```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
data=pd.read_csv("/content/BostonHousing.csv")
```

```
data.head()
```

	crim	zn	indus	chas	nox	rm	age	dis	rad	t
0	0.00632	18.0	2.31	0	0.538	6.575	65.2	4.0900	1	2
1	0.02731	0.0	7.07	0	0.469	6.421	78.9	4.9671	2	2
2	0.02729	0.0	7.07	0	0.469	7.185	61.1	4.9671	2	2
3	0.03237	0.0	2.18	0	0.458	6.998	45.8	6.0622	3	2
4	0.06905	0.0	2.18	0	0.458	7.147	54.2	6.0622	3	2

+ Code + Text

```
xd=data['rm']
yd=data['medv']
```

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(xd,yd,test_size=0
```

```
yd.isnull().sum()
```

```
0
```

```
#BatchGradientDescent Method
alpha = 0.001
theta0 = 1
theta1 = 0.5
x = x_train.values
y=y_train.values
lembda=0.00001
num=len(x)

epoch = eval(input("Enter the no of epochs: "))
cost_func = np.empty(epoch)
theta1_values = np.empty(epoch)
print(len(theta1_values))
for i in range(epoch):
    y_hat = np.empty(num)
    for j in range(num):
        y_hat[j] = x[j] * theta1 + theta0

    y_diff = np.empty(num)
    for j in range(num):
        y_diff[j] = y_hat[j] - y[j]

    y_x_diff = np.empty(num)
    for j in range(num):
        y_x_diff[j] = y_diff[j] * x[j]

    cost_func[i] = (1/(2*num)) * (np.sum((y_diff)**2)+lembda*(t

    y_diff_sum = np.sum(y_diff)+lembda*theta1
    y_x_diff_sum = np.sum(y_x_diff)
```

Release notes

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
- 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

```
    theta0 -= (alpha * y_diff_sum) / num
    theta1 -= (alpha * y_x_diff_sum) / num

    theta1_values[i] = theta1


print("Theta0:", theta0)
print("Theta1:", theta1)
print("Cost Function:",cost_func)

plt.plot(cost_func)
plt.show()

y_predict = np.empty(num)
for i in range(num):
    y_predict[i] = x[i] * theta1 + theta0

print("Predicted Values:", y_predict)
print("yhat - y: " , y_diff)
print("(yhat-y) x : ",y_x_diff)
print("Sigma (yhat-y): ",y_diff_sum)
print("Sigma (yhat-y)x: ",y_x_diff_sum)
print("Cost Func: ",cost_func)
```

- 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

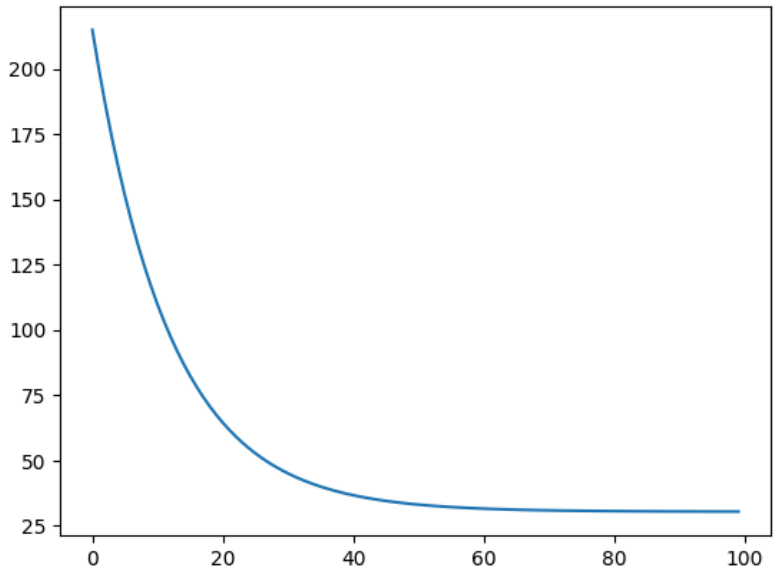
2024-09-23

- 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
- 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

