

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](#).

## 2024-09-23

- 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
- 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

```
import numpy as np
import pandas as pd
```

## LOADING DATASET

```
df = pd.read_csv("/content/CarPrice_Assignment.csv")
```

df



	car_ID	symboling	CarName	fueltype	aspiration	door
0	1	3	alfa-romero giulia	gas	std	
1	2	3	alfa-romero stelvio	gas	std	
2	3	1	alfa-romero Quadrifoglio	gas	std	
3	4	2	audi 100 ls	gas	std	
4	5	2	audi 100ls	gas	std	
...	...	...	...	...	...	...
200	201	-1	volvo 145e (sw)	gas	std	
201	202	-1	volvo 144ea	gas	turbo	
202	203	-1	volvo 244dl	gas	std	
203	204	-1	volvo 246	diesel	turbo	
204	205	-1	volvo 264gl	gas	turbo	

205 rows × 26 columns

```
df.drop("car_ID",axis=1, inplace=True)
```

## Checking dataset size, info

```
print("Dataset dimensions:", df.shape)
df.info()
```



```
Dataset dimensions: (205, 25)
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 205 entries, 0 to 204
Data columns (total 25 columns):
#   Column              Non-Null Count  Dtype
---  ---
0   symboling            205 non-null    int64
1   CarName              205 non-null    object
2   fueltype             205 non-null    object
3   aspiration            205 non-null    object
4   doornumber           205 non-null    object
5   carbody              205 non-null    object
6   drivewheel           205 non-null    object
7   enginelocation       205 non-null    object
8   wheelbase            205 non-null    float64
9   carlength           205 non-null    float64
```

```

10 carwidth          205 non-null float64
11 carheight         205 non-null float64
12 curbweight        205 non-null int64
13 enginetype         205 non-null object
14 cylindernumber     205 non-null object
15 enginesize         205 non-null int64
16 fuelsystem         205 non-null object
17 boreratio          205 non-null float64
18 stroke             205 non-null float64
19 compressionratio   205 non-null float64
20 horsepower         205 non-null int64
21 peakrpm            205 non-null int64
22 citympg            205 non-null int64
23 highwaympg         205 non-null int64
24 price              205 non-null float64
dtypes: float64(8), int64(7), object(10)
memory usage: 40.2+ KB

```

## Null values checking and treatment

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

- 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
  - 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



	0
<b>symboling</b>	0
<b>CarName</b>	0
<b>fueltype</b>	0
<b>aspiration</b>	0
<b>doornumber</b>	0
<b>carbody</b>	0
<b>drivewheel</b>	0
<b>enginelocation</b>	0
<b>wheelbase</b>	0
<b>carlength</b>	0
<b>carwidth</b>	0
<b>carheight</b>	0
<b>curbweight</b>	0
<b>enginetype</b>	0
<b>cylindernumber</b>	0
<b>enginesize</b>	0
<b>fuelsystem</b>	0
<b>boreratio</b>	0
<b>stroke</b>	0
<b>compressionratio</b>	0
<b>horsepower</b>	0
<b>peakrpm</b>	0
<b>citympg</b>	0
<b>highwaympg</b>	0
<b>price</b>	0

df.describe()

## Descriptive statistics

df.describe()

no longer hidden or clipped)

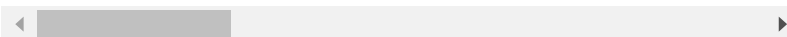
- Fixed multiple accessibility issues in Colab's comments feature (e.g. proper keyboard focus management, added accessibility landmarks, etc)
- Fixed bug where AI code generation would fail for extremely long broken code snippets
- Fixed multiple scrollbar bugs in the user secrets panel
- Added the ability 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
  - 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-firestore 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



	symboling	wheelbase	carlength	carwidth	carheight
count	205.000000	205.000000	205.000000	205.000000	205.000000
mean	0.834146	98.756585	174.049268	65.907805	53.724871
std	1.245307	6.021776	12.337289	2.145204	2.443521
min	-2.000000	86.600000	141.100000	60.300000	47.800000
25%	0.000000	94.500000	166.300000	64.100000	52.000000
50%	1.000000	97.000000	173.200000	65.500000	54.100000
75%	2.000000	102.400000	183.100000	66.900000	55.500000
max	3.000000	120.900000	208.100000	72.300000	59.800000



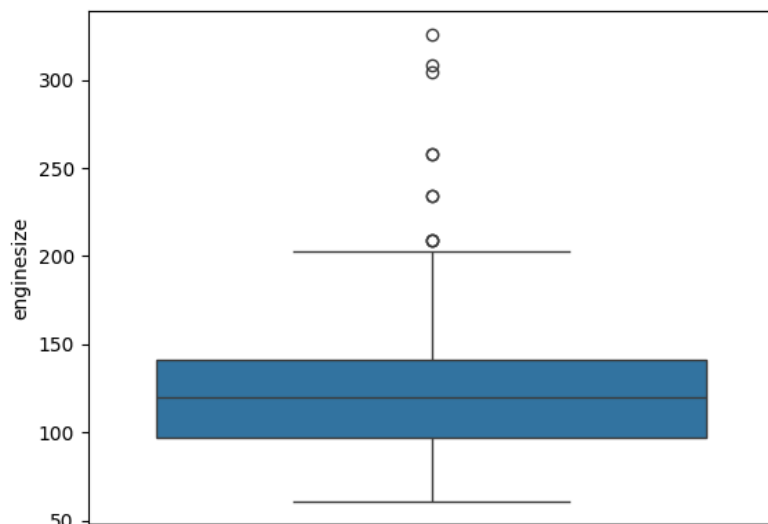
## Outlier checking and treatment

```
import seaborn as sns
import matplotlib.pyplot as plt
```

```
sns.boxplot(df.enginesize)
```



