

```

import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras import layers, models
from tensorflow.keras.datasets import cifar10
from tensorflow.keras.utils import to_categorical
from sklearn.metrics import classification_report, confusion_matrix
import seaborn as sns
import cv2

# 1. Load and Preprocess Data
(x_train, y_train), (x_test, y_test) = cifar10.load_data()
x_train, x_test = x_train / 255.0, x_test / 255.0
y_train_cat = to_categorical(y_train, 10)
y_test_cat = to_categorical(y_test, 10)

class_names = ['airplane', 'automobile', 'bird', 'cat', 'deer', 'dog', 'frog', 'horse', 'ship', 'truck']

# 2. Define CNN Model (Functional API)
inputs = tf.keras.Input(shape=(32, 32, 3))
x = layers.Conv2D(32, (3, 3), activation='relu')(inputs)
x = layers.BatchNormalization()(x)
x = layers.MaxPooling2D((2, 2))(x)
x = layers.Dropout(0.2)(x)

x = layers.Conv2D(64, (3, 3), activation='relu')(x)
x = layers.BatchNormalization()(x)
x = layers.MaxPooling2D((2, 2))(x)
x = layers.Dropout(0.3)(x)

x = layers.Conv2D(128, (3, 3), activation='relu', name='conv3')
x = layers.BatchNormalization()(x)
x = layers.GlobalAveragePooling2D()(x)

x = layers.Dense(128, activation='relu')(x)
x = layers.Dropout(0.4)(x)
outputs = layers.Dense(10, activation='softmax')(x)

model = tf.keras.Model(inputs=inputs, outputs=outputs)
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])

model.summary()

# 3. Train the Model
history = model.fit(
    x_train, y_train_cat,
    validation_data=(x_test, y_test_cat),
    epochs=15,
    batch_size=64
)

# 4. Evaluate the Model
test_loss, test_acc = model.evaluate(x_test, y_test_cat)

```

(32GB) and a whopping peak rating of 918 BF16 TFLOPS (nearly 3x A100)! Try them out with JAX & Flax in our [example notebook](#)

- Enabled UTF-8 mode by default for Python
- Added CUDA.jl and Pluto.jl for Julia
- Enabled OpenCL for LightGBM
- Python package upgrades
  - accelerate 1.5.2 -> 1.6.0
  - bigframes 1.42.0 -> 2.3.0
  - bokeh 3.6.3 -> 3.7.2
  - cudf-cu12 24.12.0 -> 25.2.1
  - google-genai 1.9.0 -> 1.14.0
  - highspy 1.9.0 -> 1.10.0
  - holidays 0.69 -> 0.72
  - huggingface-hub 0.30.1 -> 0.31.1
  - lxml 5.3.1 -> 5.4.0
  - nx\_cugraph\_cu12 24.12.0 -> 25.2.1
  - openai 1.70.0 -> 1.78.0
  - peft 0.14.0 -> 0.15.2
  - polars 1.14.0 -> 1.21.0
  - pyomo 6.8.2 -> 6.9.2
  - scipy 1.14.1 -> 1.15.3
  - sentence-transformers 3.4.1 -> 4.1.0
  - transformers 4.50.3 -> 4.51.3
  - urllib3 2.3.0 -> 2.4.0
  - xarray 2025.1.2 -> 2025.3.1
- Python package inclusions
  - dataproc-spark-connect 0.7.3

```

print(f"Test Accuracy: {test_acc:.4f}")

# 5. Classification Report
y_pred = model.predict(x_test)
y_pred_classes = np.argmax(y_pred, axis=1)
y_true = y_test.flatten()

print("\nClassification Report:")
print(classification_report(y_true, y_pred_classes, target_names=class_names))

# Confusion Matrix
conf_mat = confusion_matrix(y_true, y_pred_classes)
plt.figure(figsize=(10, 8))
sns.heatmap(conf_mat, xticklabels=class_names, yticklabels=class_names,
            annot=True, fmt='d', cmap='Blues')
plt.title("Confusion Matrix")
plt.ylabel('Actual')
plt.xlabel('Predicted')
plt.show()

# 6. Visualize Training Curves
def plot_history(hist):
    plt.figure(figsize=(12, 4))
    plt.subplot(1, 2, 1)
    plt.plot(hist.history['accuracy'], label='train acc')
    plt.plot(hist.history['val_accuracy'], label='val acc')
    plt.title("Accuracy")
    plt.legend()

    plt.subplot(1, 2, 2)
    plt.plot(hist.history['loss'], label='train loss')
    plt.plot(hist.history['val_loss'], label='val loss')
    plt.title("Loss")
    plt.legend()
    plt.show()

plot_history(history)

# 7. Grad-CAM for Explainability
def make_gradcam_heatmap(img_array, model, last_conv_layer_name):
    grad_model = tf.keras.models.Model(
        inputs=model.input,
        outputs=[model.get_layer(last_conv_layer_name).output]
    )

    with tf.GradientTape() as tape:
        conv_outputs, predictions = grad_model(img_array)
        pred_index = tf.argmax(predictions[0])
        class_channel = predictions[:, pred_index]

    grads = tape.gradient(class_channel, conv_outputs)
    pooled_grads = tf.reduce_mean(grads, axis=(0, 1, 2))
    conv_outputs = conv_outputs[0]
    heatmap = conv_outputs @ pooled_grads[..., tf.newaxis]
    heatmap = tf.squeeze(heatmap)