```
Enter the no of epochs: 100
100
Theta0: 1.4090108576710056
Theta1: 3.414483137452381
Cost Function: [214.85118475 199.89623178 186.15333804 173.524
 151.25382026 141.45325184 132.44698748 124.17065003 116.56508
 109.57591269 103.15318958  97.25100122  91.82715904  86.84289
  82.26257845  78.05347344  74.18549274  70.63098874  67.36455
  64.36284272  61.60439773  59.06950322  56.74004075  54.59936
  52.63216159  50.82438396  49.16310664  47.63645601  46.23352
  44.94427396  43.75950132  42.67073538  41.67019493  40.75072
  39.90576786  39.12927182  38.41569225  37.75992989  37.15729
  36.60349256  36.0945542   35.62684717  35.19702975  34.80203
  34.439029    34.10543039  33.7988521   33.51710416  33.25817
  33.02021262  32.80152018  32.60053509  32.41582219  32.24606
  32.09004449  31.94665403  31.8148678   31.6937453   31.58242
  31.48010441  31.38606192  31.2996241   31.22017458  31.14714
  31.0800208   31.01831775  30.9615983   30.90945853  30.86152
  30.8174634   30.77695351  30.73970954  30.70546679  30.67398
  30.6450317   30.61841042  30.5939294   30.5714152   30.55076
  30.5316625   30.51414291  30.49802592  30.48319784  30.46955
  30.45699904  30.44544411  30.43480835  30.42501727  30.41600
  30.40770083  30.40005475  30.39301104  30.38652088  30.38053
  30.37502537  30.36994091  30.36525121  30.36092426  30.35693
```




```
# Batch Gradient Descent
alpha = 0.001
theta0 = 1
theta1 = 0.5
x = x_train.values
y=y_train.values
lembda=0.00001
num=len(x)

epoch = eval(input("Enter the no of epochs: "))
cost_func = np.empty(epoch)
theta1_values = np.empty(epoch)
print(len(theta1_values))
for i in range(epoch):
    y_hat = np.empty(num)
    for j in range(num):
        y_hat[j] = x[j] * theta1 + theta0

    y_diff = np.empty(num)
    for j in range(num):
```

- 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
  - 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

```
        y_diff[j] = y_hat[j] - y[j]

    y_x_diff = np.empty(num)
    for j in range(num):
        y_x_diff[j] = y_diff[j] * x[j]

    cost_func[i] = (1/(2*num)) * (np.sum((y_diff)**2)+lembda*(a

    y_diff_sum = np.sum(y_diff)+lembda*theta1
    y_x_diff_sum = np.sum(y_x_diff)

    theta0 -= (alpha * y_diff_sum) / num
    theta1 -= (alpha * y_x_diff_sum) / num

    theta1_values[i] = theta1


print("Theta0:", theta0)
print("Theta1:", theta1)
print("Cost Function:",cost_func)

plt.plot(cost_func)
plt.show()

y_predict = np.empty(num)
for i in range(num):
    y_predict[i] = x[i] * theta1 + theta0

print("Predicted Values:", y_predict)
print("yhat - y: " , y_diff)
print("(yhat-y) x : ",y_x_diff)
print("Sigma (yhat-y): ",y_diff_sum)
print("Sigma (yhat-y)x: ",y_x_diff_sum)
print("Cost Func: ",cost_func)
```

- einops 0.8.0

2024-07-22

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

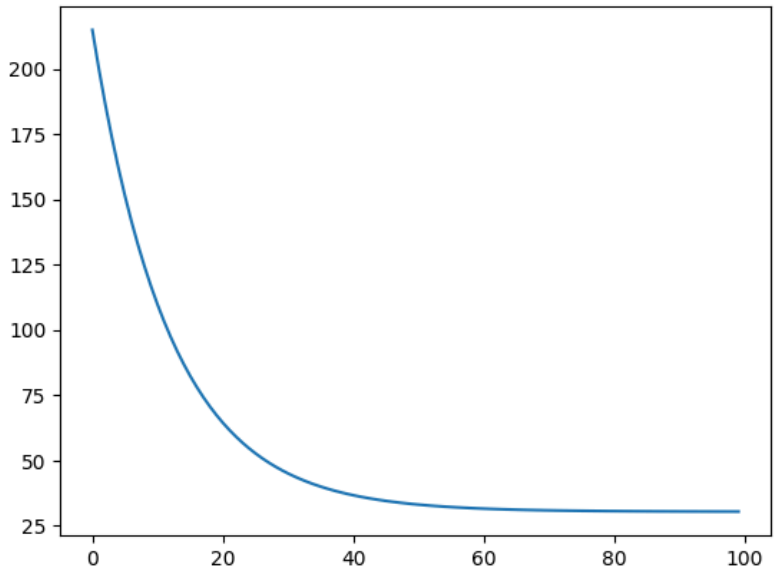
  Example:

  ```
  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
  - 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

```
Enter the no of epochs: 100
100
Theta0: 1.4090108576710056
Theta1: 3.414483137452381
Cost Function: [214.85118475 199.89623179 186.15333805 173.524
 151.25382025 141.45325184 132.44698748 124.17065002 116.56507
 109.57591268 103.15318957  97.2510012   91.82715902  86.84289
  82.26257842  78.05347342  74.18549272  70.63098871  67.36455
  64.36284268  61.60439769  59.06950318  56.74004072  54.59936
  52.63216155  50.82438391  49.1631066   47.63645596  46.23352
  44.94427391  43.75950127  42.67073532  41.67019487  40.75072
  39.9057678   39.12927175  38.41569219  37.75992982  37.15729
  36.60349249  36.09455413  35.6268471   35.19702968  34.80203
  34.43902893  34.10543032  33.79885202  33.51710409  33.25817
  33.02021254  32.8015201   32.60053501  32.41582211  32.24606
  32.09004441  31.94665395  31.81486772  31.69374521  31.58242
  31.48010432  31.38606184  31.29962401  31.22017449  31.14714
  31.08002071  31.01831766  30.96159821  30.90945844  30.86152
  30.81746331  30.77695341  30.73970944  30.70546669  30.67398
  30.6450316   30.61841032  30.59392931  30.5714151   30.55076
  30.53166241  30.51414281  30.49802582  30.48319774  30.46955
  30.45699895  30.44544401  30.43480825  30.42501717  30.41600
  30.40770073  30.40005465  30.39301094  30.38652078  30.38053
  30.37502527  30.36994081  30.36525111  30.36092416  30.35693
```




```
import numpy as np
import matplotlib.pyplot as plt

alpha = 0.001
theta0 = 1
theta1 = 0.5
x = x_train.values
y = y_train.values
num = len(x)
lembda = 0.001
epoch = int(input("Enter the number of epochs: "))
cost_func = np.empty(epoch)

# Stochastic Gradient Descent with L2 regularization
for i in range(epoch):
    cost_sum = 0
    for j in range(len(x)):
        y_hat = theta0 + theta1 * x[j]
        y_hat_diff = y_hat - y[j]
        theta0 = theta0 - alpha * y_hat_diff
```

