

Release notes X

...

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

```
df = pd.read_csv('/content/IMDb Movies India.csv', encoding='latin1')
df
```

	Name	Year	Duration	Genre	Rating	Votes
0		NaN	NaN	Drama	NaN	NaN
1	#Gadhvi (He thought he was Gandhi)	(2019)	109 min	Drama	7.0	8
2	#Homecoming	(2021)	90 min	Drama, Musical	NaN	NaN
3	#Yaaram	(2019)	110 min	Comedy, Romance	4.4	35
4	...And Once Again	(2010)	105 min	Drama	NaN	NaN
...
15504	Zulm Ko Jala Doonga	(1988)	NaN	Action	4.6	11
15505	Zulmi	(1999)	129 min	Action, Drama	4.5	655
15506	Zulmi Raj	(2005)	NaN	Action	NaN	NaN
15507	Zulmi Shikari	(1988)	NaN	Action	NaN	NaN
15508	Zulm-O-Sitam	(1998)	130 min	Action, Drama	6.2	20

15509 rows × 10 columns

```
df.head()
```

Please follow our [blog](#) to see more information about new features, tips and tricks, and featured notebooks such as [Analyzing a Bank Failure with Colab](#).

2024-11-11

- Users can now import Gemini API keys from AI Studio into their user secrets, all in Colab ([tweet](#)).
- Increased limit to 1000 characters for requests to Gemini in Chat and Generate windows.
- Improved saving notebook to GitHub flow.
- Updated Gemini spark icon to be colorful.
- `uv` is pre-installed on the PATH for faster package installs.
- Fixed bugs
 - Dropdown text for GitHub repository not visible [#4901](#).
 - Pre-installed California housing dataset README not correct [#4862](#).
 - Backend execution error for scheduled notebook [#4850](#).
 - Drive File Stream issues [#3441](#).
 - Linking to the signup page does not preserve the authuser parameter.
 - Error messages in Gemini chat are not polished.
 - Clicking in Gemini chat feedback causes jitters the UI.
 - Hovering over a table of contents entry would show the menu icons for all entries.
 - Surveys display over open dialogs.
 - Playground mode banner not shown on mobile.

Python package upgrades

- accelerate 0.34.2 → 1.1.1
- arviz 0.19.0 → 0.20.0
- bigframes 1.18.0 → 1.25.0
- bigquery-magics 0.2.0 → 0.4.0
- bokeh 3.4.3 → 3.6.1
- blosc 2.0.0 → 2.7.1
- cloudpickle 2.2.1 → 3.1.0
- cudf-cu12 24.4.1 → 24.10.1
- dask 2024.8.0 → 24.10.0
- debugpy 1.6.6 → 1.8.0
- earthengine-api 1.0.0 → 1.2.0
- folium 0.17.0 → 0.18.0
- gscfs 2024.6.1 → 2024.10.0
- geemap 0.34.3 → 0.35.1
- holidays 0.57 → 0.60
- huggingface-hub 0.24.7 → 0.26.2
- kagglehub 0.3.0 → 0.3.3
- lightgbm 4.4.0 → 4.5.0
- lxml 4.9.4 → 5.3.0
- matplotlib 3.7.1 → 3.8.0
- mizani 0.11.4 → 0.13.0

	Name	Year	Duration	Genre	Rating	Votes	Di
0		NaN	NaN	Drama	NaN	NaN	Ran
1	#Gadhvi (He thought he was Gandhi)	(2019)	109 min	Drama	7.0	8	
2	#Homecoming	(2021)	90 min	Drama, Musical	NaN	NaN	Son Ma
3	#Yaaram	(2019)	110 min	Comedy, Romance	4.4	35	
4	...And Once Again	(2010)	105 min	Drama	NaN	NaN	

```
df.info()
```

```
→ <class 'pandas.core.frame.DataFrame'>
RangeIndex: 15509 entries, 0 to 15508
Data columns (total 10 columns):
 #   Column      Non-Null Count   Dtype  
--- 
 0   Name        15509 non-null    object  
 1   Year         14981 non-null    object  
 2   Duration     7240 non-null    object  
 3   Genre        13632 non-null    object  
 4   Rating       7919 non-null    float64 
 5   Votes        7920 non-null    object  
 6   Director     14984 non-null    object  
 7   Actor 1      13892 non-null    object  
 8   Actor 2      13125 non-null    object  
 9   Actor 3      12365 non-null    object  
dtypes: float64(1), object(9)
memory usage: 1.2+ MB
```

```
df.describe()
```

	Rating
count	7919.000000
mean	5.841621
std	1.381777
min	1.100000
25%	4.900000
50%	6.000000
75%	6.800000
max	10.000000

```
df.isnull().sum()
```

- networkx 3.3 -> 3.4.2
 - nltk 3.8.1 -> 3.9.1
 - pandas 2.1.4 -> 2.2.2
 - pillow 10.4.0 -> 11.0.0
 - plotnine 0.13.6 -> 0.14.1
 - polars 1.6.0 -> 1.9.0
 - protobuf 3.20.3 -> 4.25.5
 - pyarrow 14.0.2 -> 17.0.0
 - pydrive2 1.20.0 -> 1.21.1
 - pymc 5.16.2 -> 5.18.0
 - torch 2.4.1 -> 2.5.0
 - torchaudio 2.4.1 -> 2.5.0
 - torchvision 0.19.1 -> 0.20.0
 - transformers 4.44.2 -> 4.46.2
 - xarray 2024.9.0 -> 2024.10.0

Python package inclusions

- diffusers 0.31.0
 - gitpython 3.1.43
 - langchain 0.3.7
 - openai 1.54.3
 - pygit2 1.16.0
 - pyspark 3.5.3
 - sentence-transformers 3.2.1
 - timm 1.0.11
 - wandb 0.18.6

Library and driver upgrades

- drivefs upgraded from 89.0.2 to 98.0.0

2024-09-23

- Improved code snippet search
 - Updated Marketplace image and public local runtime container
 - Improved the look-and-feel of interactive form dropdowns and checkboxes
 - Fixed bugs
 - activating the skip link caused the notebook to scroll out of view
 - toggling a checkbox too much caused the page to crash
 - lightning fast drags could cause orphaned tabs
 - custom widgets snippet would show for local runtimes

Python package upgrades

- accelerate 0.32.1 -> 0.34.2
 - arviz 0.18.0 -> 0.19
 - autograd 1.6.2 -> 1.7.0
 - bigframes 1.14.0 -> 1.18.0
 - dask 2024.7.1 -> 2024.8.0
 - distributed 2024.7.1 -> 2024.8.0
 - duckdb 0.10.3 -> 1.1.0
 - earthengine-api 0.1.416 -> 1.0.0
 - flax 0.8.4 -> 0.8.5
 - gdown 5.1.0 -> 5.2.0
 - geemap 0.33.1 -> 0.34.3
 - geopandas 0.14.4 -> 1.0.1
 - google-cloud-aiplatform 1.59.0 -> 1.67.1
 - google-cloud-bigquery-storage 2.25.0 -> 2.26.0
 - holidays 0.54 -> 0.57
 - huggingface-hub 0.23.5 -> 0.24.7
 - ibis-framework 8.0.0 -> 9.2.0

	0
Name	0
Year	528
Duration	8269
Genre	1877
Rating	7590
Votes	7589
Director	525
Actor 1	1617
Actor 2	2384
Actor 3	3144

```
dtype: int64
```

```
df.isnull()
```

	Name	Year	Duration	Genre	Rating	Votes	Director
0	False	True	True	False	True	True	False
1	False	False	False	False	False	False	False
2	False	False	False	False	True	True	False
3	False	False	False	False	False	False	False
4	False	False	False	False	True	True	False
...
15504	False	False	True	False	False	False	False
15505	False	False	False	False	False	False	False
15506	False	False	True	False	True	True	False
15507	False	False	True	False	True	True	True
15508	False	False	False	False	False	False	False

```
df.dropna(inplace=True)
```

```
df.head()
```

- jax 0.4.26 -> 0.4.33
- jaxlib 0.4.26 -> 0.4.33
- kagglehub 0.2.9 -> 0.3.0
- lightgbm 4.4.0 -> 4.5.0
- matplotlib-venn 0.11.10 -> 1.1.1
- mizani 0.9.3 -> 0.11.4
- Pillow 9.4.0 -> 10.4.0
- plotly 5.15.0 -> 5.24.1
- plotnine 0.12.4 -> 0.13.6
- polars 0.20.2 -> 1.6.0
- progressbar2 4.2.0 -> 4.5.0
- PyDrive2 1.6.3 -> 1.20.0
- pymc 5.10.4 -> 5.16.2
- pytensor 2.18.6 -> 2.25.4
- scikit-image 0.23.2 -> 0.24.0
- scikit-learn 1.3.2 -> 1.5.2
- torch 2.3.1 -> 2.4.1
- torchaudio 2.3.1 -> 2.4.1
- torchvision 0.18.1 -> 0.19.1
- transformers 4.42.4 -> 4.44.2
- urllib3 2.0.7 -> 2.2.3
- xarray 2024.6.0 -> 2024.9.0

Python package inclusions

- bigquery-magics 0.2.0

2024-08-20

- TPU memory usage and utilization can now be checked with !tpu-info
- Gemini Chat responses are now grounded in relevant sources
- Added a new "Create Gemini API key" link in the user secrets panel
- Added a new "Gemini: Creating a prompt" snippet and touched up the existing "Gemini: Connecting to Gemini" snippet
- Added the ability to specify custom placeholder text for various interactive form params (see [examples](#))
- Keyboard navigation a11y improvements to comments UI
- Various minor rendering improvements to interactive forms UI
- A11y improvements for the run button and header
- Updated tooltip styling
- A11y improvements for the file browser's disk usage bar
- On mobile, tooltips now trigger on long press
- On mobile, release notes updates will no longer display automatically
- Python package upgrades
 - astropy 5.3.4 -> 6.1.2
 - bigframes 1.11.1 -> 1.14.0
 - bokeh 3.3.4 -> 3.4.3
 - dask 2023.8.1 -> 2024.7.1
 - earthengine-api 0.1.412 -> 0.1.416
 - geopandas 0.13.2 -> 0.14.4
 - kagglehub 0.2.8 -> 0.2.9
 - keras 2.15.0 -> 3.4.1