<Axes: ylabel='enginesize'>



```
Q3 = df.enginesize.quantile(0.75)
Q1 = df.enginesize.quantile(0.25)
```

Q3



141.0

Q1



97.0

IQR = Q3-Q1

- 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
  - 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

IQR

↗ 44.0

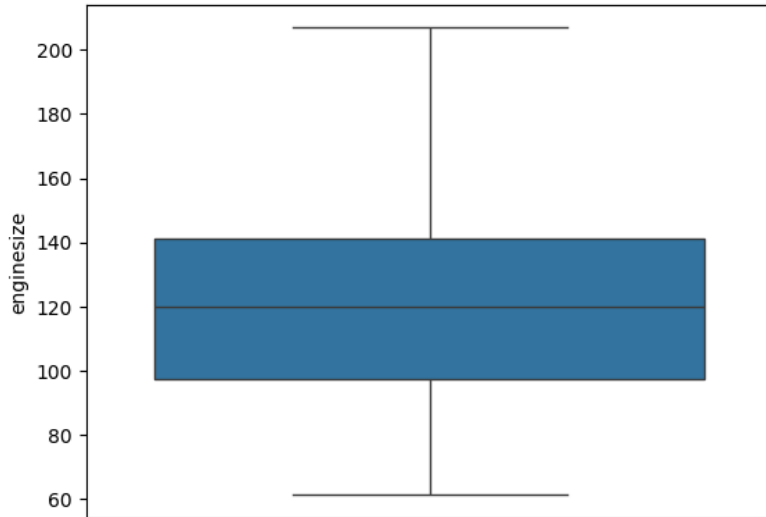
```
Upper_limit = Q3+1.5*IQR
Upper_limit
```

↗ 207.0

```
df['engine_size'] = np.where(df['engine_size'] > Upper_limit, 207.0, df['engine_size'])
```

```
sns.boxplot(df.engine_size)
```

↗ &lt;Axes: ylabel='engine\_size'&gt;



## Visualizations 1.Univariate Analysis

```
sns.distplot(df.price)
```

- 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
- 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_scrollbar` ([Example notebook](#))



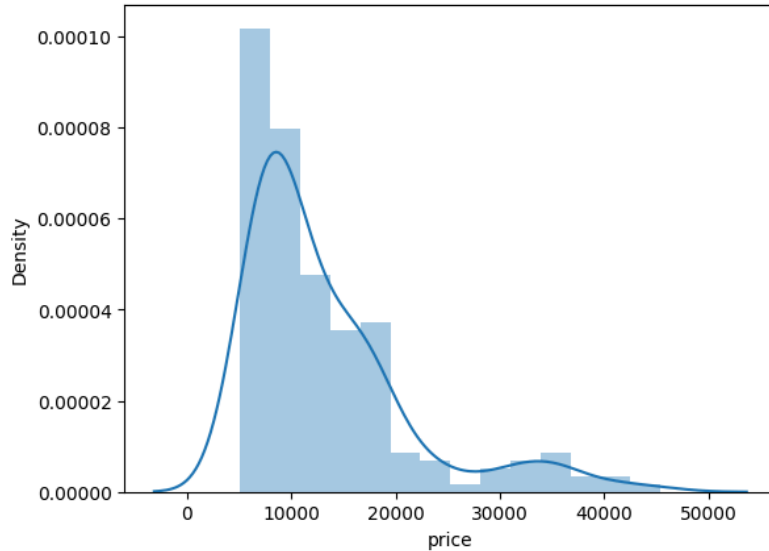
<ipython-input-75-7053edd65b83>:1: UserWarning:

`distplot` is a deprecated function and will be removed in sea

Please adapt your code to use either `displot` (a figure-level similar flexibility) or `histplot` (an axes-level function for

For a guide to updating your code to use the new functions, pl <https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe57>

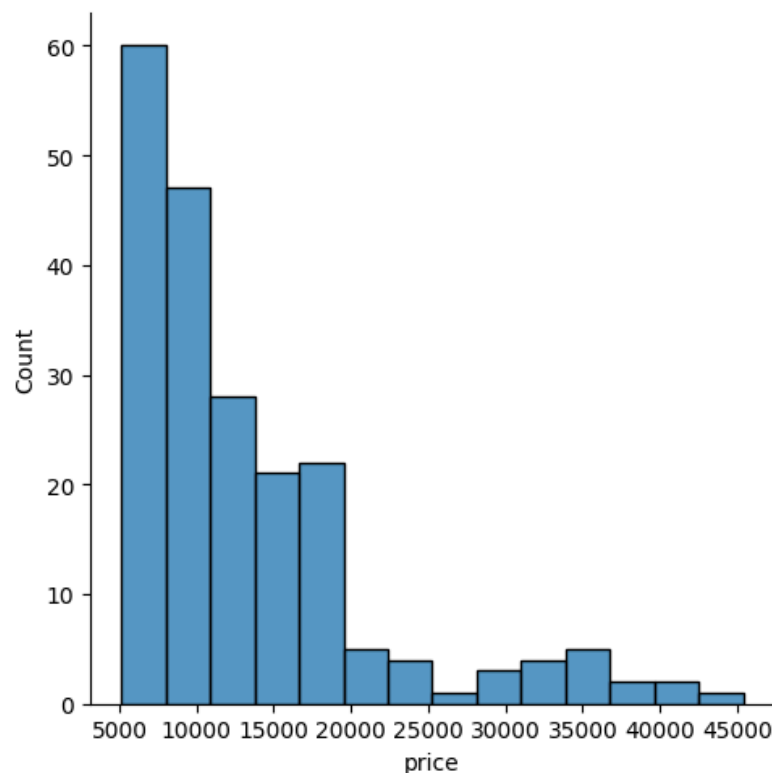
```
sns.distplot(df.price)
<Axes: xlabel='price', ylabel='Density'>
```



```
sns.displot(df.price)
```