- 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

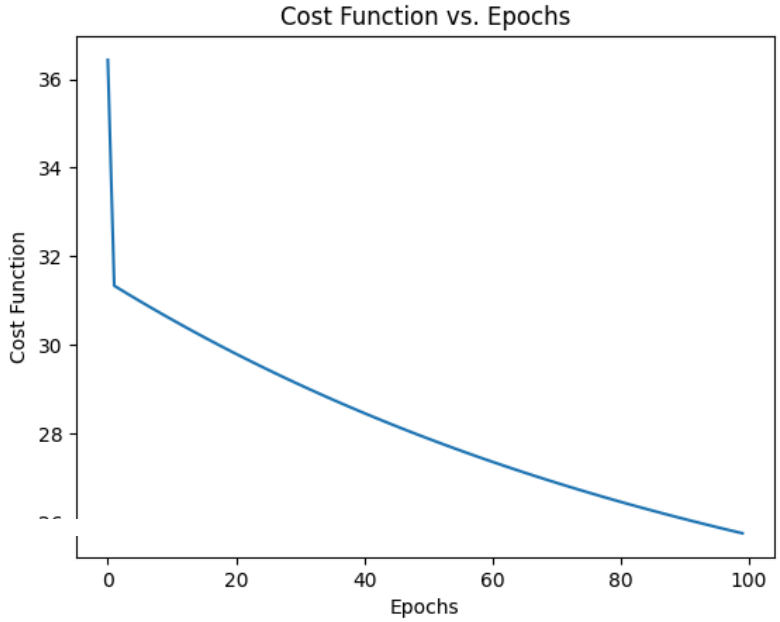
- Code actions are now supported to automatically improve and refactor code. Code actions can be triggered by the keyboard shortcut "Ctrl/⌘ + ."
- Python package upgrades
  - bigframes 1.0.0 -> 1.5.0
  - google-cloud-aiplatform 1.47.0 -> 1.51.0
  - jax[tpu] 0.4.23 -> 0.4.26
- Python package inclusions
  - 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

```
        theta1 = theta1 - alpha * (y_hat_diff * x[j] + lembda *
        cost_sum += (1 / (2*num)) * (y_hat_diff ** 2) + (lembda
    cost_func[i] = cost_sum

print("Theta0:", theta0)
print("Theta1:", theta1)

plt.plot(cost_func)
plt.xlabel("Epochs")
plt.ylabel("Cost Function")
plt.title("Cost Function vs. Epochs")
plt.show()

y_predict = theta0 + theta1 * x

print("Predicted Values:", y_predict)

```

```
Enter the number of epochs: 100
Theta0: -13.215698059882135
Theta1: 5.696786091548246
```




```
import numpy as np
import matplotlib.pyplot as plt

alpha = 0.001
theta0 = 1
theta1 = 0.5
x = x_train.values
y = y_train.values
num = len(x)
lembda = 0.001
epoch = int(input("Enter the number of epochs: "))
cost_func = np.empty(epoch)

# Stochastic Gradient Descent with L2 regularization
for i in range(epoch):
    cost_sum = 0

    for j in range(len(x)):
        y_hat = theta0 + theta1 * x[j]
```

- 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

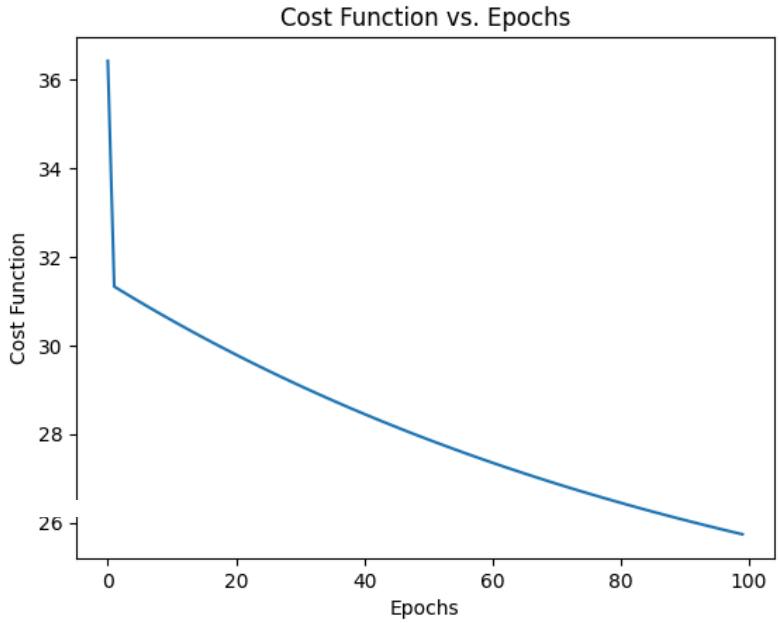
- Try out Gemma on Colab!
- Allow unicode in form text inputs
- Display documentation and link to source when displaying functions
- Display image-like ndarrays as images
- Improved UX around quick charts and execution error suggestions
- Released Marketplace image for the month of February (GitHub issue)
- 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

```
        y_hat_diff = y_hat - y[j]

        theta0 = theta0 - alpha * y_hat_diff
        theta1 = theta1 - alpha * (y_hat_diff * x[j] + lembda *
        cost_sum += (1 / (2*num)) * (y_hat_diff ** 2) + (lembda
    cost_func[i] = cost_sum

print("Theta0:", theta0)
print("Theta1:", theta1)

plt.plot(cost_func)
plt.xlabel("Epochs")
plt.ylabel("Cost Function")
plt.title("Cost Function vs. Epochs")
plt.show()
y_predict = theta0 + theta1 * x

print("Predicted Values:", y_predict)