	Name	Year	Duration	Genre	Rating	Votes	Director
1	#Gadhvi (He thought he was Gandhi)	(2019)	109 min	Drama	7.0	8	Gaurav Baks
3	#Yaaram	(2019)	110 min	Comedy, Romance	4.4	35	Ova Kha
5	...Aur Pyaar Ho Gaya	(1997)	147 min	Comedy, Drama, Musical	4.7	827	Rahul Rawal
6	Vahan	(2005)	112 min	Drama, Romance	7.1	1,006	Shoo

df.dtypes

	0
Name	object
Year	object
Duration	object
Genre	object
Rating	float64
Votes	object
Director	object
Actor 1	object
Actor 2	object
Actor 3	object

dtype: object

df.shape

(5659, 10)

```
df['Year'] = df['Year'].str.extract('(\d+)') # Extract numeric part
df['Year'] = pd.to_numeric(df['Year'], errors='coerce') # Convert
df['Duration'] = df['Duration'].str.extract('(\d+)')
df['Duration'] = pd.to_numeric(df['Duration'], errors='coerce')
```

df["Year"].head()

- lightgbm 4.1.0 -> 4.4.0
- malloy 2023.1067 -> 2024.1067
- numba 0.58.1 -> 0.60.0
- numpy 1.25.2 -> 1.26.4
- opencv-python 4.8.0.76 -> 4.10.0.84
- pandas 2.0.3 -> 2.1.4
- pandas-gbq 0.19.2 -> 0.23.1
- panel 1.3.8 -> 1.4.5
- requests 2.31.0 -> 2.32.3
- scikit-learn 1.2.2. -> 1.3.2
- scipy 1.11.4 -> 1.13.1
- tensorboard 2.15.2 -> 2.17.0
- tensorflow 2.15.0 -> 2.17.0
- tf-keras 2.15.1 -> 2.17.0
- xarray 2023.7.0 -> 2024.6.0
- xgboost 2.0.3 -> 2.1.1
- Python package inclusions
 - einops 0.8.0

2024-07-22

- You can now embed Google sheets directly into Colab to streamline interactions with data with InteractiveSheet.
- Example:

```
from google.colab import sheets
sh = sheets.InteractiveSheet()
df = sh.as_df()
```

- Fixed multiple rendering bugs in cell editors with wide text content (i.e. text is no longer hidden or clipped)
- Fixed multiple accessibility issues in Colab's comments feature (e.g. proper keyboard focus management, added accessibility landmarks, etc)
- Fixed bug where AI code generation would fail for extremely long broken code snippets
- Fixed multiple scrollbar bugs in the user secrets panel
- Added the ability for workspace admin to purchase Colab Pro and Pro+ Subscriptions for users
- Fixed bug where user secrets couldn't be moved to a tab
- Fixed several focus management accessibility issues in tabs, the table of contents, the left toolbar, and the run button
- Fixed bug where overflowing cells may be omitted when pasting from Google Sheets
- Fixed bug where the generate code button did not activate on touch
- Python package upgrades
 - bigframes 1.9.0 -> 1.11.1
 - cvxpy 1.3.4 -> 1.5.2
 - earthengine-api 0.1.408 -> 0.1.412
 - google-api-core 2.11.1 -> 2.19.1

Year

1	2019
3	2019
5	1997
6	2005
8	2012

dtype: int64

```
genre=df['Genre']
genre.head()
```

Genre

1	Drama
3	Comedy, Romance
5	Comedy, Drama, Musical
6	Drama, Romance, War
8	Horror, Mystery, Thriller

dtype: object

```
genres=df['Genre'].str.split(',',expand=True)
genres.head()
```

0 1 2

1	Drama	None	None
3	Comedy	Romance	None
5	Comedy	Drama	Musical
6	Drama	Romance	War
8	Horror	Mystery	Thriller

```
genre_counts = {}
for genre in genres.values.flatten():
    if genre is not None:
        if genre in genre_counts:
            genre_counts[genre] += 1
        else:
            genre_counts[genre] = 1
```

```
genreCounts = {genre: count for genre, count in sorted(genre_counts.items())
for genre, count in genreCounts.items():
    print(f'{genre}: {count}')
```

Action: 34
Adventure: 172
Biography: 31

- google-api-python-client 2.84.0 -> 2.137.0
- google-cloud-aiplatform 1.56.0 -> 1.59.0
- google-cloud-bigquery 3.21.0 -> 3.25.0
- google-cloud-core 2.3.3 -> 2.4.1
- google-cloud-datastore 2.15.2 -> 2.19.0
- google-cloud-firebase 2.11.1 -> 2.16.1
- google-cloud-functions 1.13.3 -> 1.16.4
- google-generativeai 0.5.4 -> 0.7.2
- kagglehub 0.2.5 -> 0.2.8
- pip 23.1.2 -> 24.1.2
- setuptools 67.7.2 -> 71.0.4
- sympy 1.12.1 -> 1.13.1
- torch 2.3.0 -> 2.3.1
- transformers 4.41.2 -> 4.42.4

• Python package inclusions

- accelerate 0.32.1

2024-06-18

- Inline AI completions are now available to users on the free-of-charge tier
- Reduced latency for LSP and terminal connections
- Improved quality of inline completions
- Visual improvements to switch controls across Colab
- Various bug fixes, performance and a11y improvements to the user secrets panel
- Improved tooltip UX behavior
- Improved behavior when copying data from Google Sheets and pasting in Colab
- Scroll to cell fixes for single tabbed view and jump to cell command
- Improved tab header behavior
- A11y improvements for notebook-focused cells
- Python package upgrades
 - torch 2.2.1 -> 2.3.0
 - torchaudio 2.2.1 -> 2.3.0
 - torchvision 0.17.1 -> 0.18.0
 - torchtext 0.17.1 -> 0.18.0
 - google-cloud-aiplatform 1.51.0 -> 1.56.0
 - bigframes 1.5.0 -> 1.8.0
 - regex 2023.12.25 -> 2024.5.15

2024-05-13

- Code actions are now supported to automatically improve and refactor code. Code actions can be triggered by the keyboard shortcut "Ctrl/⌘ + ."
- Python package upgrades
 - bigframes 1.0.0 -> 1.5.0

```

Comedy: 355
Crime: 604
Drama: 1954
Family: 364
Fantasy: 115
History: 91
Horror: 74
Music: 50
Musical: 322
Mystery: 245
News: 1
Romance: 1221
Sci-Fi: 28
Sport: 38
Thriller: 590
War: 30
Western: 1
Action: 1652
Adventure: 105
Animation: 40
Biography: 84
Comedy: 989
Crime: 271
Documentary: 48
Drama: 1842
Family: 52
Fantasy: 31
History: 8
Horror: 128
Music: 3
Musical: 90
Mystery: 59
Romance: 159
Sci-Fi: 4
Sport: 2
Thriller: 89
War: 3

```

```

genresPie = df['Genre'].value_counts()
genresPie.head(5)

```

	count
Genre	
Drama	844
Drama, Romance	332
Action, Crime, Drama	329
Action, Drama	206
Comedy, Drama	205

dtype: int64

```

genrePie = pd.DataFrame(list(genresPie.items()))
genrePie = genrePie.rename(columns={0: 'Genre', 1: 'Count'})
genrePie.head(5)

```

- google-cloud-aiplatform 1.47.0 -> 1.51.0
- jax[tpu] 0.4.23 -> 0.4.26
- Python package inclusions
 - cudf 24.4.1

2024-04-15

- TPU v2 runtime is now available
- L4 runtime is now available for paid users
- New distributed fine-tuning Gemma tutorial on TPUs ([GitHub](#))
- Symbol rename is now supported with keyboard shortcut F2
- Fixed bug causing inability to re-upload deleted files
- Fixed breaking bug in colabtools %upload_files_async
- Added syntax highlighting to %%writefile cells
- Cuda dependencies that come with Torch are cached for faster downloads for packages that require Torch and its dependencies ([GitHub issue](#))
- Python package upgrades
 - bigframes 0.24.0 -> 1.0.0
 - duckdb 0.9.2 -> 0.10.1
 - google-cloud-aiplatform 1.43.0 -> 1.47.0
 - jax 0.4.23 -> 0.4.26

2024-03-13

- Fixed bug that sometimes caused UserSecrets to move / disappear
- Improved messaging for mounting drive in an unsupported environment ([GitHub issue](#))
- Python package upgrades
 - torch 2.1.0 -> 2.2.1
 - torchaudio 2.1.0 -> 2.2.1
 - torchvision 0.16.0 -> 0.17.1
 - torchtext 0.16.0 -> 0.17.1
 - PyMC 5.7.2 -> 5.10.4
 - BigFrames 0.21.0 -> 0.24.0
 - google-cloud-aiplatform 1.42.1 -> 1.43.0
 - tornado 6.3.2 -> 6.3.3

2024-02-21

- Try out Gemma on [Colab!](#)
- Allow unicode in form text inputs
- Display documentation and link to source when displaying functions
- Display image-like ndarrays as images
- Improved UX around quick charts and execution error suggestions

	Genre	Count
0	Drama	844
1	Drama, Romance	332
2	Action, Crime, Drama	329
3	Action, Drama	206
4	Comedy, Drama	205

```
df['Votes'] = df['Votes'].str.replace(',', '').astype(int)
df["Votes"].head(5)
```

	Votes
1	8
3	35
5	827
6	1086
8	326

dtype: int64

```
directors = df["Director"].value_counts()
directors.head(5)
```

	count
Director	
David Dhawan	41
Mahesh Bhatt	39
Ram Gopal Varma	33
Hrishikesh Mukherjee	33
Shakti Samanta	33

dtype: int64

```
actors = pd.concat([df['Actor 1'], df['Actor 2'], df['Actor 3']]).
actors.head(5)
```

- Released Marketplace image for the month of February ([GitHub issue](#))
- Python package upgrades
 - bigframes 0.19.2 → 0.21.0
 - regex 2023.6.3 → 2023.12.25
 - spacy 3.6.1 → 3.7.4
 - beautifulsoup4 4.11.2 → 4.12.3
 - tensorflow-probability 0.22.0 → 0.23.0
 - google-cloud-language 2.9.1 → 2.13.1
 - google-cloud-aiplatform 1.39.0 → 1.42.1
 - transformers 4.35.2 → 4..37.2
 - pyarrow 10.0.1 → 14.0.2