<seaborn.axisgrid.FacetGrid at 0x795c91023ee0>



- 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 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

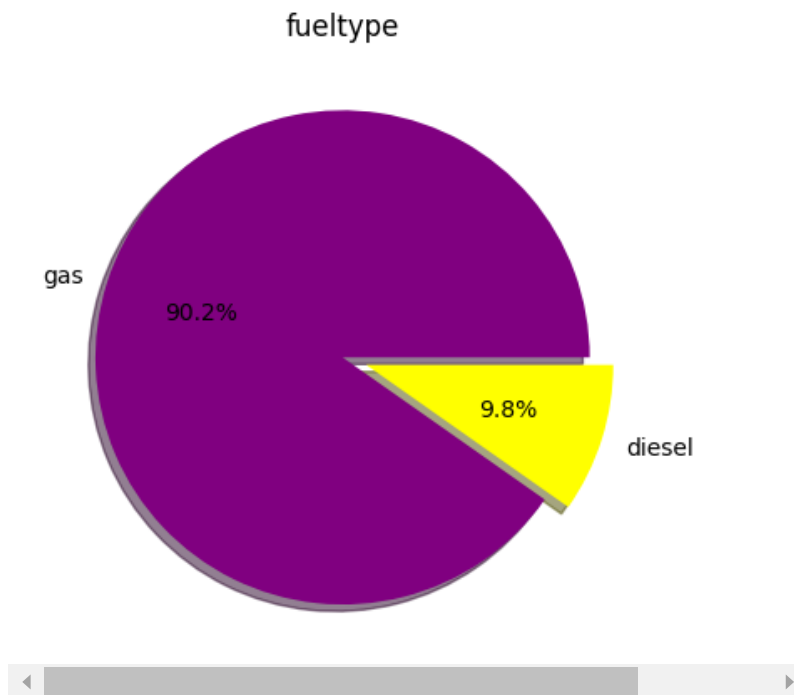
## 2023-11-27

- 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

```
plt.pie(df['fueltype'].value_counts(),[0,0.1],labels = ['gas','die
plt.title('fueltype')
plt.show()
```



```
from matplotlib import rcParams
```

```
rcParams['figure.figsize']=8,8
sns.barplot(x =df['carbody'].value_counts().index, y =df['carbody']
```

- 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
  - earthengine-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

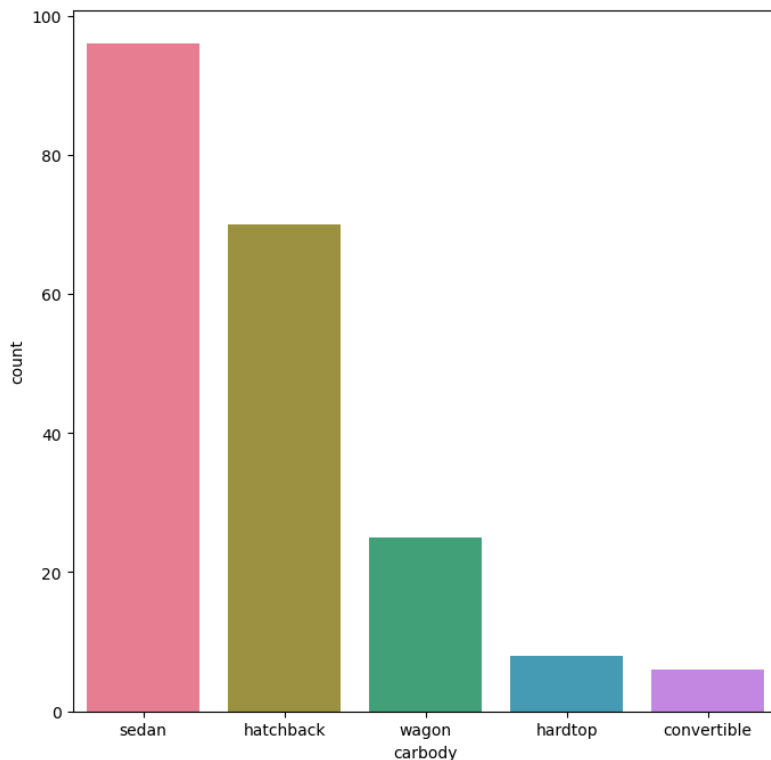
- Added "Change runtime type" to the menu in the connection button
- Improved auto-reconnection to an already running notebook ([#3764](#))