```

retrieval.

- Upgraded Colab runtimes to Python 3.11.

#### Python package upgrades

- bigframes 1.29.0 -> 1.42.0
- TensorFlow 2.17.1 -> 2.18.0
- tensorboard 2.17.1 -> 2.18.0
- keras 3.5.0 -> 3.8.0
- torch 2.5.1 -> 2.6.0
- torchaudio 2.5.1 -> 2.6.0
- torchvision 0.20.1 -> 0.21.0
- fastai 2.7.18 -> 2.7.19
- ipykernel 5.5.6 -> 6.17.1
- google-genai 0.3.0 -> 1.9.0
- google-auth 2.27.0 -> 2.38.0
- Tornado 6.3.3 -> 6.4.2
- jax 0.4.33 -> 0.5.2
- accelerate 1.2.1 -> 1.5.2
- transformers 4.47.1 -> 4.50.3
- openai 1.57.4 -> 1.70.0
- kagglehub 0.3.6 -> 0.3.11
- earthengine-api 1.4.3 -> 1.5.9
- google-cloud-bigquery 3.29.0 -> 3.31.0
- bigquery-magics 0.8.1 -> 0.9.0
- NumPy 1.26.4 -> 2.0.2

#### Python package inclusions

- cuml-cu12 24.12.0

### 2025-01-13

- Released version 1.2.0 of the [\(Open in Colab Chrome Extension\)](#).
- Released minimizable comments with indicators next to cell.
- TPU v5e-1 Runtimes are now available for selection ([tweet](#)).
- GPU prices were decreased ([tweet](#)).

#### Python package upgrades

- accelerate 1.1.1 -> 1.2.1

```

heatmap = tf.maximum(heatmap, 0) / tf.math.reduce_max(heatmap)
return heatmap.numpy()

def display_gradcam(image, model, last_conv_layer='last_max'):
    img_array = np.expand_dims(image, axis=0)
    heatmap = make_gradcam_heatmap(img_array, model, last_conv_layer)

    heatmap = cv2.resize(heatmap, (32, 32))
    heatmap = np.uint8(255 * heatmap)
    heatmap_color = cv2.applyColorMap(heatmap, cv2.COLORMAP_JET)
    superimposed_img = heatmap_color * 0.4 + image * 255
    superimposed_img = np.uint8(superimposed_img)

    plt.figure(figsize=(6, 3))
    plt.subplot(1, 2, 1)
    plt.imshow(image)
    plt.title("Original")
    plt.axis('off')
    plt.subplot(1, 2, 2)
    plt.imshow(superimposed_img)
    plt.title("Grad-CAM")
    plt.axis('off')
    plt.show()

# Display Grad-CAM for one image
display_gradcam(x_test[0], model)

```

- scikit-image 0.24.0 -> 0.25.0
- scikit-learn 1.5.2 -> 1.6.0
- sentence-transformers 3.2.1 -> 3.3.1
- tensorflow 2.17.0 -> 2.17.1
- torch 2.5.0 -> 2.5.1
- torchaudio 2.5.0 -> 2.5.1
- torchvision 0.20.0 -> 0.20.1
- transformers 4.46.2 -> 4.47.1
- wandb 0.18.6 -> 0.19.1
- xarray 2024.10.0 -> 2024.11.0

Python package inclusions

- google-genai 0.3.0

## 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



Downloading data from <https://www.cs.toronto.edu/~170498071/170498071> 4s 0us/st  
Model: "functional"