2024-01-29

- New [Kaggle Notebooks <=> Colab updates!](#)! Now you can:
 - Import directly from Colab without having to download/re-upload
 - Upload via link, by pasting Google Drive or Colab URLs
 - Export & run Kaggle Notebooks on Colab with 1 click
- Try these notebooks that talk to Gemini:
 - [Gemini and Stable Diffusion](#)
 - [Learning with Gemini and ChatGPT](#)
 - [Talk to Gemini with Google's Speech to Text API](#)
 - [Sell lemonade with Gemini and Sheets](#)
 - [Generate images with Gemini and Vertex](#)
- Python package upgrades
 - google-cloud-aiplatform 1.38.1 → 1.39.0
 - bigframes 0.18.0 → 0.19.2
 - polars 0.17.3 → 0.20.2
 - gdown 4.6.6 → 4.7.3 ([GitHub issue](#))
 - tensorflow-hub 0.15.0 → 0.16.0
 - flax 0.7.5 → 0.8.0
- Python package inclusions
 - sentencepiece 0.1.99

2024-01-08

- Avoid nested scrollbars for large outputs by using `google.colab.output.no_vertical_s` [Example notebook](#)
- Fix [bug](#) where downloading models from Hugging Face could freeze
- Python package upgrades
 - huggingface-hub 0.19.4 → 0.20.2
 - bigframes 0.17.0 → 0.18.0

2023-12-18

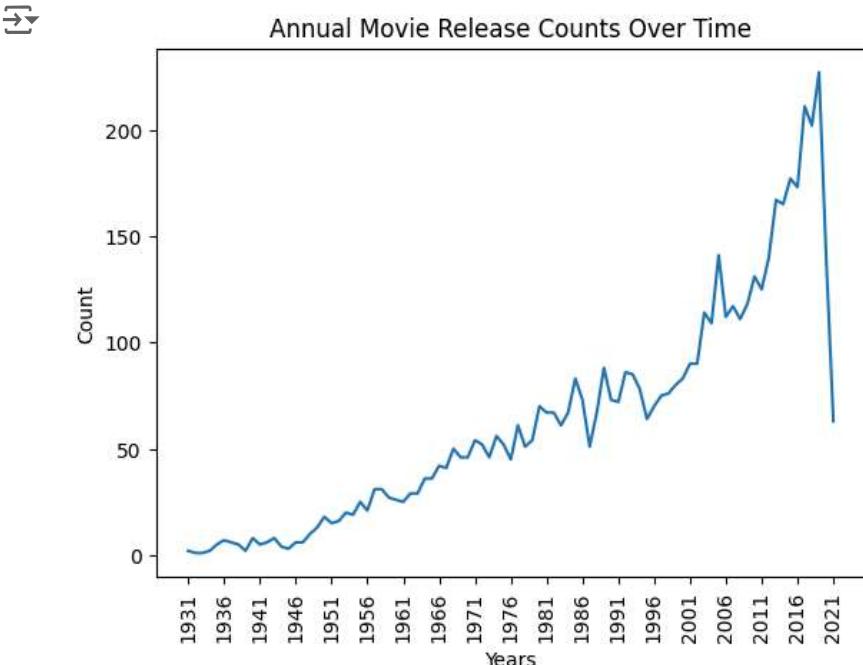
- Expanded access to AI coding has arrived in Colab across 175 locales for all

	count
Mithun Chakraborty	160
Amitabh Bachchan	148
Dharmendra	146
Ashok Kumar	124
Akshay Kumar	120

dtype: int64

```
import seaborn as sb
```

```
ax = sb.lineplot(data=df['Year'].value_counts().sort_index())
tick_positions = range(min(df['Year']), max(df['Year']) + 1, 5)
ax.set_title("Annual Movie Release Counts Over Time")
ax.set_xticks(tick_positions)
ax.set_xticklabels(tick_positions, rotation = 90)
ax.set_xlabel("Years")
ax.set_ylabel("Count")
plt.show()
```



```
ax = sb.boxplot(data=df, y='Duration')
ax.set_title("Box Plot of Average Movie Durations")
ax.set_ylabel('Average Duration(in minutes)')
plt.show()
```

tiers of Colab users

- Improvements to display of ML-based inline completions (for eligible Pro/Pro+ users)
- Started a series of [notebooks](#) highlighting Gemini API capabilities
- Enable ⌘/Ctrl+L to select the full line in an editor
- Fixed [bug](#) where we weren't correctly formatting output from multiple execution results
- Python package upgrades
 - CUDA 11.8 to CUDA 12.2
 - tensorflow 2.14.0 -> 2.15.0
 - tensorboard 2.14.0 -> 2.15.0
 - keras 2.14.0 -> 2.15.0
 - Nvidia drivers 525.105.17 -> 535.104.05
 - tensorflow-gcs-config 2.14.0 -> 2.15.0
 - bigframes 0.13.0 -> 0.17.0
 - geemap 0.28.2 -> 0.29.6
 - pyarrow 9.0.0 -> 10.0.1
 - google-generativeai 0.2.2 -> 0.3.1
 - jax 0.4.20 -> 0.4.23
 - jaxlib 0.4.20 -> 0.4.23
- Python package inclusions
 - kagglehub 0.1.4
 - google-cloud-aiplatform 1.38.1

2023-11-27

- Removed warning when calling await to make it render as code
- Added "Run selection" to the cell context menu
- Added highlighting for the %python cell magic
- Launched AI coding features for Pro/Pro+ users in more locales
- Python package upgrades
 - bigframes 0.12.0 -> 0.13.0
- Python package inclusions
 - transformers 4.35.2
 - google-generativeai 0.2.2

2023-11-08

- Launched Secrets, for safe storage of private keys on Colab ([tweet](#))
- Fixed issue where TensorBoard would not load ([#3990](#))
- Python package upgrades
 - lightgbm 4.0.0 -> 4.1.0
 - bigframes 0.10.0 -> 0.12.0
 - bokeh 3.2.2 -> 3.3.0
 - duckdb 0.8.1 -> 0.9.1
 - numba 0.56.4 -> 0.58.1
 - tweepy 4.13.0 -> 4.14.0
 - jax 0.4.16 -> 0.4.20

- jaxlib 0.4.16 -> 0.4.20

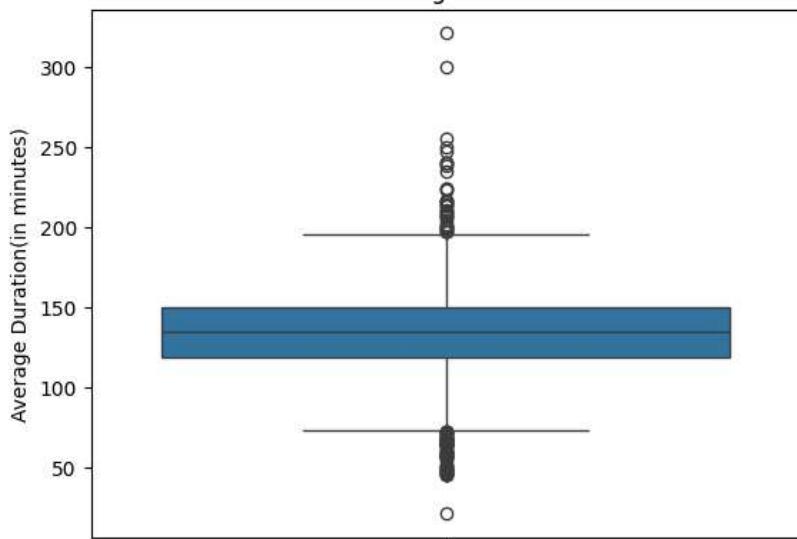
2023-10-23

- Updated the [Open notebook](#) dialog for better usability and support for smaller screen sizes
- Added smart paste support for data from Google Sheets for R notebooks
- Enabled showing release notes in a tab
- Launched AI coding features for Pro/Pro+ users in Australia AU Canada CA India IN and Japan JP ([tweet](#))
- Python package upgrades
 - eartheengine-api 0.1.357 -> 0.1.375
 - flax 0.7.2 -> 0.7.4
 - geemap 0.27.4 -> 0.28.2
 - jax 0.4.14 -> 0.4.16
 - jaxlib 0.4.14 -> 0.4.16
 - keras 2.13.1 -> 2.14.0
 - tensorboard 2.13.0 -> 2.14.1
 - tensorflow 2.13.0 -> 2.14.0
 - tensorflow-gcs-config 2.13.0 -> 2.14.0
 - tensorflow-hub 0.14.0 -> 0.15.0
 - tensorflow-probability 0.20.1 -> 0.22.0
 - torch 2.0.1 -> 2.1.0
 - torchaudio 2.0.2 -> 2.1.0
 - torchtext 0.15.2 -> 0.16.0
 - torchvision 0.15.2 -> 0.16.0
 - xgboost 1.7.6 -> 2.0.0
- Python package inclusions
 - bigframes 0.10.0
 - malloy 2023.1056

2023-09-22

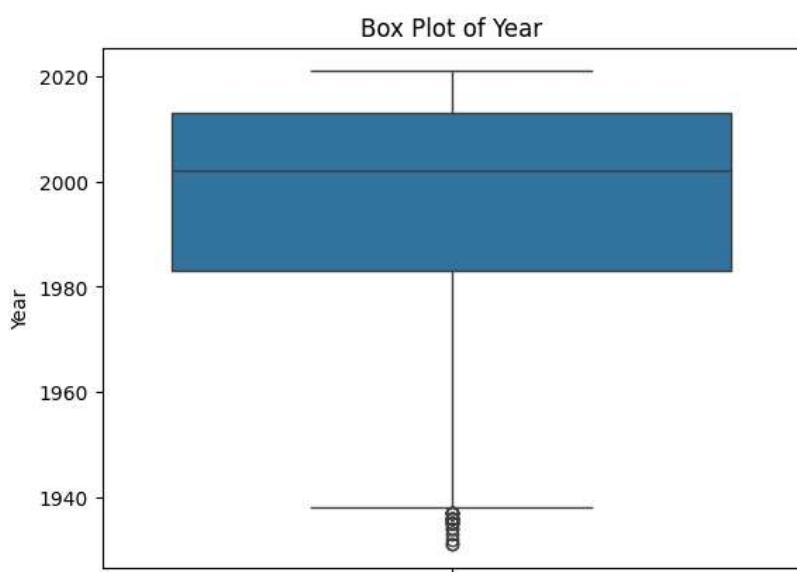
- Added the ability to scope an AI generated suggestion to a specific Pandas dataframe ([tweet](#))
- Added Colab link previews to Docs ([tweet](#))
- Added smart paste support for data from Google Sheets
- Increased font size of dropdowns in interactive forms
- Improved rendering of the notebook when printing
- Python package upgrades
 - tensorflow 2.12.0 -> 2.13.0
 - tensorboard 2.12.3 -> 2.13.0
 - keras 2.12.0 -> 2.13.1
 - tensorflow-gcs-config 2.12.0 -> 2.13.
 - scipy 1.10.1 -> 1.11.2
 - cython 0.29.6 -> 3.0.2
- Python package inclusions
 - geemap 0.26.0