<ipython-input-78-f88f4f02fd20>:4: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will

```
sns.barplot(x =df['carbody'].value_counts().index, y =df['count']
<Axes: xlabel='carbody', ylabel='count'>
```



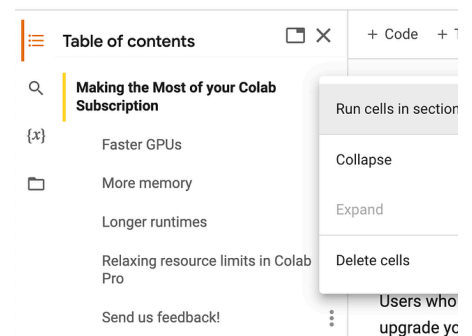
- Increased the specs of our highmem machines for Pro users
- Fixed add-apt-repository command on Ubuntu 22.04 runtime ([#3867](#))
- Python package upgrades
  - bokeh 2.4.3 -> 3.2.2
  - cmake 3.25.2 -> 3.27.2
  - cryptography 3.4.8 -> 41.0.3
  - dask 2022.12.1 -> 2023.8.0
  - distributed 2022.12.1 -> 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](#))

### 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](#))

## 2.Bivariate Analysis

```
sns.violinplot(x = df['fueltype'],y = df['aspiration'], palette =
```

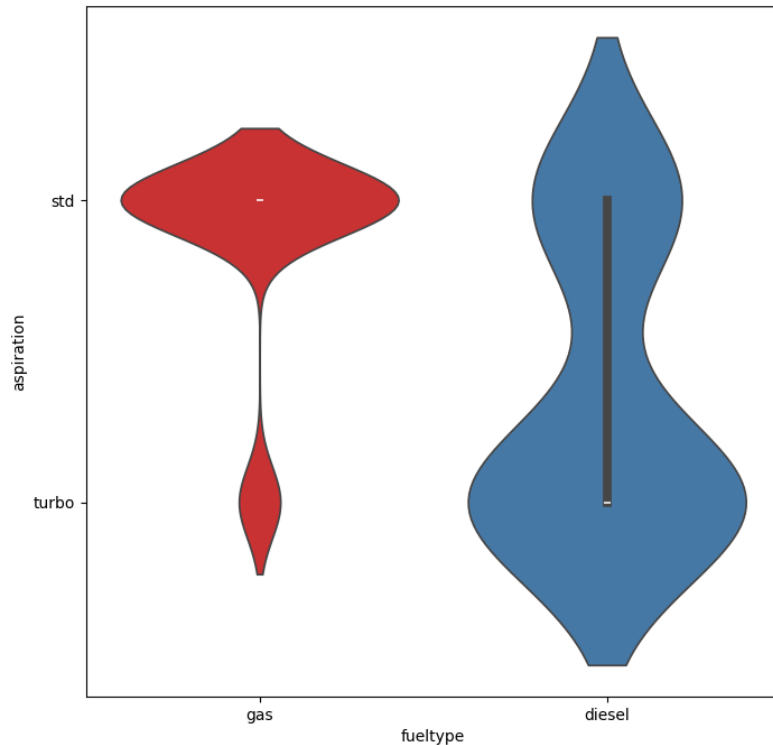




<ipython-input-79-45b67602c9d2>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will

```
sns.violinplot(x = df['fueltype'], y = df['aspiration'], palette=
<Axes: xlabel='fueltype', ylabel='aspiration'>
```



```
sns.catplot(x='fueltype', y = 'engine_size', kind = 'box', data=df,
```

- 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

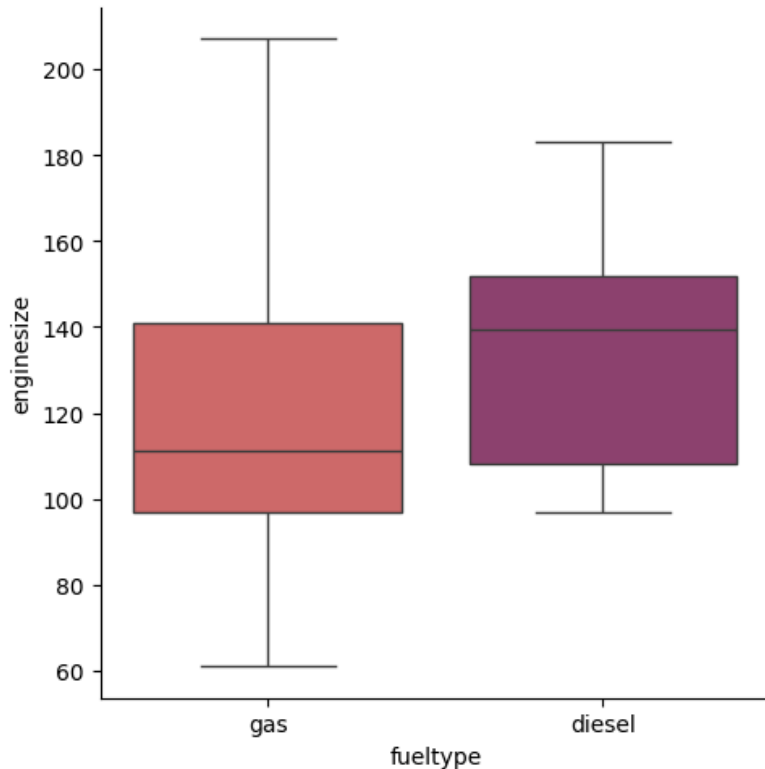
- Launched AI coding features to subscribed users starting with Pro+ users in the US ([tweet](#), [post](#))
- Added the Kernel Selector in the Notebook Settings ([tweet](#))
- Fixed double space trimming issue in markdown [#3766](#)
- Fixed run button indicator not always centered [#3609](#)
- Fixed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