Layer (type)	Output Shape
input_layer (InputLayer)	(None, 32, 32,
conv2d (Conv2D)	(None, 30, 30,
batch_normalization (BatchNormalization)	(None, 30, 30,
max_pooling2d (MaxPooling2D)	(None, 15, 15,
dropout (Dropout)	(None, 15, 15,
conv2d_1 (Conv2D)	(None, 13, 13,
batch_normalization_1 (BatchNormalization)	(None, 13, 13,
max_pooling2d_1 (MaxPooling2D)	(None, 6, 6, 6
dropout_1 (Dropout)	(None, 6, 6, 6
last_conv (Conv2D)	(None, 4, 4, 1
batch_normalization_2 (BatchNormalization)	(None, 4, 4, 1
global_average_pooling2d (GlobalAveragePooling2D)	(None, 128)
dense (Dense)	(None, 128)
dropout_2 (Dropout)	(None, 128)
dense_1 (Dense)	(None, 10)

Total params: 111,946 (437.29 KB)

Trainable params: 111,498 (435.54 KB)

Non-trainable params: 448 (1.75 KB)

Epoch 1/15

782/782 103s 124ms/step - acc

Epoch 2/15

782/782 140s 122ms/step - acc

Epoch 3/15

782/782 142s 123ms/step - acc

Epoch 4/15

782/782 139s 119ms/step - acc

Epoch 5/15

782/782 142s 120ms/step - acc

Epoch 6/15

782/782 142s 121ms/step - acc

Epoch 7/15

782/782 93s 119ms/step - accu

Epoch 8/15

782/782 94s 121ms/step - accu

Epoch 9/15

- 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
- 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

Epoch 9/15

**782/782**  **142s** 121ms/step - acc

Epoch 10/15

**782/782**  **145s** 125ms/step - acc

Epoch 11/15

**782/782**  **139s** 121ms/step - acc

Epoch 12/15

**782/782**  **141s** 121ms/step - acc

Epoch 13/15

**782/782**  **143s** 122ms/step - acc

Epoch 14/15

**782/782**  **146s** 127ms/step - acc

Epoch 15/15

**782/782**  **140s** 124ms/step - acc

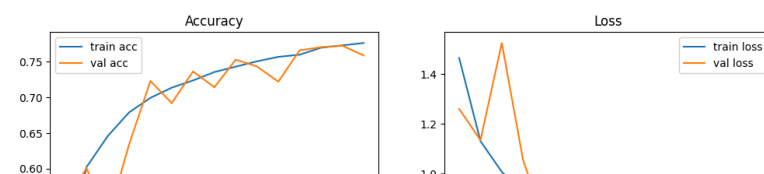
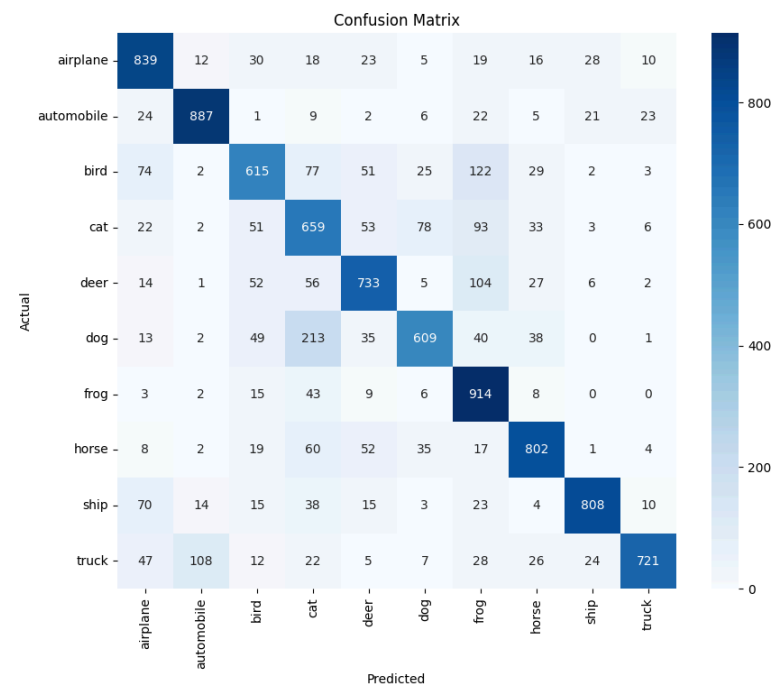
**313/313**  **6s** 18ms/step - accura