2023-08-18



Double-click (or enter) to edit

```
ax = sb.boxplot(data=df, y='Year')
ax.set_ylabel('Year')
ax.set_title('Box Plot of Year')
plt.show()
```

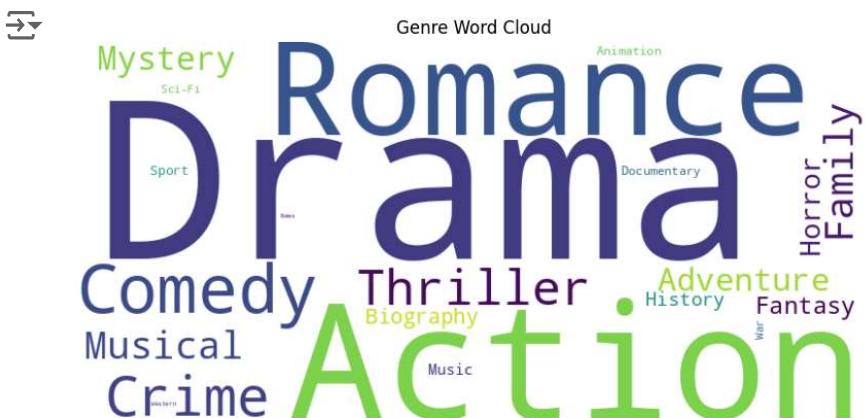


```
Q1 = df['Duration'].quantile(0.25)
Q3 = df['Duration'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
```

```
upper_bound = Q3 + 1.5 * IQR
df = df[(df['Duration'] >= lower_bound) & (df['Duration'] <= upper_bound)]
df.head(5)
```

	Name	Year	Duration	Genre	Rating	Votes	Director
1	#Gadhvi (He thought he was Gandhi)	2019	109	Drama	7.0	8	Gaurav Bakshi
3	#Yaaram	2019	110	Comedy, Romance	4.4	35	Ovais Khan
5	...Aur Pyaar Ho Gaya	1997	147	Comedy, Drama, Musical	4.7	827	Rahul Rawail
6	Vahan	2005	112	Drama, Romance	7.1	1006	Shoojit

```
from wordcloud import WordCloud
genre_counts = df['Genre'].str.split(', ', expand=True).stack().value_counts()
wordcloud = WordCloud(width=800, height=400, background_color='white')
plt.figure(figsize=(10, 6))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.title('Genre Word Cloud')
plt.show()
```

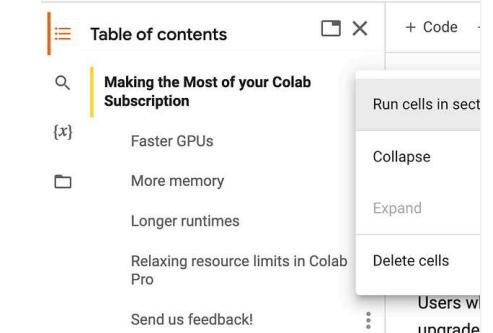


Start coding or generate with AI.

- Added "Change runtime type" to the menu in the connection button
- Improved auto-reconnection to an already running notebook ([#3764](#))
- Increased the specs of our highmem machines for Pro users
- Fixed add-apt-repository command on Ubuntu 22.04 runtime ([#3867](#))
- Python package upgrades
 - bokeh 2.4.3 -> 3.2.2
 - cmake 3.25.2 -> 3.27.2
 - cryptography 3.4.8 -> 41.0.3
 - dask 2022.12.1 -> 2023.8.0
 - distributed 2022.12.1 -> 2023.8.0
 - earthengine-api 0.1.358 -> 0.1.364
 - flax 0.7.0 -> 0.7.2
 - ipython-sql 0.4.0 -> 0.5.0
 - jax 0.4.13 -> 0.4.14
 - jaxlib 0.4.13 -> 0.4.14
 - lightgbm 3.3.5 -> 4.0.0
 - mkl 2019.0 -> 2023.2.0
 - notebook 6.4.8 -> 6.5.5
 - numpy 1.22.4 -> 1.23.5
 - opencv-python 4.7.0.72 -> 4.8.0.76
 - pillow 8.4.0 -> 9.4.0
 - plotly 5.13.1 -> 5.15.0
 - prettytable 0.7.2 -> 3.8.0
 - pytensor 2.10.1 -> 2.14.2
 - spacy 3.5.4 -> 3.6.1
 - statsmodels 0.13.5 -> 0.14.0
 - xarray 2022.12.0 -> 2023.7.0
- Python package inclusions
 - PyDrive2 1.6.3

2023-07-21

- Launched auto-plotting for dataframes, available using the chart button that shows up alongside datatables ([post](#))
- Added a menu to the table of contents to support running a section or collapsing/expanding sections ([post](#))

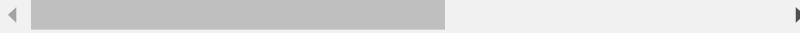
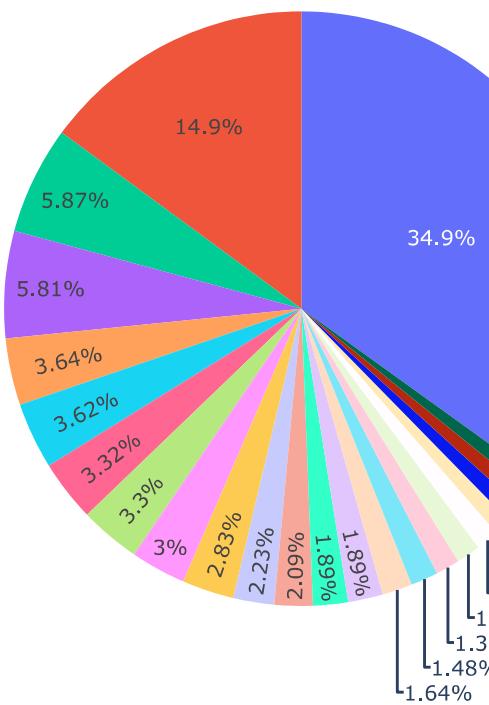


- Added an option to automatically run the first cell or section, available under Edit -> Notebook settings ([post](#))

```
import plotly.express as px
genrePie.loc[genrePie['Count'] < 50, 'Genre'] = 'Other'
ax = px.pie(genrePie, values='Count', names='Genre', title='More than one genre')
ax.show()
```



More than one Genre of movies in Indian Cinema



```
genreLabels = sorted(genreCounts.keys())
genreCounts = sorted(genreCounts.values())
ax = sb.barplot(x = genreLabels, y = genreCounts)
ax.set_xticklabels(labels=genreLabels, rotation = 90)
plt.show()
```

Notebook settings

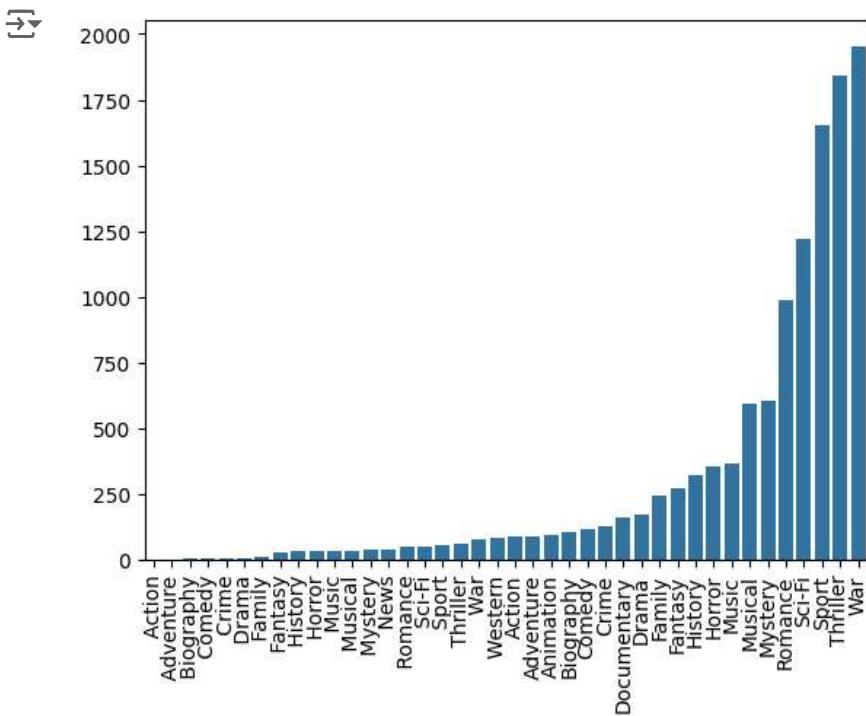
Runtime type
Python 3
Hardware accelerator
None
 Automatically run the first cell or section
 Omit code cell output when saving this notebook