<ipython-input-80-87b81ecf35a7>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and wi

```
sns.catplot(x='fueltype', y = 'enginesize', kind = 'box', data=
<seaborn.axisgrid.FacetGrid at 0x795c8efcad70>
```



```
sns.jointplot(x='horsepower', y='compressionratio', data=df)
```

- 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](https://colab.google)
- Published Colab's Docker runtime image to [us-docker.pkg.dev/colab-images/public/runtime](https://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

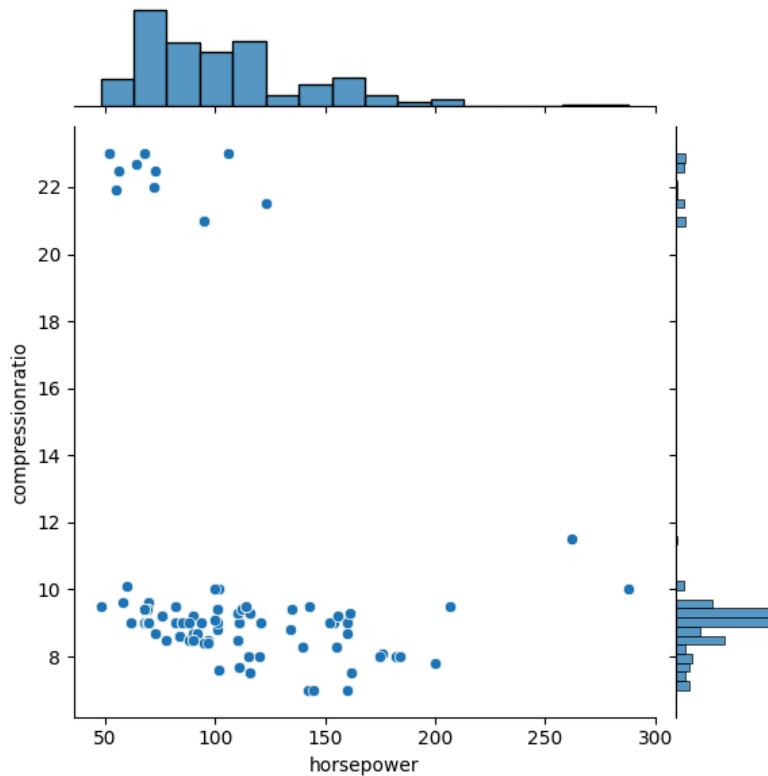
## 2023-05-05

- 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 -> 23.1.0
  - earthengine-api 0.1.349 -> 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

```
<seaborn.axisgrid.JointGrid at 0x795c8eedecb0>
```



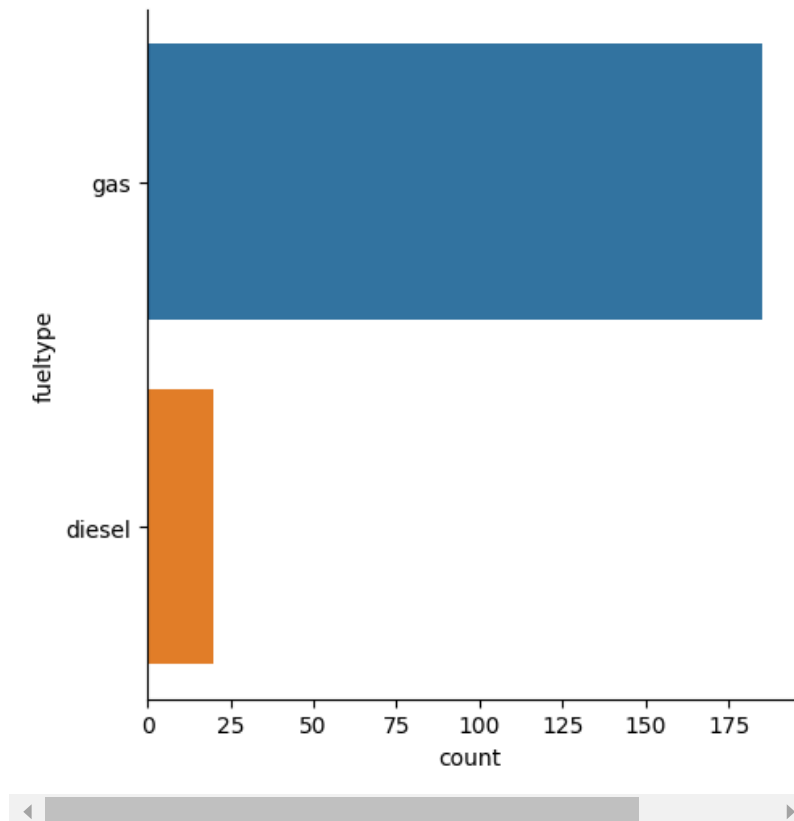
- google-auth-oauthlib 0.4.6 -> 1.0.0
- google-cloud-bigquery 3.4.2 -> 3.9.0
- google-cloud-datastore 2.11.1 -> 2.15.1
- google-cloud-firestore 2.7.3 -> 2.11.0
- google-cloud-language 2.6.1 -> 2.9.1
- google-cloud-storage 2.7.0 -> 2.8.0
- google-cloud-translate 3.8.4 -> 3.11.1
- networkx 3.0 -> 3.1
- 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
  - 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

