notebook workspace.
- **Move Cell Down**—Moves the currently selected cell down one position in the notebook workspace.
- **Find and Replace**—Opens a pop-up window that allows you to enter a search query. This allows you to find and replace specific values or strings within your notebook.
- **Copy Cell Attachments**—Copies the attachments contained in the selected cell.
- **Cut Cell Attachments**—Cuts and copies the attachments contained in the selected cell.
- **Paste Cell Attachments**—Pastes the copied attachments into the selected cell.
- **Insert Image**—Opens a pop-up window that allows you to browse and add images, including GIFs, into Markdown cells only.

View

- **Toggle Toolbar**—Hides or shows the toolbar.
- **Toggle Line Numbers**—Hides or shows line numbers within each cell in the notebook workspace.
- **Cell Toolbar**—Hides or shows the selected slide toolbar option for each cell in the notebook workspace. The options are the following:
 - **None**—Do not show cell toolbars.
 - **Edit Metadata**—Displays an option to enter metadata for each cell using JSON.
 - **Raw Cell Format**—Raw cells allow you to write output directly; the content of these cells is not evaluated by the notebook.
 - **Slideshow**—Displays an option for each cell for you to specify how it will display in a slide show. Helpful when presenting code.
 - **Attachments**—Allows you to manage the associated attachments within each cell in the notebook workspace.
 - **Tags**—Allows you to create and manage tags for each cell within the notebook workspace.

Insert

- **Insert Cell Above**—Inserts an empty cell above the currently selected cell.
- **Insert Cell Below**—Inserts an empty cell below the currently selected cell.

Cell

- **Run Cells**—Runs the currently selected cell and moves the pointer to the next cell.
- **Run Cells and Select Below**—Runs the currently selected cell and then selects the cell below.
- **Runs Cells and Insert Below**—Runs the currently selected cell and then inserts an empty cell below your selected cell.
- **Run All**—Runs all the cells in the notebook in sequential order.
- **Run All Above**—Runs all cells above the currently selected cell, but does not run your selected cell.
- **Run All Below**—Runs the currently selected cell and all cells below it.
- **Cell Type**—Allows you to change the type of the currently selected cell. The options are **Code**, **Markdown**, and **Raw NBConvert**. Note that the **Heading** type will switch to Markdown.
- **Current Outputs**—Allows you to control the output of the currently selected cell. The options include the following:
 - **Toggle Output**—Hides or shows the output of the currently selected cell.
 - **Toggle Scrolling**—Enables or disables scrolling on the currently selected cell.
 - **Clear Output**—Clears the output of the currently selected cell.
- **All Output**—Allows you to control the output of all cells within the notebook workspace. The options include the following:
 - **Toggle Output**—Hides or shows the output of all cells.
 - **Toggle Scrolling**—Enables or disables scrolling on all cells.
 - **Clear Output**—Clears the output of all cells.

Kernel

- **Interrupt**—Pauses the running kernel if a calculation or analysis is taking too long.
- **Restart**—Restarts the entire computational process by restarting the kernel.
- **Restart & Clear Output**—Restarts the computational process and clears any output that is displayed within the notebooks.
- **Restart & Run All**—Restarts the computational process and then runs all the cells in sequential order.
- **Reconnect**—Allows you to reconnect to a kernel if it goes idle.
- **Shutdown**—Shuts down all computational processes within the notebook.
- **Change Kernel**—Allows you to change the kernel type. Only the Python 3 kernel type is supported in ArcGIS Notebooks.

Help

This list provides access to information on keyboard shortcuts, the user interface, and the various help documents associated with ArcGIS Notebooks and key Python modules.

The **User Interface Tour** is particularly helpful for users who are new to the notebook environment.

Icons on the notebook toolbar

The notebook toolbar provides quick access to the most commonly used actions from the notebook menu ribbon. The icons available, from left to right, are as follows:

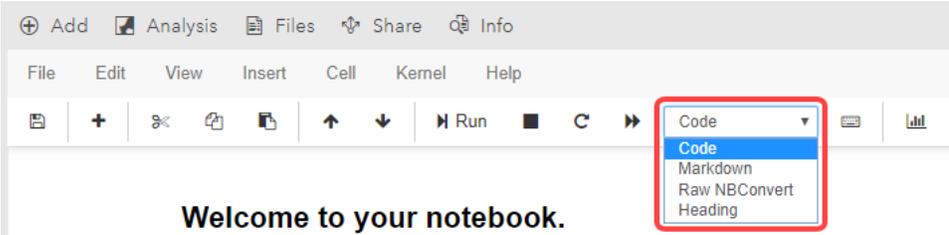
- Add icon—Inserts a cell below the currently selected cell.
- Scissors icon—Cuts the currently selected cell.
- Copy icon—Copies the currently selected cell.
- Paste icon—Pastes your copied cells below the currently selected cell.
- Up arrow—Moves the selected cell up in the notebook sequence.
- Down arrow—Moves the selected cell down in the notebook sequence.
- Run icon—Runs the currently selected cell.
- Stop icon—Interrupts the kernel.
- Restart icon—Restarts the kernel.
- Fast-forward icon—Restarts the kernel and runs all cells.
- Cell type list—Allows you to select or change the type of the currently selected cell.
- Keyboard icon—Opens the command palette.
- Chart icon—Enters or exits slide show mode.

Essential notebook commands

ArcGIS Notebooks run a Jupyter notebook environment, which provides a streamlined cell-based workspace. This topic walks through the basic commands and aspects of working in ArcGIS Notebooks, including shortcuts and best practices.

Specify a cell's type

There are three types of cells you can use in an ArcGIS Notebook. When you have selected a certain cell with your pointer, you can change the cell's type using the drop-down list on the toolbar.



The three available types are:

- **Code** — The notebook will interpret all content in a code cell in the Python language. When writing Python code, typing certain strings, such as `from` or the equal sign `=`, will prompt the notebook to automatically recolor or highlight them for clarity. Any line of code that starts with an octothorpe `#` will be interpreted as a comment, colored green and italicized, and will not be executed as code by the notebook.
- **Markdown** — The notebook will interpret all content in a Markdown cell in the Markdown language. This is a simple language for formatting rich text, used across the internet by clients such as GitHub. See the [Markdown Guide](#) online for a reference to using Markdown. Running a Markdown cell will turn its content into rich text. Any line that starts with one or multiple octothorpes `#` will be formatted as headings. You can also add raw HTML code to Markdown cells.
- **Raw NBConvert** — The notebook will not process content in a Raw NBConvert cell. This cell type is rarely used.

Note:

The **Heading** cell type is also available in the drop-down list. However, this cell type is no longer used in Jupyter notebook environments. Clicking this cell type will turn the cell into a Markdown cell and append an octothorpe `#`, which denotes a top-level heading in Markdown.

The use of rich text and code comments will make your notebooks more readable and valuable to users with whom they are shared.

Work with cells

For a notebook to execute code, the code must be contained in a cell. The code in cells allow you to define variables and to run functions contained in Python libraries.

To define a variable, run a cell that contains a variable statement, including an equal sign `=`. The default notebook template, for example, launches having defined a variable `gis`. If you run a cell containing only that variable name, `gis`, the notebook will return the URL of your ArcGIS Online as an output.

To run a Python function, provide the function's syntax and any arguments required or accepted by the function. See the **Use functions in a cell** section below to learn more.

You can create a new cell by pressing **Shift+Enter**, or by clicking **Insert** on the menu ribbon, which gives you the option to insert a new cell above or below your current cell.

Import libraries and modules

In the default notebook template, ArcGIS Notebooks only import the `gis` module from the ArcGIS API for Python. Typically, you will want to use additional Python libraries available in your notebook's runtime. To access these libraries, run an `import` command.

[See all Python libraries available in ArcGIS Notebooks](#)

Create a new cell and type `import <library>`, then run the cell.

In the ArcGIS API for Python and ArcPy, and in some other cases, Python libraries are organized into modules. To access the libraries within a module, declare the module to access with a `from` statement, then declare a library using an `import` statement. For example, to call the `WebScene` library from the `mapping` module in the ArcGIS API for Python, you would run the following command in a cell:

```
from arcgis.mapping import WebScene
```

ArcGIS Notebooks include an autocomplete feature when running cells. You can use it to help you find the libraries and modules you need. In a cell, type the first portion of your command, then press **Tab** to activate the autocomplete feature. It will provide possible values that can complete the command.

For example, if you type `arcgis.` and then press **Tab**, the notebook will provide a drop-down list of all the modules available in the ArcGIS API for Python. You can use the up and down arrows to navigate the list; when you find the option you want, press **Enter** to insert it into your line of code.