```

```
Enter the number of epochs: 100
Theta0: -13.215698059882135
Theta1: 5.696786091548246
```




```
#Multiple Linear Regression
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
dataset = pd.read_csv('BostonHousing.csv')

x = dataset.iloc[:,:-1].values
y = dataset.iloc[:,-1].values
```

```
dataset.info()
dataset.describe()
```

- 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 al 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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 14 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   crim     506 non-null    float64
 1   zn       506 non-null    float64
 2   indus    506 non-null    float64
 3   chas     506 non-null    int64
 4   nox      506 non-null    float64
 5   rm       506 non-null    float64
 6   age      506 non-null    float64
 7   dis      506 non-null    float64
 8   rad      506 non-null    int64
 9   tax      506 non-null    int64
 10  ptratio  506 non-null    float64
 11  b        506 non-null    float64
 12  lstat    506 non-null    float64
 13  medv     506 non-null    float64
dtypes: float64(11), int64(3)
memory usage: 55.5 KB
```

	crim	zn	indus	chas	nc
count	506.000000	506.000000	506.000000	506.000000	506.0000(
mean	3.613524	11.363636	11.136779	0.069170	0.5546(
std	8.601545	23.322453	6.860353	0.253994	0.1158(
min	0.006320	0.000000	0.460000	0.000000	0.3850(
25%	0.082045	0.000000	5.190000	0.000000	0.4490(
50%	0.256510	0.000000	9.690000	0.000000	0.5380(
75%	3.677083	12.500000	18.100000	0.000000	0.6240(
max	88.976200	100.000000	27.740000	1.000000	0.8710(

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size
```

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()

x_train[:,:-1] = sc.fit_transform(x_train[:,:-1])
x_test[:,:-1] = sc.transform(x_test[:,:-1])
```

```
import numpy as np
import matplotlib.pyplot as plt

iterations = int(input("Enter the number of epochs/iterations:
alphaArr = [0.001, 0.004, 0.0012]
lambda_param = 0.001
cost_values = []

# Perform Batch Gradient Descent for each alpha
for alpha in alphaArr:
    theta = np.random.uniform(0, 1, size=(x_train.shape[1]))
    theta0 = np.random.uniform(0, 1, size=(1))
    g = []

    for j in range(iterations):
        y_pred = np.dot(x_train, theta) + theta0
        predError = y_pred - y_train

```

- 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

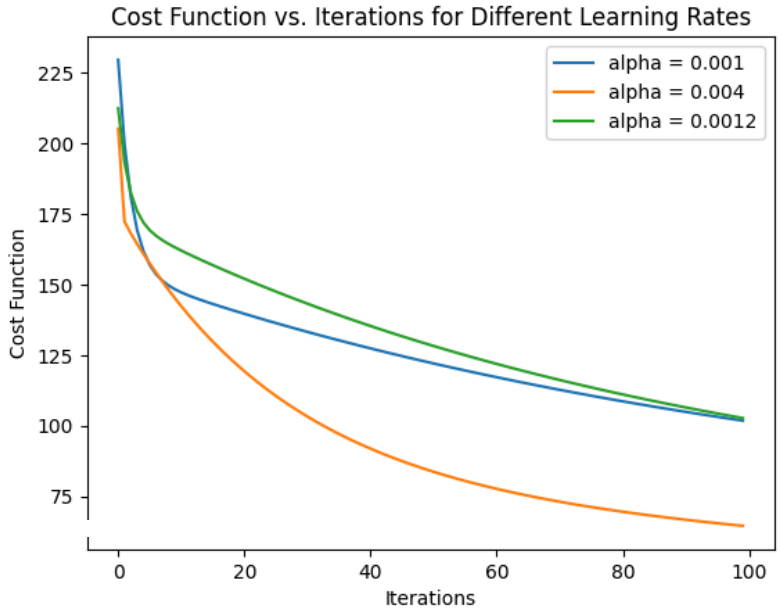
- Updated the **Open notebook** dialog for better usability and support for smaller screen sizes
- Added smart paste support for data from Google Sheets for R notebooks
- Enabled showing release notes in a tab
- Launched AI coding features for Pro/Pro+ users in Australia AU Canada CA India IN and Japan JP (tweet)
- Python package upgrades
  - 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