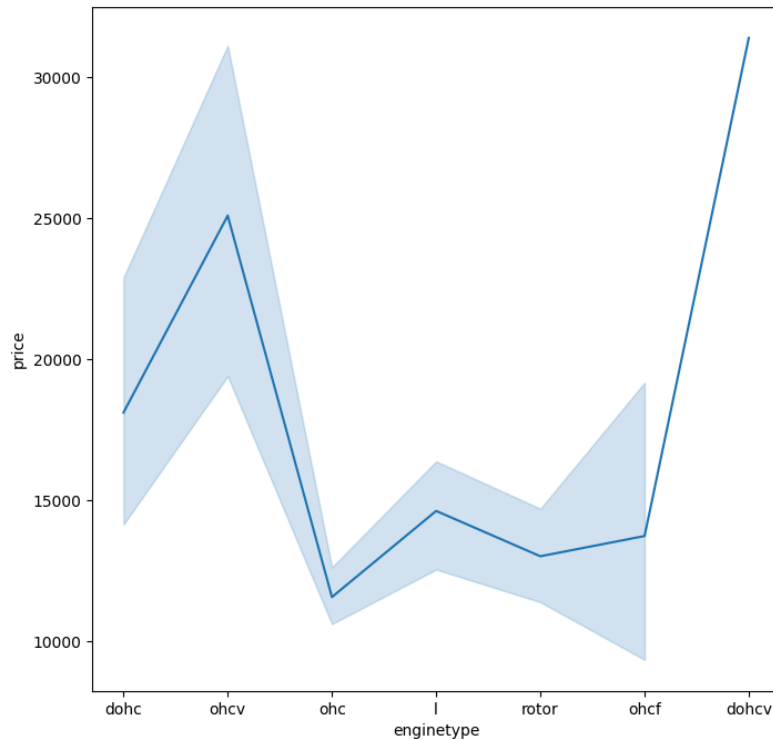
```
sns.catplot(y='fueltype', hue='fueltype', kind='count', data=df)
```

```
<seaborn.axisgrid.FacetGrid at 0x795c91370b50>
```



```
sns.lineplot(x=df.engine_type, y=df.price)
```

↔ <Axes: xlabel='enginetype', ylabel='price'>



- 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

## 2023-02-17

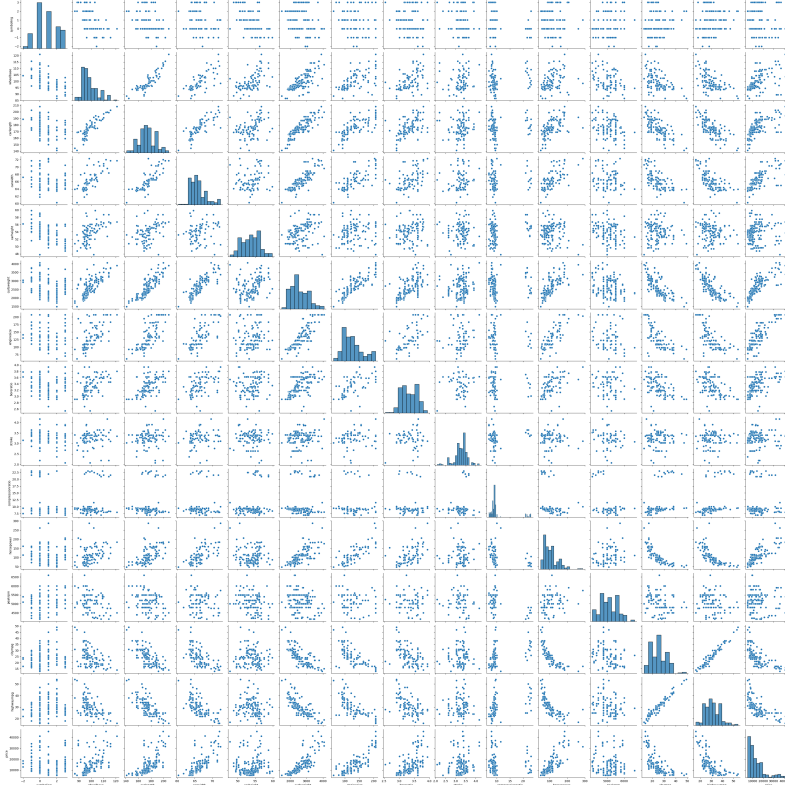
- Show graphs of RAM and disk usage in notebook toolbar
- Copy cell links directly to the clipboard instead of showing a dialog when clicking on the link icon in the cell toolbar
- Updated the [Colab Marketplace VM image](#)
- Upgraded CUDA to 11.6.2 and cuDNN to 8.4.0.27
- Python package updates:
  - tensorflow 2.9.2 -> 2.11.0
  - tensorboard 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
  - tiff file 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