Cancel

- Launched Pro/Pro+ to Algeria, Argentina, Chile, Ecuador, Egypt, Ghana, Kenya, Malaysia, Nepal, Nigeria, Peru, Rwanda, Saudi Arabia, South Africa, Sri Lanka, Tunisia, and Ukraine ([tweet](#))
- Added a command, "Toggle tab moves focus" for toggling tab trapping in the editor (Tools -> Command palette, "Toggle tab moves focus")
- Fixed issue where `files.upload()` was sometimes returning an incorrect filename ([#1550](#))
- Fixed f-string syntax highlighting bug ([#3802](#))
- Disabled ambiguous characters highlighting for commonly used LaTeX characters ([#3648](#))
- Upgraded Ubuntu from 20.04 LTS to [22.04 LTS](#)
- Updated the Colab Marketplace VM image
- Python package upgrades:
 - autograd 1.6.1 -> 1.6.2
 - drivefs 76.0 -> 77.0
 - flax 0.6.11 -> 0.7.0
 - earthengine-api 0.1.357 -> 0.1.358
 - GDAL 3.3.2->3.4.3
 - google-cloud-bigquery-storage 2.20.0 -> 2.22.2
 - gspread-dataframe 3.0.8 -> 3.3.1
 - holidays 0.27.1 -> 0.29
 - jax 0.4.10 -> jax 0.4.13
 - jaxlib 0.4.10 -> jax 0.4.13
 - jupyterlab-widgets 3.0.7 -> 3.0.8
 - nbformat 5.9.0 -> 5.9.1
 - opencv-python-headless 4.7.0.72 -> 4.8.0.74
 - pygame 2.4.0 -> 2.5.0
 - spacy 3.5.3 -> 3.5.4
 - SQLAlchemy 2.0.16 -> 2.0.19
 - tabulate 0.8.10 -> 0.9.0
 - tensorflow-hub 0.13.0 -> 0.14.0

2023-06-23

- Launched AI coding features to subscribed users starting with Pro+ users in the US ([tweet](#), [post](#))
- Added the Kernel Selector in the Notebook Settings ([tweet](#))
- Fixed double space trimming issue in markdown ([#3766](#))
- Fixed run button indicator not always centered ([#3609](#))

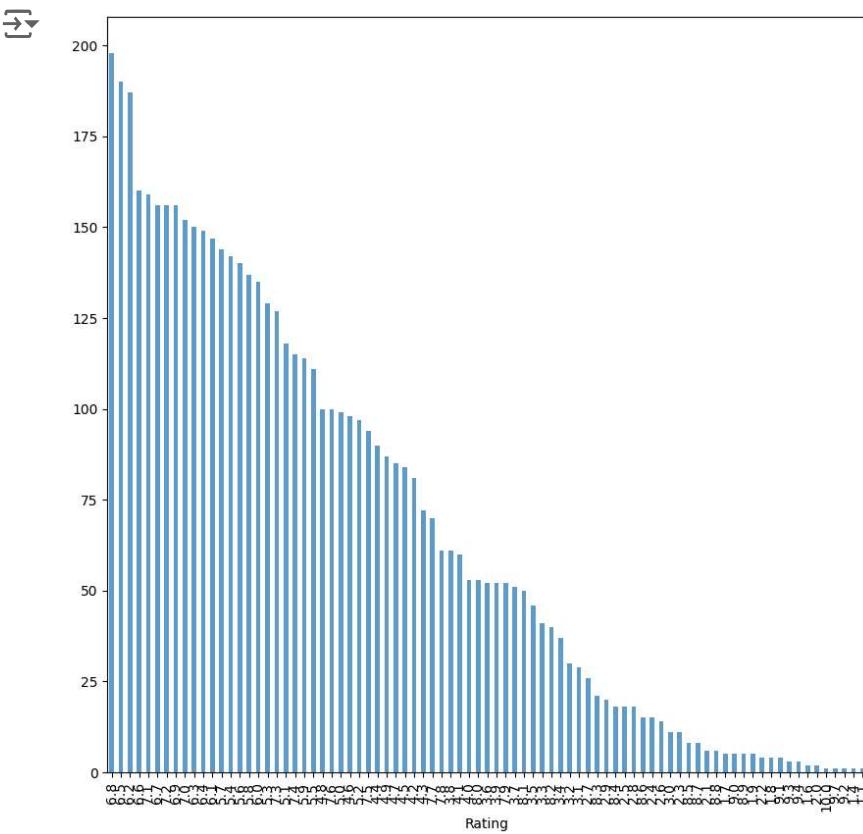


```
#Visualize overall rating by users  
df['Rating'].value_counts().plot(kind='bar',alpha=0.7,figsize=(10,  
plt.show()
```

- Fixed inconsistencies for automatic indentation on multi-line [#3697](#)
 - Upgraded Python from 3.10.11 to 3.10.12
 - Python package updates:
 - duckdb 0.7.1 -> 0.8.1
 - earthengine-api 0.1.350 -> 0.1.357
 - flax 0.6.9 -> 0.6.11
 - google-cloud-bigquery 3.9.0 -> 3.10.0
 - google-cloud-bigquery-storage 2.19.1 -> 2.20.0
 - grpcio 1.54.0 -> 1.56.0
 - holidays 0.25 -> 0.27.1
 - nbformat 5.8.0 -> 5.9.0
 - prophet 1.1.3 -> 1.1.4
 - pydata-google-auth 1.7.0 -> 1.8.0
 - spacy 3.5.2 -> 3.5.3
 - tensorboard 2.12.2 -> 2.12.3
 - xgboost 1.7.5 -> 1.7.6
 - Python package inclusions:
 - gcsfs 2023.6.0
 - geopandas 0.13.2
 - google-cloud-bigquery-connection 1.12.0
 - google-cloud-functions 1.13.0
 - grpc-google-iam-v1 0.12.6
 - multidict 6.0.4
 - tensorboard-data-server 0.7.1

2023-06-02

- Released the new site [colab.google](#)
 - Published Colab's Docker runtime image to us-docker.pkg.dev/colab-images/public/runtime ([tweet, instructions](#))
 - Launched support for Google children accounts ([tweet](#))
 - Launched DagsHub integration ([tweet, post](#))
 - Upgraded to Monaco Editor Version 0.37.1
 - Fixed various Vim keybinding bugs
 - Fixed issue where the N and P letters sometimes couldn't be typed ([#3664](#))
 - Fixed rendering support for compositional inputs ([#3660](#), [#3679](#))
 - Fixed lag in notebooks with lots of cells ([#3676](#))
 - Improved support for R by adding a Runtime type notebook setting (Edit -> Notebook settings)
 - Improved documentation for connecting to a local runtime (Connect -> Connect to a local runtime)
 - Python package updates:
 - `holidays` 0.23 -> 0.25
 - `jax` 0.4.8 -> 0.4.10
 - `jaxlib` 0.4.8 -> 0.4.10
 - `pip` 23.0.1 -> 23.1.2
 - `tensorflow-probability` 0.19.0 -> 0.20.1
 - `torch` 2.0.0 -> 2.0.1
 - `torchaudio` 2.0.1 -> 2.0.2



- torchdata 0.6.0 -> 0.6.1
- torchtext 0.15.1 -> 0.15.2
- torchvision 0.15.1 -> 0.15.2
- tornado 6.2 -> 6.3.1

2023-05-05

- Released GPU type selection for paid users, allowing them to choose a preferred NVidia GPU
- Upgraded R from 4.2.3 to 4.3.0
- Upgraded Python from 3.9.16 to 3.10.11
- Python package updates:
 - attrs 22.2.0 -> attrs 23.1.0
 - earthengine-api 0.1.349 -> earthengine-api 0.1.350
 - flax 0.6.8 -> 0.6.9
 - grpcio 1.53.0 -> 1.54.0
 - nbclient 0.7.3 -> 0.7.4
 - tensorflow-datasets 4.8.3 -> 4.9.2
 - termcolor 2.2.0 -> 2.3.0
 - zict 2.2.0 -> 3.0.0

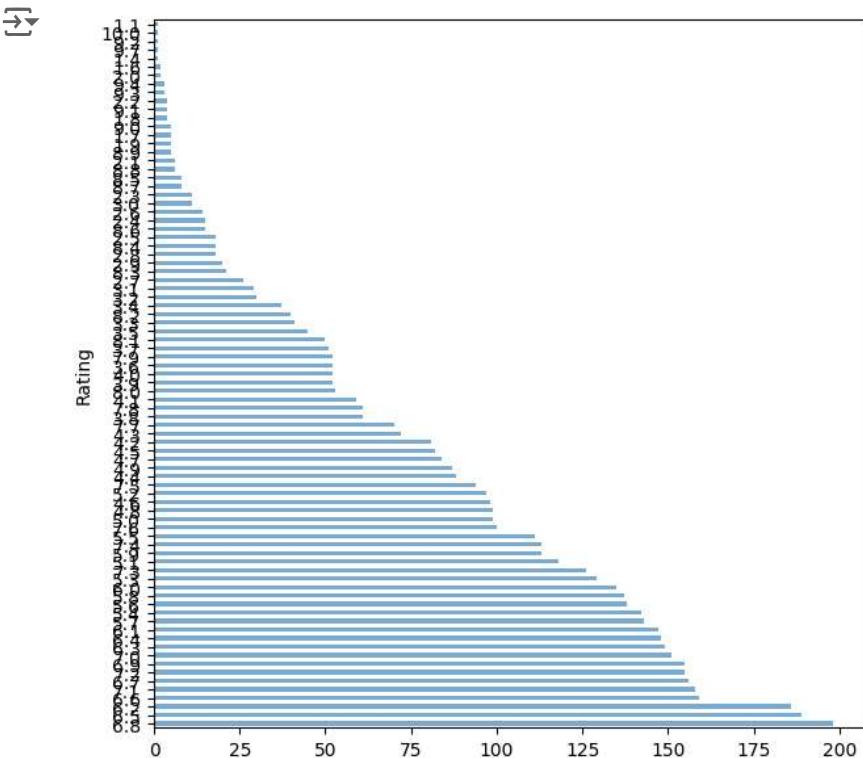
2023-04-14

- Python package updates:
 - google-api-python-client 2.70.0 -> 2.84.0
 - google-auth-oauthlib 0.4.6 -> 1.0.0
 - google-cloud-bigquery 3.4.2 -> 3.9.0
 - google-cloud-datastore 2.11.1 -> 2.15.1
 - google-cloud-firebase 2.7.3 -> 2.11.0
 - google-cloud-language 2.6.1 -> 2.9.1
 - google-cloud-storage 2.7.0 -> 2.8.0
 - google-cloud-translate 3.8.4 -> 3.11.1
 - networkx 3.0 -> 3.1
 - notebook 6.3.0 -> 6.4.8
 - jax 0.4.7 -> 0.4.8
 - pandas 1.4.4 -> 1.5.3
 - spacy 3.5.1 -> 3.5.2
 - SQLAlchemy 1.4.47 -> 2.0.9
 - xgboost 1.7.4 -> 1.7.5