To learn more about how the ArcGIS API for Python and ArcPy work in your notebooks, see the following topics:

- [Use the ArcGIS API for Python in your notebook](#)
- [Use ArcPy in your notebook](#)

Use functions in a cell

To perform analysis and work with data in notebooks, you use Python functions. Functions are contained within Python libraries, and often take input arguments to specify how they will execute and what content they will execute on.

The notebook's autocomplete tool can help you find functions by providing a drop-down list of what's available. For any library `bar`, type `bar.` and press **Tab** to show the functions available in it.

For example, to view the tools available in the `Summarize Data` library of the `arcgis.features` module, enter the following code and then press **Tab**:

```
features.summarize_data.
```

The autocomplete tool will show a drop-down list of the tools available in the library.

Often, a command in a notebook will have required or optional arguments — parameters that provide information to execute a command. If a command's syntax ends with an empty set of parentheses (`()`), the command requires or can include optional arguments for you to add.

Enter arguments within the parentheses, separating multiple arguments by commas. To view the string of required and optional arguments for any function, replace its empty parentheses with a question mark and run the cell. This will show the function's `docstring`, which lists all arguments.

For example, all tools available through the notebook editor's **Analysis** pane require arguments. Adding a tool from this pane to a cell will insert the tool's ArcGIS API for Python syntax, ending in empty parentheses. If you try to run this syntax in a cell without providing one or more arguments, the cell will fail and provide an error message.

If you want to run the Aggregate Points tool in the Summarize Data library, you would locate the tool in the **Analysis** pane and add it to a new cell, or simply type in the tool syntax as follows:

```
features.summarize_data.aggregate_points()
```

To view the list of arguments for the tool, modify the syntax as follows and run the cell:

```
features.summarize_data.aggregate_points?
```

This will open the `docstring` reference window for the tool. This reference has buttons to expand or close the window in the top right corner.

When you're working in a cell, keep the following in mind:

- For any function `foo()`, type `foo?` and press **Enter** to show the function's `docstring`, which describes the function.
- If you start a cell with `!`, the cell's contents run as a bash command in your notebook container.

Run a cell

When you run a cell, its code is executed, and all operations within are performed. You can only run a whole cell, not a subsection of the cell or a specific line of code. Cells can consist of one or multiple lines of code.

To run a selected cell, click the **Run** button on the toolbar, or click **Cells > Run Cells**. You can also press **Ctrl+Enter** to run the cell your mouse pointer is in.

To manually stop a cell that is being run, click **Kernel > Interrupt**. You can also click the square stop button in the toolbar.

To the left of each code cell is an `In []` element. If the cell has not yet been run, or if a previously run cell has been cleared of its output, the bracket will be empty. While the cell is being run, it will contain an asterisk: `In [*]`. When a cell has completed running, its `In []` bracket will be populated with a number that indicates the order of cells that have been run. Because cells in a notebook can be run in any order and can be run multiple times, the `In []` numbers in a notebook's cells may not be in sequential order.

Note:

Markdown cells maintain an `In []` element until they are run, at which point the element disappears and the cell's content becomes rich text.

When a line of code in a cell you run produces an output, the output is displayed in your notebook underneath the executed cell. Next to the output is an `Out []` element, which matches what's in the corresponding cell's `In []` element.

Work with the kernel

When you launch a new ArcGIS Notebook, a kernel is launched with it. This kernel executes the code you run in the notebook. As you run cells in the notebook (populating their In [] elements), variables you have defined in executed cells are stored in the kernel's memory.

To restart your notebook's kernel and clear in-memory variables, click **Kernel > Restart**. If you want to restart the kernel, clear in-memory variables, then run all cells in the notebook sequentially, click **Kernel > Restart & Run All**.

When you are done actively using a notebook, click **Kernel > Shutdown** to shut down the notebook's kernel and clear all in-memory variables. The kernel will stop running, but will not erase the outputs of cells that have been run.

Add layers and web tools to a notebook

The notebook editor provides a sidebar where you can browse and search, add layers, and web tools to your notebook. The layers can be hosted in your own organization, or they can be publicly available in ArcGIS Online or the ArcGIS Living Atlas of the World.