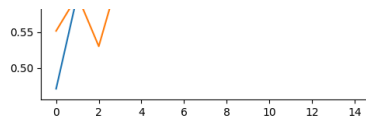
Test Accuracy: 0.7587

**313/313**  **4s** 14ms/step

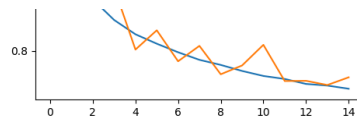
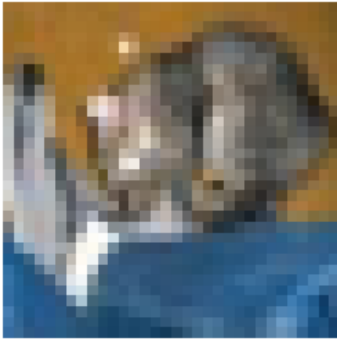
### Classification Report:

	precision	recall	f1-score	supp
airplane	0.75	0.84	0.79	1
automobile	0.86	0.89	0.87	1
bird	0.72	0.61	0.66	1
cat	0.55	0.66	0.60	1
deer	0.75	0.73	0.74	1
dog	0.78	0.61	0.68	1
frog	0.66	0.91	0.77	1
horse	0.81	0.80	0.81	1
ship	0.90	0.81	0.85	1
truck	0.92	0.72	0.81	1
accuracy			0.76	10
macro avg	0.77	0.76	0.76	10
weighted avg	0.77	0.76	0.76	10





Original



Grad-CAM



- 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

- 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

- 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

#### 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



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

- sympy 1.12.1 -> 1.13.1
- torch 2.3.0 -> 2.3.1
- transformers 4.41.2 -> 4.42.4
- Python package inclusions
  - accelerate 0.32.1

## 2024-06-18

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

- 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](#))

- 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

- 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](#))
- 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

- jax 0.4.20 → 0.4.23
- jaxlib 0.4.20 → 0.4.23
- Python package inclusions
  - kagglehub 0.1.4
  - google-cloud-aiplatform 1.38.1

## 2023-11-27

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

## 2023-11-08

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

- 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

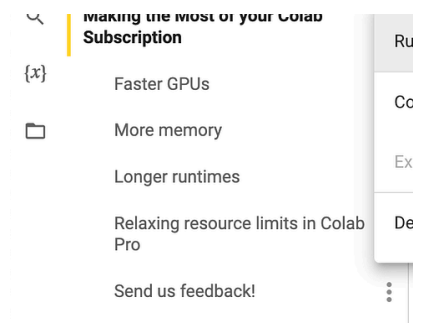
## 2023-09-22

- 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

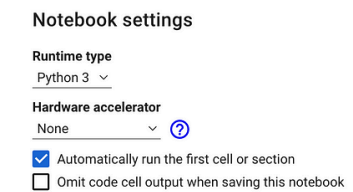
button

- 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





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



- 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](#))

- 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

- gRPC-google-iam-v1 0.12.0
- 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 [docker.pkg.dev/colab-images/public/runtime](https://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

- Python package updates:
  - attrs 22.2.0 -> 23.1.0
  - earthengine-api 0.1.349 -> earthengine-api 0.1.350
  - flax 0.6.8 -> 0.6.9
  - grpcio 1.53.0 -> 1.54.0
  - nbclient 0.7.3 -> 0.7.4
  - tensorflow-datasets 4.8.3 -> 4.9.2
  - termcolor 2.2.0 -> 2.3.0
  - zict 2.2.0 -> 3.0.0

## 2023-04-14

- Python package updates:
  - google-api-python-client 2.70.0 -> 2.84.0
  - google-auth-oauthlib 0.4.6 -> 1.0.0
  - google-cloud-bigquery 3.4.2 -> 3.9.0
  - google-cloud-datastore 2.11.1 -> 2.15.1
  - google-cloud-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](#))

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

## 2023-03-10

- Added the [Colab editor shortcuts](#) example notebook
- Fixed triggering of @-mention and email autocomplete for large comments ([GitHub issue](#))
- Added View Resources to the Runtime menu
- Made file viewer images fit the view by default, resizing to original size on click
- When in VIM mode, enable copy as well as allowing propagation to monaco-vim to escape visual mode ([GitHub issue](#))
- Upgraded CUDA 11.6.2 -> 11.8.0 and cuDNN 8.4.0.27 -> 8.7.0.84
- Upgraded Nvidia drivers 525.78.01 -> 530.30.02
- Upgraded Python 3.8.10 -> 3.9.16

- 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

- 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

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-httpplib2 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



- 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
- xldr 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

## 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](#))

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

7.9.0, rpropnet 0.7 to propnet 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](#))

### 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 FAC 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

## 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.authentic](#) 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