```
        cost = (np.sum(predError**2) + lambda_param * np.sum(th
        g.append(cost)

        theta_grad = (np.dot(x_train.T, predError) + lambda_par
        theta0_grad = np.sum(predError) / len(x_train)

        theta -= alpha * theta_grad
        theta0 -= alpha * theta0_grad
    cost_values.append(g)

for idx, alpha in enumerate(alphaArr):
    plt.plot(cost_values[idx], label=f'alpha = {alpha}')

plt.xlabel('Iterations')
plt.ylabel('Cost Function')
plt.title('Cost Function vs. Iterations for Different Learning
plt.legend()
plt.show()

```

```
Enter the number of epochs/iterations: 100
```




```
import numpy as np
import matplotlib.pyplot as plt

iterations = int(input("Enter the number of epochs/iterations:

alphaArr = [0.001, 0.004, 0.0012]
lambda_param = 0.001
cost_values = []

# Perform Batch Gradient Descent for each alpha
for alpha in alphaArr:
    theta = np.random.uniform(0, 1, size=(x_train.shape[1]))
    theta0 = np.random.uniform(0, 1, size=(1))

    g = []
    for j in range(iterations):
        y_pred = np.dot(x_train, theta) + theta0

        predError = y_pred - y_train
```

- 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

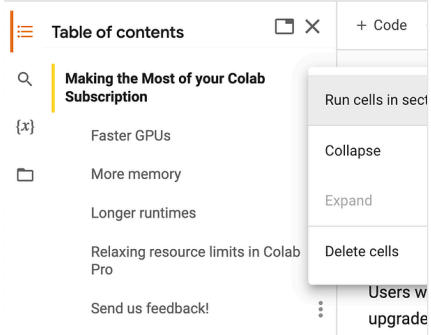
2023-08-18

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

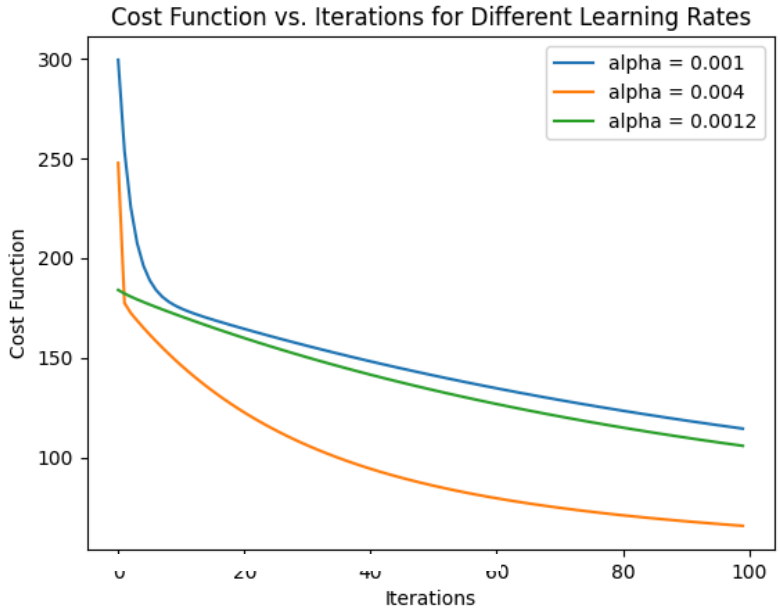
- Added a menu to the table of contents to support running a section or collapsing/expanding sections (post)



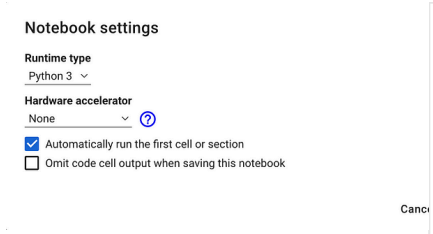
- Added an option to automatically run the first cell or section, available under Edit -> Notebook settings (post)