2023-03-31

- Improve bash ! syntax highlighting ([GitHub issue](#))
- Fix bug where VIM keybindings weren't working in the file editor
- Upgraded R from 4.2.2 to 4.2.3
- Python package updates:
 - arviz 0.12.1 -> 0.15.1
 - astropy 4.3.1 -> 5.2.2
 - dopamine-rl 1.0.5 -> 4.0.6
 - gensim 3.6.0 -> 4.3.1
 - ipykernel 5.3.4 -> 5.5.6
 - ipython 7.9.0 -> 7.34.0
 - jax 0.4.4 -> 0.4.7
 - jaxlib 0.4.4 -> 0.4.7
 - jupyter_core 5.2.0 -> 5.3.0
 - keras 2.11.0 -> 2.12.0

```
#Find and visualize the top 25 movies by viewership rating
top_25 = df[25:]
top_25['Rating'].value_counts().plot(kind='barh',alpha=0.6,figsize=(10,10))
plt.show()
```



```
#First 500 extracted records
first_500 = df[500:]
first_500.dropna(inplace=True)

features = first_500[['Year','Duration','Votes']].values

labels = first_500[['Rating']].values

train, test, train_labels, test_labels = train_test_split(features

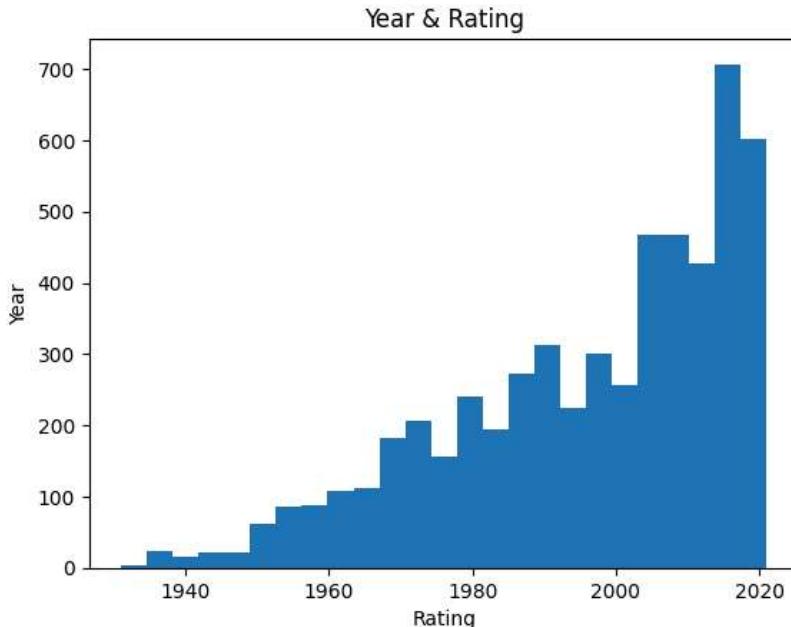
#Create a histogram for year
df.Year.plot.hist(bins=25)
plt.title("Year & Rating")
plt.ylabel('Year')
plt.xlabel('Rating')
```

- lightgbm 2.2.3 -> 3.3.5
- matplotlib 3.5.3 -> 3.7.1
- nltk 3.7 -> 3.8.1
- opencv-python 4.6.0.66 -> 4.7.0.72
- plotly 5.5.0 -> 5.13.1
- pymc 4.1.4 -> 5.1.2
- seaborn 0.11.2 -> 0.12.2
- spacy 3.4.4 -> 3.5.1
- sympy 1.7.1 -> 1.11.1
- tensorboard 2.11.2 -> 2.12.0
- tensorflow 2.11.0 -> 2.12.0
- tensorflow-estimator 2.11.0 -> 2.12.0
- tensorflow-hub 0.12.0 -> 0.13.0
- torch 1.13.1 -> 2.0.0
- torchaudio 0.13.1 -> 2.0.1
- torchtext 0.14.1 -> 0.15.1
- torchvision 0.14.1 -> 0.15.1

2023-03-10

- Added the [Colab editor shortcuts](#) example notebook
- Fixed triggering of @-mention and email autocomplete for large comments ([GitHub issue](#))
- Added View Resources to the Runtime menu
- Made file viewer images fit the view by default, resizing to original size on click
- When in VIM mode, enable copy as well as allowing propagation to monaco-vim to escape visual mode ([GitHub issue](#))
- Upgraded CUDA 11.6.2 -> 11.8.0 and cuDNN 8.4.0.27 -> 8.7.0.84
- Upgraded Nvidia drivers 525.78.01 -> 530.30.02
- Upgraded Python 3.8.10 -> 3.9.16
- Python package updates:
 - beautifulsoup4 4.6.3 -> 4.9.3
 - bokeh 2.3.3 -> 2.4.3
 - debugpy 1.0.0 -> 1.6.6
 - Flask 1.1.4 -> 2.2.3
 - jax 0.3.25 -> 0.4.4
 - jaxlib 0.3.25 -> 0.4.4
 - Jinja2 2.11.3 -> 3.1.2
 - matplotlib 3.2.2 -> 3.5.3
 - nbconvert 5.6.1 -> 6.5.4
 - pandas 1.3.5 -> 1.4.4
 - pandas-datareader 0.9.0 -> 0.10.0
 - pandas-profiling 1.4.1 -> 3.2.0
 - Pillow 7.1.2 -> 8.4.0
 - plotnine 0.8.0 -> 0.10.1
 - scikit-image 0.18.3 -> 0.19.3
 - scikit-learn 1.0.2 -> 1.2.2
 - scipy 1.7.3 -> 1.10.1
 - setuptools 57.4.0 -> 63.4.3
 - sklearn-pandas 1.8.0 -> 2.2.0
 - statsmodels 0.12.2 -> 0.13.5
 - urllib3 1.24.3 -> 1.26.14
 - Werkzeug 1.0.1 -> 2.2.3
 - wrapt 1.14.1 -> 1.15.0
 - xgboost 0.90 -> 1.7.4
 - xlrd 1.2.0 -> 2.0.1

→ Text(0.5, 0, 'Rating')



2023-02-17

- Show graphs of RAM and disk usage in notebook toolbar
- Copy cell links directly to the clipboard instead of showing a dialog when clicking on the link icon in the cell toolbar
- Updated the [Colab Marketplace VM image](#)
- Upgraded CUDA to 11.6.2 and cuDNN to 8.4.0.27
- Python package updates:
 - tensorflow 2.9.2 → 2.11.0
 - tensorflowboard 2.9.1 → 2.11.2
 - keras 2.9.0 → 2.11.0
 - tensorflow-estimator 2.9.0 → 2.11.0
 - tensorflow-probability 0.17.0 → 0.19.0
 - tensorflow-gcs-config 2.9.0 → 2.11.0
 - earthengine-api 0.1.339 → 0.1.341
 - flatbuffers 1.12 → 23.1.21
 - platformdirs 2.6.2 → 3.0.0
 - pydata-google-auth 1.6.0 → 1.7.0
 - python-utils 3.4.5 → 3.5.2
 - tenacity 8.1.0 → 8.2.1
 - tifffile 2023.1.23.1 → 2023.2.3
 - notebook 5.7.16 → 6.3.0
 - tornado 6.0.4 → 6.2
 - aiohttp 3.8.3 → 3.8.4
 - charset-normalizer 2.1.1 → 3.0.1
 - fastai 2.7.0 → 2.7.1
 - soundfile 0.11.0 → 0.12.1
 - typing-extensions 4.4.0 → 4.5.0
 - widgetsnbextension 3.6.1 → 3.6.2
 - pydantic 1.10.4 → 1.10.5
 - zipp 3.12.0 → 3.13.0
 - numpy 1.21.6 → 1.22.4
 - drivefs 66.0 → 69.0
 - gdal 3.0.4 → 3.3.2 [GitHub issue](#)

- Added libudunits2-dev for smoother R package installs [GitHub issue](#)

2023-02-03

- Improved tooltips for pandas series to show common statistics about the series object
- Made the forms dropdown behave like an autocomplete box when it allows input
- Updated the nvidia driver from 460.32.03 to 510.47.03
- Python package updates:
 - absl-py 1.3.0 → 1.4.0
 - bleach 5.0.1 → 6.0.0
 - cachetools 5.2.1 → 5.3.0
 - cmdstanpy 1.0.8 → 1.1.0
 - dnspython 2.2.1 → 2.3.0
 - fsspec 2022.11.0 → 2023.1.0
 - google-cloud-bigquery-storage 2.17.0 → 2.18.1
 - holidays 0.18 → 0.19
 - jupyter-core 5.1.3 → 5.2.0
 - packaging 21.3 → 23.0

```
import pandas as pd
from sklearn.linear_model import LinearRegression # Import Linear
from sklearn.model_selection import train_test_split

# Assuming 'features' and 'labels' are your original data
train, test, train_labels, test_labels = train_test_split(features)

# Convert train and test to pandas DataFrames
train = pd.DataFrame(train) # Convert train to DataFrame
test = pd.DataFrame(test) # Convert test to DataFrame

# Now give columns names based on your actual data
# For example, if your original features have columns named 'featu
train.columns = ['feature1', 'feature2', 'feature3']
test.columns = ['feature1', 'feature2', 'feature3']

# Now, fit a Linear Regression model (suitable for continuous targ
linreg = LinearRegression() # Create a LinearRegression object
linreg.fit(train, train_labels) # Fit the model
Y_pred = linreg.predict(test) # Make predictions
acc_lin = round(linreg.score(train, train_labels) * 100, 2) # Cal
acc_lin

→ 8.95

# Decision Tree

# Import DecisionTreeRegressor for regression tasks
from sklearn.tree import DecisionTreeRegressor

# Use DecisionTreeRegressor instead of DecisionTreeClassifier
decision_tree = DecisionTreeRegressor()
```

```
decision_tree.fit(train, train_labels)
Y_pred = decision_tree.predict(test)
acc_decision_tree = round(decision_tree.score(train, train_labels))
acc_decision_tree
```

99.87

```
# Random Forest
```

```
# Import RandomForestRegressor for regression tasks
from sklearn.ensemble import RandomForestRegressor

random_forest = RandomForestRegressor(n_estimators=100) # Use Rar
random_forest.fit(train, train_labels.ravel()) # Ravel train_label
Y_pred = random_forest.predict(test)
random_forest.score(train, train_labels)
acc_random_forest = round(random_forest.score(train, train_labels))
acc_random_forest
```