## 3.Multivariate Analysis

```
sns.pairplot(df)
```



<seaborn.axisgrid.PairGrid at 0x795c8e8aab30>



```
numeric_columns = ['compressionratio', 'horsepower', 'price']
correlation_matrix = df[numeric_columns].corr()
```

correlation\_matrix



	compressionratio	horsepower	price
compressionratio	1.000000	-0.204326	0.067984
horsepower	-0.204326	1.000000	0.808139
price	0.067984	0.808139	1.000000

```
plt.figure(figsize=(10,10))
sns.heatmap(correlation_matrix, annot=True)
```

- 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
  - 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-http 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-firestore 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



&lt;Axes: &gt;



- pip 21.1.3 -> 22.04
- 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
  - 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-firestore 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

## Transformation (Encoding)

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
```

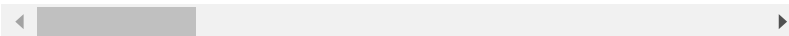
```
df['CarName'] = le.fit_transform(df['CarName'])
df['fueltype'] = le.fit_transform(df['fueltype'])
df['aspiration'] = le.fit_transform(df['aspiration'])
df['doornumber'] = le.fit_transform(df['doornumber'])
df['carbody'] = le.fit_transform(df['carbody'])
df['drivewheel'] = le.fit_transform(df['drivewheel'])
df['enginelocation'] = le.fit_transform(df['enginelocation'])
df['engine-type'] = le.fit_transform(df['engine-type'])
df['cylindernumber'] = le.fit_transform(df['cylindernumber'])
df['fuelsystem'] = le.fit_transform(df['fuelsystem'])
```

```
df
```



	symboling	CarName	fueltype	aspiration	doornumber	car
0	3	2	1	0	1	
1	3	3	1	0	1	
2	1	1	1	0	1	
3	2	4	1	0	0	
4	2	5	1	0	0	
...	...	...	...	...	...	...
200	-1	139	1	0	0	
201	-1	138	1	1	0	
202	-1	140	1	0	0	
203	-1	142	0	1	0	
204	-1	143	1	1	0	

205 rows × 25 columns



df.corr()

query results ([announcement](#))

- Launched [Pro, Pro+, 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](#))
- 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 tcclib 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](#))

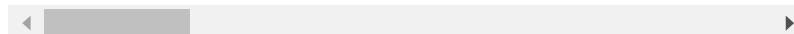
**2022-08-26**





	symboling	CarName	fueltype	aspiration	d
symboling	1.000000	-0.107095	0.194311	-0.059866	
CarName	-0.107095	1.000000	-0.069435	0.019914	
fueltype	0.194311	-0.069435	1.000000	-0.401397	
aspiration	-0.059866	0.019914	-0.401397	1.000000	
doornumber	0.664073	-0.171745	0.191491	-0.031792	
carbody	-0.596135	0.099691	-0.147853	0.063028	
drivewheel	-0.041671	-0.016129	-0.132257	0.066465	
enginelocation	0.212471	0.055968	0.040070	-0.057191	
wheelbase	-0.531954	0.014550	-0.308346	0.257611	
carlength	-0.357612	0.053016	-0.212679	0.234539	
carwidth	-0.232919	-0.075349	-0.233880	0.300567	
carheight	-0.541038	0.201900	-0.284631	0.087311	
curbweight	-0.227691	-0.049407	-0.217275	0.324902	
engineype	0.050372	-0.090381	0.082695	-0.102963	
cylindernumber	0.197762	0.047154	0.110617	-0.133119	
enginesize	-0.100869	-0.114889	-0.107971	0.164998	
fuelsystem	0.091163	0.123845	0.041529	0.288086	
boreratio	-0.130051	0.188598	-0.054451	0.212614	
stroke	-0.008735	-0.181775	-0.241829	0.222982	
compressionratio	-0.178515	0.101730	-0.984356	0.295541	
horsepower	0.070873	-0.092131	0.163926	0.241685	
peakrpm	0.273606	-0.138309	0.476883	-0.183383	
citympg	-0.035823	0.093437	-0.255963	-0.202362	
highwaympg	0.034606	0.102895	-0.191392	-0.254416	
price	-0.079978	-0.231439	-0.105679	0.177926	

25 rows × 25 columns



```
df.corr()['price'].sort_values(ascending= False)
```

- 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](#))
- 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





	price
price	1.000000
enginesize	0.854532
curbweight	0.835305
horsepower	0.808139
carwidth	0.759325
carlength	0.682920
drivewheel	0.577992
wheelbase	0.577816
boreratio	0.553173
fuelsystem	0.526823
enginelocation	0.324973
aspiration	0.177926
carheight	0.119336
stroke	0.079443
compressionratio	0.067984
enginetype	0.049171
cylindernumber	-0.027628
doornumber	-0.031835
symboling	-0.079978
carbody	-0.083976
peakrpm	-0.085267
fueltype	-0.105679
CarName	-0.231439
citympg	-0.685751
highwaympg	-0.697599

df = df[['price', 'enginesize', 'curbweight', 'horsepower', 'carwidth', 'carlength', 'drivewheel', 'wheelbase', 'boreratio', 'fuelsystem', 'enginelocation', 'aspiration', 'carheight', 'stroke', 'compressionratio', 'enginetype', 'cylindernumber', 'doornumber', 'symboling', 'carbody', 'peakrpm', 'fueltype', 'CarName', 'citympg', 'highwaympg']]

### X and y Split