```
20
21         cost = (np.sum(predError**2) + lambda_param * np.sum(at
22         g.append(cost)
23
24         theta_grad = (np.dot(x_train.T, predError) + lambda_par
25         theta0_grad = np.sum(predError) / len(x_train)
26
27         theta -= alpha * theta_grad
28         theta0 -= alpha * theta0_grad
29     cost_values.append(g)
30
31 for idx, alpha in enumerate(alphaArr):
32     plt.plot(cost_values[idx], label=f'alpha = {alpha}')
33
34 plt.xlabel('Iterations')
35 plt.ylabel('Cost Function')
36 plt.title('Cost Function vs. Iterations for Different Learning
37 plt.legend()
38 plt.show()
39
```

```
Enter the number of epochs/iterations: 100
```




```
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 epochs = int(input("Enter the number of epochs: "))
5
6 alphaArr = [0.001, 0.004, 0.0012]
7 lambda_param = 0.001
8
9 cost_values = []
10
11 #StochasticGradientDescent
12 for alpha in alphaArr:
13     theta = np.random.uniform(0, 1, size=(x_train.shape[1]))
14     theta0 = np.random.uniform(0, 1, size=(1))
15     g = []
16     for epoch in range(epochs):
17         cost_sum = 0
18         for i in range(len(x_train)):
```



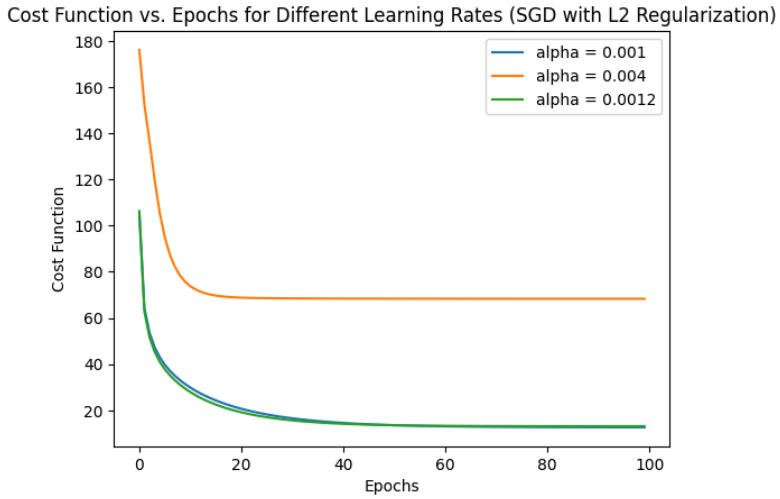
- Launched Pro/Pro+ to Algeria, Argentina, Chile, Ecuador, Egypt, Ghana, Kenya, Malaysia, Nepal, Nigeria, Peru, Rwanda, Saudi Arabia, South Africa, Sri Lanka, Tunisia, and Ukraine (tweet)
- Added a command, "Toggle tab moves focus" for toggling tab trapping in the editor (Tools -> Command palette, "Toggle 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
- 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

```
            y_pred = np.dot(x_train[i], theta) + theta0
            predError = y_pred - y_train[i]
            cost_sum += (1 / 2) * (predError ** 2)

            theta -= alpha * (predError * x_train[i] + lambda_p
            theta0 -= alpha * predError
        average_cost = (cost_sum + (lambda_param / 2) * np.sum(
        g.append(average_cost)

    cost_values.append(g)

for idx, alpha in enumerate(alphaArr):
    plt.plot(cost_values[idx], label=f'alpha = {alpha}')

plt.xlabel('Epochs')
plt.ylabel('Cost Function')
plt.title('Cost Function vs. Epochs for Different Learning Rate
plt.legend()
plt.show()

```