Browse and search for content

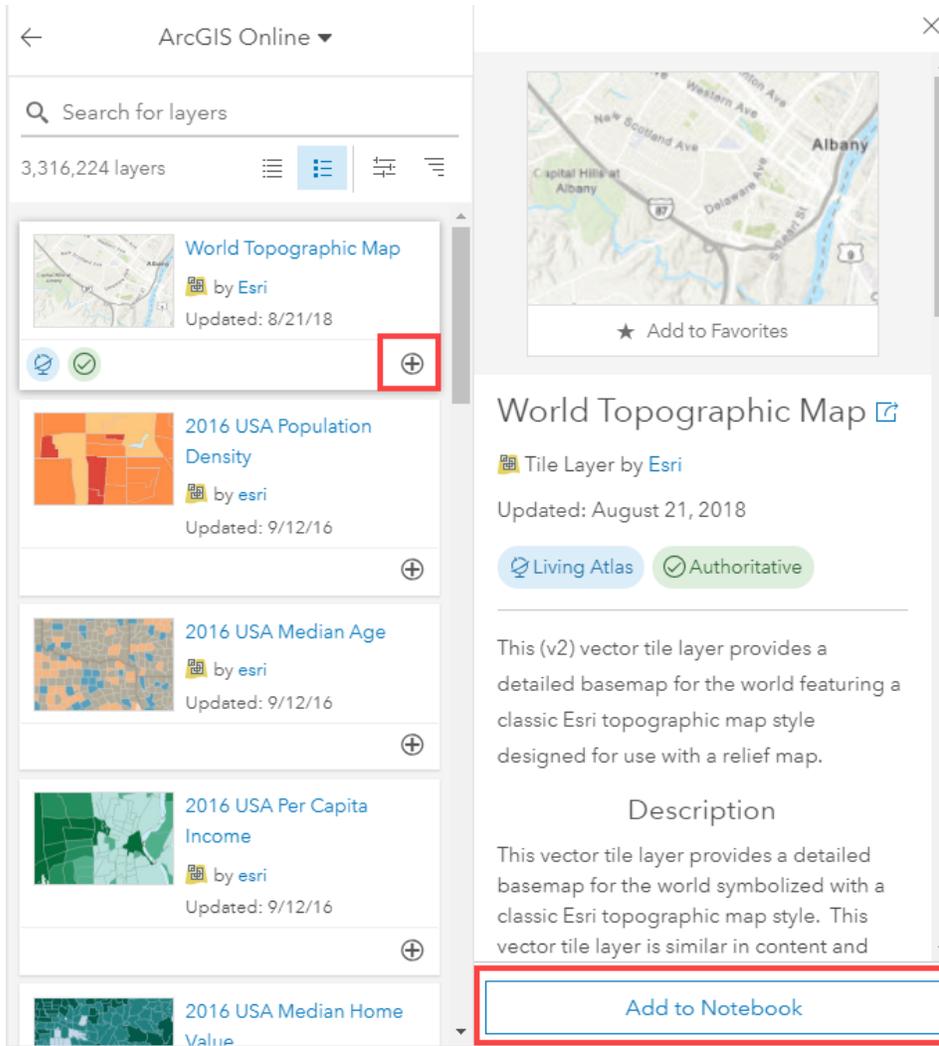
To browse and search for content in the notebook editor, complete the following steps:

1. On the top ribbon of the notebook editor, click the **Add** button  to open the content browser panel. Several tools are listed that you can use to find content.
2. At the top of the panel, click the drop-down menu and select the location of displayed content. The options are as follows:
 - **My Content**
 - **My Favorites**
 - **My Groups**
 - **My Organization**
 - **Living Atlas**
 - **ArcGIS Online**
3. Use the search text box to search for layers and web tools in the selected location. Searching will match items with keywords in their title, tags, or summary.
4. Below the search bar, click the **Compact view** button to view only the item titles of displayed content, or click the **List view** button to view item type, owner, date of last update, and any labels the item includes (authoritative, deprecated, or Esri-curated).
5. Optionally filter displayed items by attribute, and sort the content by category. The **Filter** and **Sort** options available depend on the content location you selected, though some options are always available, such as filtering by **Item Type** (layers or tools) and sorting by **Title**.

When you click an item in the panel, another sidebar opens with information about the item. In this sidebar, you can read the item summary, description, terms of use, and attribution. You can also see its view count, creation date, and sharing settings.

Add content to your notebook

To add an item from the content browser panel to your notebook, click the item's **Add** button or click **Add to Notebook**.



A new cell is created in your notebook below the currently selected cell. The item is listed with the information described in the subsections below.

Layers

If the item is a layer, the notebook assigns the `layer` default variable to the item and displays the item as the cell's output when the cell is run.