88.73

```
Input.head(5)
```

	Year	Duration	Votes
1	2019	109	8
3	2019	110	35
5	1997	147	827
6	2005	142	1086
8	2012	82	326

```
Output.head()
```

	Rating
1	7.0
3	4.4
5	4.7
6	7.4
8	5.6

```
dtype: float64
```

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor
from sklearn.neural_network import MLPRegressor
from sklearn.svm import SVR
import xgboost as xgb
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
```

- prometheus-client 0.15.0 → 0.16.0
- pyct 0.4.8 → 0.5.0
- pydata-google-auth 1.5.0 → 1.6.0
- python-slugify 7.0.0 → 8.0.0
- sqlalchemy 1.4.46 → 2.0.0
- tensorflow-io-gcs-filesystem 0.29.0 → 0.30.0
- tifffile 2022.10.10 → 2023.1.23.1
- zipp 3.11.0 → 3.12.0
- Pinned sqlalchemy to version 1.4.46

2023-01-12

- Added support for @-mention and email autocomplete in comments
- Improved errors when GitHub notebooks can't be loaded
- Increased color contrast for colors used for syntax highlighting in the code editor
- Added terminal access for custom GCE VM runtimes
- Upgraded Ubuntu from 18.04 LTS to 20.04 LTS ([GitHub issue](#))
- Python package updates:
 - GDAL 2.2.2 → 2.2.3.
 - NumPy from 1.21.5 to 1.21.6.
 - attrs 22.1.0 → 22.2.0
 - chardet 3.0.4 → 4.0.0
 - cloudpickle 1.6.0 → 2.2.0
 - filelock 3.8.2 → 3.9.0
 - google-api-core 2.8.2 → 2.11.0
 - google-api-python-client 1.12.11 → 2.70.0
 - google-auth-httpbin2 0.0.3 → 0.1.0
 - google-cloud-bigquery 3.3.5 → 3.4.1
 - google-cloud-datastore 2.9.0 → 2.11.0
 - google-cloud-firebase 2.7.2 → 2.7.3
 - google-cloud-storage 2.5.0 → 2.7.0
 - holidays 0.17.2 → holidays 0.18
 - importlib-metadata 5.2.0 → 6.0.0
 - networkx 2.8.8 → 3.0
 - opencv-python-headless 4.6.0.66 → 4.7.0.68
 - pip 21.1.3 → 22.0.4
 - pip-tools 6.2.0 → 6.6.2
 - prettytable 3.5.0 → 3.6.0
 - requests 2.23.0 → 2.25.1
 - termcolor 2.1.1 → 2.2.0
 - torch 1.13.0 → 1.13.1
 - torchaudio 0.13.0 → 0.13.1
 - torchtext 0.14.0 → 0.14.1
 - torchvision 0.14.0 → 0.14.1

2022-12-06

- Made fallback runtime version available until mid-December ([GitHub issue](#))
- Upgraded to Python 3.8 ([GitHub issue](#))
- Python package updates:
 - jax from 0.3.23 to 0.3.25, jaxlib from 0.3.22 to 0.3.25
 - pyarrow from 6.0.1 to 9.0.0

```

from sklearn.metrics import r2_score
from sklearn.tree import DecisionTreeRegressor

from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor
from sklearn.neighbors import KNeighborsRegressor
from sklearn.svm import SVR
from sklearn.model_selection import RandomizedSearchCV
dct = {
    'Linear':LinearRegression(),
    'DecisionTree':DecisionTreeRegressor(),
    'RandomForest':RandomForestRegressor(),
    'GradientBoosting':GradientBoostingRegressor(),
    'KNN':KNeighborsRegressor(),
    'SVR':SVR()
}
dct.items()

→ dict_items([('Linear', LinearRegression()), ('DecisionTree', DecisionTreeRegressor()), ('RandomForest', RandomForestRegressor()), ('GradientBoosting', GradientBoostingRegressor()), ('KNN', KNeighborsRegressor()), ('SVR', SVR())])

```

```

from sklearn.metrics import mean_squared_error,r2_score
from sklearn.model_selection import cross_val_score

train_mse = []
train_r2 = []
test_mse = []
test_r2 = []
train_cv = []

for name,model in dct.items():
    # fit the model
    # The original code used 'xtrain' and 'ytrain', likely typos +
    m = model.fit(x_train, y_train)
    ypred_train = m.predict(x_train)
    # Similarly, 'xtest' is likely a typo for 'x_test'
    ypred_test = m.predict(x_test)
    # calculate MSE
    mse_train = mean_squared_error(y_train, ypred_train)
    mse_test = mean_squared_error(y_test, ypred_test)
    # calculate R2
    r2_train = (r2_score(y_train, ypred_train)) * 100
    r2_test = (r2_score(y_test, ypred_test)) * 100
    # calculate cross validated scores
    cv = cross_val_score(m, x_train, y_train, cv=5, scoring='r2')
    scores = (cv.mean()) * 100

    # add these values to the respective list to compare the output
    train_mse.append(mse_train)
    train_r2.append(r2_train)
    test_mse.append(mse_test)
    test_r2.append(r2_test)
    train_cv.append(scores)

```

- torch from 1.12.1 to 1.13.0
- torchaudio from 0.12.1 to 0.13.0
- torchvision from 0.13.1 to 0.14.0
- torchtext from 0.13.1 to 0.14.0
- xlrd from 1.1.0 to 1.2.0
- DriveFS from 62.0.1 to 66.0.3
- Made styling of markdown tables in outputs match markdown tables in text cells
- Improved formatting for empty interactive table rows
- Fixed syntax highlighting for variables with names that contain Python keywords ([GitHub issue](#))

2022-11-11

- Added more dark editor themes for Monaco (when in dark mode, "Editor colorization" appears as an option in the Editor tab of the Tools → Settings dialog)
- Fixed bug where collapsed forms were deleted on mobile ([GitHub issue](#))
- Python package updates:
 - rpy2 from 3.4.0 to 3.5.5 ([GitHub issue](#))
 - notebook from 5.5.0 to 5.7.16
 - tornado from 5.1.1 to 6.0.4
 - tensorflow_probability from 0.16.0 to 0.17.0
 - pandas-gbq from 0.13.3 to 0.17.9
 - protobuf from 3.17.3 to 3.19.6
 - google-api-core[grpc] from 1.31.5 to 2.8.2
 - google-cloud-bigquery from 1.21.0 to 3.3.5
 - google-cloud-core from 1.0.1 to 2.3.2
 - google-cloud-datastore from 1.8.0 to 2.9.0
 - google-cloud-firebase from 1.7.0 to 2.7.2
 - google-cloud-language from 1.2.0 to 2.6.1
 - google-cloud-storage from 1.18.0 to 2.5.0
 - google-cloud-translate from 1.5.0 to 3.8.4

2022-10-21

- Launched a single-click way to get from BigQuery to Colab to further explore query results ([announcement](#))
- Launched [Pro, Prot, and Pay As You Go](#) to 19 additional countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Hungary, Latvia, Lithuania, Norway, Portugal, Romania, Slovakia, Slovenia, and Sweden ([tweet](#))
- Updated jax from 0.3.17 to 0.3.23, jaxlib from 0.3.15 to 0.3.22, TensorFlow from 2.8.2 to 2.9.2, CUDA from 11.1 to 11.2, and cuDNN from 8.0 to 8.1 ([backend-info](#))

```
# print the results
print(f'Scores for {name}')
print("Training Scores")
print(f'MSE:{train_mse}')
print(f'R2:{train_r2}')
print("Testing Scores")
print(f'MSE:{test_mse}')
print(f'R2:{test_r2}')
print(f'CV:{train_cv}')
print("=====")
```

→ Scores for Linear
Training Scores
MSE:[1.7209761546655007]
R2:[10.097448537444475]
Testing Scores
MSE:[1.9591154020422163]
R2:[-6.654042212418165]
CV:[9.440024247228669]
=====

Scores for DecisionTree
Training Scores
MSE:[1.7209761546655007, 0.004015066336856306]
R2:[10.097448537444475, 99.79025583416933]
Testing Scores
MSE:[1.9591154020422163, 2.742686600719425]
R2:[-6.654042212418165, -49.31157816616454]
CV:[9.440024247228669, -46.602901962252744]
=====

Scores for RandomForest
Training Scores
MSE:[1.7209761546655007, 0.004015066336856306, 0.2109032328538]
R2:[10.097448537444475, 99.79025583416933, 88.9825674261318]
Testing Scores
MSE:[1.9591154020422163, 2.742686600719425, 1.4548348000971725]
R2:[-6.654042212418165, -49.31157816616454, 20.798942206307448]
CV:[9.440024247228669, -46.602901962252744, 22.282889602149552]
=====

Scores for GradientBoosting
Training Scores
MSE:[1.7209761546655007, 0.004015066336856306, 0.2109032328538]
R2:[10.097448537444475, 99.79025583416933, 88.9825674261318, 3]
Testing Scores
MSE:[1.9591154020422163, 2.742686600719425, 1.4548348000971725]
R2:[-6.654042212418165, -49.31157816616454, 20.798942206307448]
CV:[9.440024247228669, -46.602901962252744, 22.282889602149552]
=====

Scores for KNN
Training Scores
MSE:[1.7209761546655007, 0.004015066336856306, 0.2109032328538]
R2:[10.097448537444475, 99.79025583416933, 88.9825674261318, 3]
Testing Scores
MSE:[1.9591154020422163, 2.742686600719425, 1.4548348000971725]
R2:[-6.654042212418165, -49.31157816616454, 20.798942206307448]
CV:[9.440024247228669, -46.602901962252744, 22.282889602149552]
=====

Scores for SVR
Training Scores
MSE:[1.7209761546655007, 0.004015066336856306, 0.2109032328538]
R2:[10.097448537444475, 99.79025583416933, 88.9825674261318, 3]
Testing Scores
MSE:[1.9591154020422163, 2.742686600719425, 1.4548348000971725]
R2:[-6.654042212418165, -49.31157816616454, 20.798942206307448]

- Added a readonly option to [drive.mount](#)
- Fixed bug where Xarray was not working ([GitHub issue](#))
- Modified Markdown parsing to ignore block quote symbol within MathJax ([GitHub issue](#))

2022-09-30

- Launched [Pay As You Go](#), allowing premium GPU access without requiring a subscription
- Added vim and tcilib to our runtime image
- Fixed bug where open files were closed on kernel disconnect ([GitHub issue](#))
- Fixed bug where the play button/execution indicator was not clickable when scrolled into the cell output ([GitHub issue](#))
- Updated the styling for form titles so that they avoid obscuring the code editor
- Created a GitHub repo, [backend-info](#), with the latest apt-list.txt and pip-freeze.txt files for the Colab runtime ([GitHub issue](#))
- Added [files.upload_file\(filename\)](#) to upload a file from the browser to the runtime with a specified filename

2022-09-16

- Upgraded pymc from 3.11.0 to 4.1.4, jax from 0.3.14 to 0.3.17, jaxlib from 0.3.14 to 0.3.15, fsspec from 2022.8.1 to 2022.8.2
- Modified our save flow to avoid persisting Drive filenames as titles in notebook JSON
- Updated our [Terms of Service](#)
- Modified the Jump to Cell command to locate the cursor at the end of the command palette input (Jump to cell in Tools → Command palette in a notebook with section headings)
- Updated the styling of the Drive notebook comment UI
- Added support for terminating your runtime from code: python from google.colab import runtime runtime.unassign()
- Added regex filter support to the Recent notebooks dialog
- Inline google.colab.files.upload JS to fix [files.upload\(\)](#) not working ([GitHub issue](#))

2022-08-26

- Upgraded PyYAML from 3.13 to 6.0 ([GitHub issue](#)), drivefs from 61.0.3 to 62.0.1
- Upgraded TensorFlow from 2.8.2 to 2.9.1 and ipywidgets from 7.7.1 to 8.0.1 but rolled both back due to a number of user reports ([GitHub issue](#), [GitHub issue](#))