```
Enter the number of epochs: 100
```




```
import numpy as np
import matplotlib.pyplot as plt
epochs = int(input("Enter the number of epochs: "))
alphaArr = [0.001, 0.004, 0.0012]
lambda_param = 0.001

cost_values = []

#Stochastic GradientDescent
for alpha in alphaArr:
    theta = np.random.uniform(0, 1, size=(x_train.shape[1]))
    theta0 = np.random.uniform(0, 1, size=(1))
    g = []
    for epoch in range(epochs):
        cost_sum = 0
        for i in range(len(x_train)):
            y_pred = np.dot(x_train[i], theta) + theta0
            predError = y_pred - y_train[i]
```

- 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

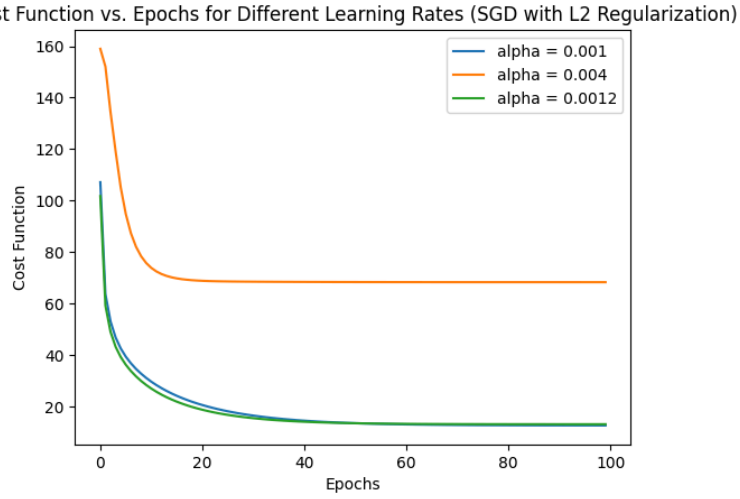
- Released the new site colab.google
- Published Colab's Docker runtime image to us-docker.pkg.dev/colab-images/public/runtime (tweet, instructions)
- Launched support for Google children accounts (tweet)
- Launched DagsHub integration (tweet, post)
- Upgraded to Monaco Editor Version 0.37.1
- Fixed 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

```
            cost_sum += (1 / 2) * (predError ** 2)
            theta -= alpha * (predError * x_train[i] + lambda_p
            theta0 -= alpha * predError

        average_cost = (cost_sum + (lambda_param / 2) * np.sum(
        g.append(average_cost)
    cost_values.append(g)

for idx, alpha in enumerate(alphaArr):
    plt.plot(cost_values[idx], label=f'alpha = {alpha}')

plt.xlabel('Epochs')
plt.ylabel('Cost Function')
plt.title('Cost Function vs. Epochs for Different Learning Rate
plt.legend()
plt.show()

```

```
Enter the number of epochs: 100
```




```
from sklearn.linear_model import Lasso
from sklearn.metrics import mean_squared_error
lasso = Lasso(alpha=0.1)
lasso.fit(x_train, y_train)

y_pred = lasso.predict(x_test)

mse = mean_squared_error(y_test, y_pred)
print(f'Mean Squared Error: {mse}')
```

```
Mean Squared Error: 24.48991914624721
```

```
from sklearn.linear_model import Ridge
from sklearn.metrics import mean_squared_error
ridge = Ridge(alpha=1.0)
ridge.fit(x_train, y_train)

y_pred = ridge.predict(x_test)

mse = mean_squared_error(y_test, y_pred)
```

- 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-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

2023-03-10

```
print(f'Mean Squared Error: {mse}')

```

```
Mean Squared Error: 23.39500782778501
```

```
Start coding or generate with AI.
```

- 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

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
  - 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
  - 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-httplib2 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
- 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 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 tcllib 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)
- 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 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 wher 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

- 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 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
- 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

- 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