Tip:

Rename the `layer` variable something that uniquely identifies the item.

```
# Item Added From Toolbar
# Title: <layer title> | Type: <layer type> | Owner: <layer owner>
layer = gis.content.get("<item ID of layer>")
layer
```

Web tools

If the item is a web tool, the notebook imports the geoprocessing toolbox as a Python module that you can use with your content. If you intend to add multiple web tools to your notebook, rename the `my_toolbox` variable a unique identifier.

 **Tip:**

Uncomment the last line to display the web tool's help documentation when the cell is run.

```
# Item Added From Toolbar
# Title: <tool title> | Type: <tool type> | Owner: <tool owner>
from arcgis.geoprocessing import import_toolbox
web_tool_item = gis.content.get("<item ID of tool>")
my_toolbox = import_toolbox(web_tool_item)
# help(my_toolbox)
```

Work with content in the user workspace

In the notebook editor, you can work with content in a workspace in your ArcGIS Online organization, to add items to your notebook or download them to your machine. Click the **Files** button to open the **Files** pane.

Browse content in the workspace

The **Files** pane provides a browser for the files in your workspace. The default folders are home and samplesdata (the latter for the data used in the [sample notebooks](#)).

Upload content to the workspace

To upload files, complete the following steps:

1. In the **Files** pane, click **Browse**, and browse to the desired file.
2. Select the file.
3. Click **Upload**.
The file is uploaded to the workspace.

Download content from the workspace

To save a file from the workspace to your local machine, in the **Files** pane, browse to the file and select it. The file is automatically downloaded to your machine.

Specify the runtime of a notebook

When you author a notebook, the resources and Python libraries you use are made available through a notebook runtime.

There are two runtimes available: the Standard runtime contains ArcGIS API for Python along with [a few hundred other Python libraries](#), and the Advanced runtime contains all of the same libraries as well as ArcPy and some related libraries.

Note:

Notebooks that use the Advanced runtime can run ArcGIS API for Python and all other libraries from the Standard runtime.

Whether you can use only the Standard runtime or both the Standard and Advanced runtimes depends on the license your administrator has obtained from Esri.

To author notebooks, your administrator must assign you a [custom member role](#) that contains the appropriate privileges. There is one privilege to author notebooks using the Standard runtime, and another privilege to author notebooks using the Advanced runtime or the Advanced with GPU runtime.

If your organization only has the Standard runtime available and you've been assigned a role containing the corresponding privilege, you don't need to do anything else. You can start authoring notebooks immediately.

When you [create a blank notebook](#), you choose which runtime the notebook will use. The list you choose from is based on your privileges; if you have been granted the Advanced Notebooks privilege, you will be able to choose between Standard and Advanced runtimes. You can also change the runtime of a notebook after it has been created; the steps to do so are given below.

If you have the appropriate privileges, you may want to create notebooks using either runtime in different situations. For example, you're authoring a notebook to share with other notebook authors in your organization who don't have the Advanced Notebooks privilege. To share your notebook with them, you need to specify the notebook to use the Standard runtime.

Note:

Before changing the runtime for a notebook from Advanced to Standard, ensure there is no content from ArcPy or [the other Advanced libraries](#) in the notebook. If there is, an error will appear when members open the notebook.

Follow these steps to specify the runtime applied to an existing notebook. This workflow can only be used by members who can author notebooks using either notebook runtime.

1. Open the notebook's item details page and click the **Settings** tab.
In the **Notebook** section of the tab, under **Notebook Settings**, the **Notebook Runtime** option designates the runtime the notebook is using.
2. Click the drop-down list, and select the runtime.

Note:

If you don't have the Advanced Notebooks privilege, only the Standard runtime appears in the drop-down list.

3. Click **Save** to confirm.

The notebook will now use the Standard runtime and can be shared with any member who has Standard runtime access. ArcPy will be unavailable in the notebook.

Analyze and share

Perform analysis using notebooks

The notebook editor provides an **Analysis** pane to browse and add the code snippets for the analysis tools available in your ArcGIS Online organization. The standard feature analysis tools are always available in the pane. To access the pane, click **Analysis** on the top ribbon of the notebook editor.

Adding a tool to your notebook inserts the ArcGIS API for Python syntax for that tool into a new cell.

Explore the Analysis pane

When you open the **Analysis** pane, each available tool set appears as a tab. On each tab, the tools are grouped into categories, identical to how they appear in your ArcGIS Online organization.