```
X = df.loc[:, ['curbweight', 'carwidth', 'carlength', 'enginesize']]
```

```
y= df['price']
```

```
X.head()
```

- Add a preference for code font to the settings menu under Tools → Settings
- Update drivefs 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 drivefs 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 drivefs 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



	curbweight	carwidth	carlength	enginesize	drivewheel	bc
0	2548	64.1	168.8	130.0	2	
1	2548	64.1	168.8	130.0	2	
2	2823	65.5	171.2	152.0	2	
3	2337	66.2	176.6	109.0	1	
4	2824	66.4	176.6	136.0	0	

```
y.head()
```



	price
0	13495.0
1	16500.0
2	16500.0
3	13950.0
4	17450.0

## Transformation (Scaling)

```
from sklearn.preprocessing import MinMaxScaler
scale =MinMaxScaler()
```

```
scaled_x = pd.DataFrame(scale.fit_transform(X),columns = X.columns)
scaled_x.head()
```



	curbweight	carwidth	carlength	enginesize	drivewheel	bc
0	0.411171	0.316667	0.413433	0.472603	1.0	
1	0.411171	0.316667	0.413433	0.472603	1.0	
2	0.517843	0.433333	0.449254	0.623288	1.0	
3	0.329325	0.491667	0.529851	0.328767	0.5	
4	0.518231	0.508333	0.529851	0.513699	0.0	

## Performing Train Test Split

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test =train_test_split(scaled_x,y,test_si
```

```
x_train.head()
```

- 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\\_service](#) 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 open 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



	curbweight	carwidth	carlength	enginesize	drivewheel
<b>4</b>	0.518231	0.508333	0.529851	0.513699	0.0
<b>71</b>	0.873545	0.950000	0.917910	1.000000	1.0
<b>134</b>	0.472847	0.516667	0.679104	0.410959	0.5
<b>145</b>	0.396431	0.425000	0.461194	0.321918	0.0
<b>122</b>	0.272692	0.291667	0.391045	0.253425	0.5

Train the data with suitable ML model

```
from sklearn.linear_model import LinearRegression
lr =LinearRegression()
```

```
lr.fit(x_train,y_train)
```



```
▼ LinearRegression
LinearRegression()
```

```
y_pred = lr.predict(x_test)
y_pred
```



```
array([ 6271.58803427, 21890.44426701, 13580.89737139,
       -885.30744576,
        9967.85354966, 15553.05452978,  6722.24233982,
        4417.57543871,
        24894.84438123,  7743.81126299, 17061.3257812 ,
        39121.93769001,
        10473.73208445, 13068.81628779,  5946.30197945,
        15156.67331617,
        11625.71802894, 18732.69971361, 10495.24448024,
        5673.21164571,
        10993.53057625, 15770.66576925, 11508.85642866,
        15661.44001788,
        23695.72219904,  5434.93739019,  7004.49779136,
        15921.40529267,
        7131.46364884,  5881.83664968,  8593.34693424,
        10673.35274442,
        20156.18862937, 10756.56444758,  6033.57633302,
        27854.68929425,
        8449.52164558, 16340.84836621,  5945.26651284,
        31925.07044387,
        5837.91649136])
```

Test the model

```
x_test
```

- 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 [gsread examples](#) in our documentation
- Update gdown from 3.6 to 4.2

## 2022-01-21

- New documentation for the [google.colab package](#)
- Show GPU RAM in the resource usage tab
- Improved security for mounting Google Drive which disallows mounting Drive from accounts other than the one currently executing the notebook

## 2022-01-14

- Add a preference (Tools → Settings) to use a temporary scratch notebook as the default landing page
- Fix bug where / and : weren't working in VIM mode
- Update gsread from 3.0 to 3.4
- Update the [Colab Marketplace VM image](#)



	curbweight	carwidth	carlength	enginesize	drivewheel
52	0.161753	0.325000	0.268657	0.205479	0.5
181	0.645074	0.516667	0.697015	0.684932	1.0
5	0.395268	0.500000	0.540299	0.513699	0.5
18	0.000000	0.000000	0.000000	0.000000	0.5
188	0.314973	0.433333	0.456716	0.328767	0.5
170	0.461986	0.441667	0.523881	0.582192	1.0
76	0.166796	0.341667	0.241791	0.212329	0.5
154	0.311094	0.275000	0.426866	0.212329	0.0
104	0.614042	0.633333	0.441791	0.821918	1.0
33	0.175330	0.308333	0.132836	0.212329	0.5
12	0.474011	0.375000	0.532836	0.705479	1.0
129	0.728472	1.000000	0.516418	0.972603	1.0
55	0.346005	0.450000	0.416418	0.061644	1.0
66	0.470132	0.483333	0.505970	0.500000	1.0
45	0.163305	0.275000	0.220896	0.198630	0.5
169	0.412335	0.441667	0.523881	0.582192	1.0
130	0.423196	0.516667	0.602985	0.486301	0.5
7	0.568658	0.925000	0.770149	0.513699	0.5
37	0.290147	0.408333	0.394030	0.335616	0.5
152	0.204422	0.275000	0.262687	0.212329	0.5
80	0.342126	0.425000	0.476119	0.335616	0.5
111	0.615593	0.675000	0.680597	0.404110	1.0
131	0.377036	0.525000	0.532836	0.486301	0.5
171	0.475562	0.441667	0.523881	0.582192	1.0
179	0.592708	0.616667	0.632836	0.753425	1.0
138	0.217998	0.258333	0.235821	0.246575	0.5