```
CV: [9.440024247228669, -46.602901962252744, 22.282889602149552
=====
```

```
res = {'Name':list(dct.keys()),
       'MSE Training Scores':train_mse,
       'MSE Testing Scores':test_mse,
       'R2 Training Scores':train_r2,
       'R2 Testing Scores':test_r2,
       'CV Training Scores':train_cv}
df_res = pd.DataFrame(res)
df_res.sort_values('CV Training Scores', ascending=False)
```

	Name	MSE Training Scores	MSE Testing Scores	R2 Training Scores	R2 Testing Scores	
3	GradientBoosting	1.209770	1.287897	36.802485	29.887011	2
2	RandomForest	0.210903	1.454835	88.982567	20.798942	2
4	KNN	1.108676	1.621753	42.083578	11.711939	1
0	Linear	1.720976	1.959115	10.097449	-6.654042	
5	SVR	1.855185	1.812136	3.086479	1.347496	

```
from xgboost import XGBRegressor
model = XGBRegressor()
model.fit(x_train,y_train)
```

```
XGBRegressor(base_score=None, booster=None, callbacks=None,
             colsample_bylevel=None, colsample_bynode=None,
             colsample_bytree=None, device=None, early_stopping_rounds=None,
             enable_categorical=False, eval_metric=None, feature_type=None,
             gamma=None, grow_policy=None, importance_type=None,
             interaction_constraints=None, learning_rate=None,
             max_cat_threshold=None, max_cat_to_onehot=None,
             max_delta_step=None, max_depth=None, max_leaves=None,
             min_child_weight=None, missing=nan, monotone_constraints=None,
             multi_class_strategy=None, n_estimators=None, n_jobs=None,
             num_parallel_tree=None, random_state=None, ...)
```

- Stop persisting inferred titles in notebook JSON ([GitHub issue](#))
- Fix bug in background execution which affected some Pro+ users ([GitHub issue](#))
- Fix bug where Download as .py incorrectly handled text cells ending in a double quote
- Fix bug for Pro and Pro+ users where we weren't honoring the preference (Tools → Settings) to use a temporary scratch notebook as the default landing page
- Provide undo/redo for scratch cells
- When writing ipynb files, serialize empty multiline strings as [] for better consistency with JupyterLab

2022-08-11

- Upgraded ipython from 5.5.0 to 7.9.0, fbprophet 0.7 to prophet 1.1, tensorflow-datasets from 4.0.1 to 4.6.0, drivefs from 60.0.2 to 61.0.3, pytorch from 1.12.0 to 1.12.1, numba from 0.51 to 0.56, and lxml from 4.2.0 to 4.9.1
- Loosened our requests version requirement ([GitHub issue](#))
- Removed support for TensorFlow 1
- Added Help → Report Drive abuse for Drive notebooks
- Fixed indentation for Python lines ending in [
- Modified styling of tables in Markdown to left-align them rather than centering them
- Fixed special character replacement when copying interactive tables as Markdown
- Fixed ansi 8-bit color parsing ([GitHub issue](#))
- Configured logging to preempt transitive imports and other loading from implicitly configuring the root logger
- Modified forms to use a value of None instead of causing a parse error when clearing raw and numeric-typed form fields

2022-07-22

- Update scipy from 1.4.1 to 1.7.3, drivefs from 59.0.3 to 60.0.2, pytorch from 1.11 to 1.12, jax & jaxlib from 0.3.8 to 0.3.14, opencv-python from 4.1.2.30 to 4.6.0.66, spaCy from 3.3.1 to 3.4.0, and dlib from 19.18.0 to 19.24.0
- Fix Open in tab doc link which was rendering incorrectly ([GitHub issue](#))
- Add a preference for the default tab orientation to the Site section of the settings menu under Tools → Settings
- Show a warning for USE_AUTH_EPHEM usage when running authenticate_user on a TPU runtime ([code](#))

2022-07-01

- Add a preference for code font to the settings menu under Tools → Settings
- Update drives from 58.0.3 to 59.0.3 and spacy from 2.2.4 to 3.3.1
- Allow [display_data](#) and [execute_result](#) text outputs to wrap, matching behavior of JupyterLab (does not affect stream outputs/print statements).
- Improve LSP handling of some magics, esp. %%writefile ([GitHub issue](#)).
- Add a [FAQ entry](#) about the mount Drive button behavior and include link buttons for each FAQ entry.
- Fix bug where the notebook was sometimes hidden behind other tabs on load when in single pane view.
- Fix issue with inconsistent scrolling when an editor is in multi-select mode.
- Fix bug where clicking on a link in a form would navigate away from the notebook
- Show a confirmation dialog before performing Replace all from the Find and replace pane.

2022-06-10

- Update drives from 57.0.5 to 58.0.3 and tensorflow from 2.8.0 to 2.8.2
- Support more than 100 repos in the GitHub repo selector shown in the open dialog and the clone to GitHub dialog
- Show full notebook names on hover in the open dialog
- Improve the color contrast for links, buttons, and the `ipywidgets.Accordion` widget in dark mode

2022-05-20

- Support URL params for linking to some common pref settings:
`force_theme=dark,force_corgi_mode=1,force_font_size=14`. Params forced by URL are not persisted unless saved using Tools → Settings.
- Add a class `markdown-google-sans` to allow Markdown to render in Google Sans
- Update monaco-vim from 0.1.19 to 0.3.4
- Update drives from 55.0.3 to 57.0.5, jax from 0.3.4 to 0.3.8, and jaxlib from 0.3.2 to 0.3.7

2022-04-29

- Added 🚨 mode (under Miscellaneous in Tools → Settings)
- Added "Disconnect and delete runtime" option to the menu next to the Connect button
- Improved rendering of filter options in an interactive table
- Added git-lfs to the base image
- Updated torch from 1.10.0 to 1.11.0, jupyter-core from 4.9.2 to 4.10.0, and cmake from 3.12.0 to 3.22.3

- Added more details to our [FAQ](#) about unsupported uses (using proxies, downloading torrents, etc.)
- Fixed [issue](#) with apt-get dependencies

2022-04-15

- Add an option in the file browser to show hidden files.
- Upgrade gdown from 4.2.0 to 4.4.0, google-api-core[grpc] from 1.26.0 to 1.31.5, and pytz from 2018.4 to 2022.1

2022-03-25

- Launched [Pro/Pro+](#) to 12 additional countries: Australia, Bangladesh, Colombia, Hong Kong, Indonesia, Mexico New Zealand, Pakistan, Philippines, Singapore, Taiwan, and Vietnam
- Added [google.colab.auth.authenticate_se](#) to support using [Service Account keys](#)
- Update jax from 0.3.1 to 0.3.4 & jaxlib from 0.3.0 to 0.3.2
- Fixed an issue with Twitter previews of notebooks shared as GitHub Gists

2022-03-10

- Launched [Pro/Pro+](#) to 10 new countries: Ireland, Israel, Italy, Morocco, the Netherlands, Poland, Spain, Switzerland, Turkey, and the United Arab Emirates
- Launched support for [scheduling notebooks for Pro+ users](#)
- Fixed bug in interactive datatables where filtering by number did not work
- Finished removing the python2 kernelspec

2022-02-25

- Made various accessibility improvements to the header
- Fix bug with [forms run:auto](#) where a form field change would trigger multiple runs
- Minor updates to the [bigquery.example notebook](#) and snippet
- Include background execution setting in the sessions dialog for Pro+ users
- Update tensorflow-probability from 0.15 to 0.16
- Update jax from 0.2.25 to 0.3.1 & jaxlib from 0.1.71 to 0.3.0

2022-02-11

- Improve keyboard navigation for the oper dialog
- Fix issue where nvidia-smi stopped reporting resource utilization for some users who were modifying the version of nvidia used
- Update tensorflow from 2.7 to 2.8, keras from 2.7 to 2.8, numpy from 1.19.5 to 1.21.5, tables from 3.4.4 to 3.7.0

2022-02-04

- Improve UX for opening content alongside your notebook, such as files opened from the file browser. This includes a multi-pane view and drag-drop support
- Better Twitter previews when sharing example Colab notebooks and notebooks opened from GitHub Gists
- Update pandas from 1.1.5 to 1.3.5
- Update openpyxl from 2.5.9 to 3.0.0 and pyarrow from 3.0.0 to 6.0.0
- Link to the release notes from the Help menu

2022-01-28

- Add a copy button to [data tables](#)
- Python LSP support for better completions and code diagnostics. This can be configured in the Editor Settings (Tools → Settings)
- Update [gspread examples](#) in our documentation
- Update gdown from 3.6 to 4.2

2022 01 21