To view the tools in a category, expand or collapse it using the button next to the category. Click the **Info** button for a category or a tool to view its details. When you locate the analysis tool you want to use, click the **Add** button  to add the Python code snippet corresponding to the tool into a new cell in your notebook.

Standard feature analysis tools

The tools in this set can be used to perform common analytical functions such as finding hot spots, locating streets and addresses, finding a place, routing, or accessing a geodatabase. By performing analysis, you can answer questions and make decisions using more than visual analysis.

[Learn more about standard analysis tools](#)

Share a notebook

You can share an ArcGIS Notebook you've created with other users in the same way as any other item. By default, your notebook is only accessible to you; it does not appear in other users' search results and is not part of any group. Depending on your sharing [privileges](#), you can share it with others.

Note:

When you share a notebook with others, they can open and run the notebook. However, any changes they make to the notebook will be saved as a new copy that they will own. The changes they make are not saved to your notebook.

You have the following options for sharing notebooks:

- **Everyone**—Sharing with everyone makes your notebook public; anybody who has access to the organization website can find and use it, and group owners can include it in their group content.
- **Your organization**—To ensure only members (named users) of your portal have access to your notebook, you can share it with only named users in your organization.
- **Groups**—If you are a member of a group, you can share your notebook with that group. Sharing with specific groups restricts access to a smaller, focused set of people. This is the best option for sharing securely.
- **Everyone and a group**—If you want to share your notebook with a subset of users or organize your content into a collection of items, but you also want everyone to have access to your item, you can share an item with a group and with everyone. This is appropriate for focused group work where all members benefit from specific content they can use for collaboration and exchange.
- **Groups and your organization or everyone**—You can share a notebook with a larger audience (everyone or your organization) and also share it with a specific group. This allows you to categorize your notebook as relevant to a particular group while still making it available to others in your organization.

You can update a notebook's sharing settings from the **Content** page or from the notebook editor itself. Both open the **Share** dialog box for the item, where you set and save setting options.

Prepare your notebook to be shared

Before you share an ArcGIS Notebook, ensure the notebook can be opened and run successfully by others while preserving the integrity, security, and accessibility of your notebook.

- Avoid storing usernames, passwords, credentials, or any other personal information in a notebook. Sharing a notebook with such content will expose it to others.
- Any item you have added into your notebook must also be shared with a member for that member to be able to view and use it in the notebook. Check the sharing properties for each item in your notebook before sharing the notebook.
- You can use files from your user workspace in your notebooks. However, if you intend to share a notebook with others in your organization, upload any such files to **My Content**, then add those items into your notebook. Share them with the members who will be viewing your notebook.
- If your notebook uses the Advanced notebook runtime, only users with the Advanced Notebook privilege will be able to open and run the notebook when it is shared with them. See [Specify the runtime of a notebook](#) for steps on how to change the runtime.

Share a notebook from the Content page

To share a notebook from **Content**, complete the following steps:

1. On the **Content** page, on the **My Content** tab, locate the notebook item you want to share, and click its sharing button, which, by default, is a lock icon.
2. On the notebook's item page, click the **Share** button.
The dialog box displays the levels at which you can share the item, including each of the groups in your organization.
3. Choose how you want to share the notebook.
4. Click **OK**.

Share a notebook from the workspace

You can also access the **Share** dialog box from the notebook workspace.

1. On the action ribbon, click the **Share** button.
The **Share Notebook** panel opens, displaying the notebook's current sharing settings.
2. Click the **Share** button on the panel to open the dialog box.
3. Change the settings as desired.
4. Click **OK**.
Your new sharing settings are shown in the panel.

Work on a shared notebook

When an organization member opens an ArcGIS Notebook that has been shared with them by another member, a copy of that notebook is created and then opened. The member with whom the notebook was shared is the owner of this new notebook copy; it runs in their own container and uses their own processing resources. Any changes they make to the notebook are only made in the new notebook copy.

You can search your organization's content to find a shared notebook, or access the notebook item from the group with which it is shared. Preview the notebook to view its content, and open the notebook from its item details page.

Ensure you only open shared notebooks from sources you trust. Any code you run in a shared notebook is run on your behalf, using your credentials. It's a best practice to review all cells in a shared notebook individually before running them, and to not use the **Run All** option when first opening a shared notebook.

Notebooks shared with you may reference files you do not have access to — they may be from items that haven't been shared with you, or may reside in the author's own user workspace. Contact the author if you receive any such errors.