

```
# Step 1: Load data and libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats

# Load data
marks_df = pd.read_csv("senior_marks.csv")
grants_df = pd.read_csv("grant_data.csv")

# Display basic info to confirm structure
print("Marks data:")
print(marks_df.info())
print(marks_df.head())

print("\nGrant data:")
print(grants_df.info())
print(grants_df.head())

C: \Users\User\AppData\Local\Temp\ipykernel_7716\1793549732.py:8: DtypeWarning: Columns (4)
marks_df = pd.read_csv("senior_marks.csv")
Marks data:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 399981 entries, 0 to 399980
Data columns (total 8 columns):
#   Column              Non-Null Count  Dtype
---  --
0   academic_yr         399981 non-null  int64
1   subject_code        399981 non-null  int64
2   grade_level         399878 non-null  object
3   credit_received     399981 non-null  float64
4   loi                 399981 non-null  object
5   student_nbr_hashed  399981 non-null  int64
6   school_nbr_hashed   399981 non-null  int64
7   mark                399981 non-null  object
dtypes: float64(1), int64(4), object(3)
memory usage: 24.4+ MB
None
   academic_yr  subject_code  grade_level  credit_received  loi \
0      2018      169      30F      1.0      1
1      2018      108      42S      1.0      1
2      2018      274      10S      1.0      1
3      2019      1      10E      1.0      1
4      2019      80      10E      1.0      1
   student_nbr_hashed  school_nbr_hashed  mark
0      -892975303      1530474944      CO
1      626087110      839850712      100
2      1263813983      839850712      00S
3      -1112627507      393550485      100
4      -1112627507      393550485      067

Grant data:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6417 entries, 0 to 6416
Data columns (total 4 columns):
#   Column              Non-Null Count  Dtype
---  --
0   academic_yr         6417 non-null  int64
1   stu_grant_code       6417 non-null  int64
2   student_nbr_hashed   6417 non-null  int64
3   school_nbr_hashed    6417 non-null  int64
dtypes: int64(4)
memory usage: 200.7 KB
None
   academic_yr  stu_grant_code  student_nbr_hashed  school_nbr_hashed
0      2018      110      -1166479635      -1702353697
1      2018      110      1390699299      -1702353697
2      2018      110      1235962137      -1702353697
3      2018      110      -11014225      -1702353697
4      2018      110      829098392      -1702353697

# Define valid math subject codes
math_codes = [3909, 3900, 3907, 3903, 3000, 3001, 3004, 3005,
              3006, 3007, 3008, 3905, 3908, 3908, 3940, 3939, 3923, 3918, 3919]

# Keep only rows with math subject codes
marks_df = marks_df[marks_df["subject_code"].isin(math_codes)]

# Keep only rows with numeric marks
marks_df = marks_df[pd.to_numeric(marks_df["mark"], errors="coerce").notnull()]
marks_df["mark"] = marks_df["mark"].astype(float)

# Keep only valid languages of instruction: 1 = English, 2 = French
marks_df = marks_df[marks_df["loi"].isin([1, 2])]

# Merge on student ID and academic year
merged_df = pd.merge(marks_df, grants_df, on=["student_nbr_hashed", "academic_yr"], how="left")

merged_df["stu_grant_code"] = merged_df["stu_grant_code"].fillna(0)

def get_program(code):
```

Release notes X

...

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](#).

2025-06-16

- At Google I/O Colab announced a new, reimagined AI-first Colab, bringing a powerful agentic collaborator into the notebook. Learn more [here](#).
- Huggingface integration: We've partnered with Hugging Face to add "Open in Colab" support for all models on the Hugging Face Hub. Now you can directly launch a Colab notebook from any model card, making it easier than ever to experiment with and evaluate models. View the announcement [blog](#) to learn more.
- Python package upgrades
 - accelerate 1.6.0 -> 1.7.0
 - bigframes 2.3.0 -> 2.6.0
 - earthengine-api 1.5.14 -> 1.5.19
 - gdal 3.6.4 -> 3.8.4
 - google-generativeai 1.14.0 -> 1.20.0
 - grpcio 1.71.0 -> 1.73.0
 - highspy 1.10.0 -> 1.11.0
 - huggingface-hub 0.31.1 -> 0.33.0
 - narwhals 1.38.2 -> 1.42.0
 - networkx 3.4.2 -> 3.5
 - openai 1.78.0 -> 1.86.0
 - pandas-gbq 0.28.0 -> 0.29.1
 - panel 1.6.3 -> 1.7.1
 - pymc 5.22.0 -> 5.23.0
 - pytensor 2.30.3 -> 2.31.3
 - spacy 3.8.5 -> 3.8.7
 - wandb 0.19.11 -> 0.20.1
 - zipp 3.21 -> 3.23
- Python package inclusions
 - grado 5.31.0

2025-05-12

- Pro+ Subscriptions give 600 CCUs now: <https://x.com/GoogleColab/status/1913312272967209357>
- Launched Colab's fastest deep learning accelerator: v6e-1 (Trillium) TPUv4! 2x the high bandwidth memory as v5e-1 (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-JI 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-generativeai 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
 - dataprox-spark-connect 0.7.3
 - libysal 4.13.0
 - lightgbm
 - stumpy 1.13.0
 - torchao 0.10.0
 - torchune 0.6.1
 - tsfresh 0.21.0

2025-04-09

- Colab Data Science Agent [launched!](#)
- Julia language runtimes available with GPU and TPU support [GitHub](#)
- Now your popular Kaggle datasets are cached for quick 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
- tensorflowboard 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

https://colab.research.google.com/drive/1NzmDO1xvvUnhYceGxommyh31MtAa-pdS#scrollTo...

1/13

```
if code == 101:
    return "Français"
elif code == 110:
    return "Immersion - Early"
elif code == 112:
    return "Immersion - Late"
elif code == 0:
    return "English"
else:
    return "Unknown"

merged_df["program_label"] = merged_df["stu_grant_code"].apply(get_program)

print(merged_df.head())
print(merged_df["program_label"].value_counts())
# Show some Français students
print(merged_df[merged_df["program_label"] == "Français"].head())

# Show some Immersion students
print(merged_df[merged_df["program_label"].str.contains("Immersion")].head())
```

academic_yr	subject_code	grade_level	credit_received	loi	
0	2018	3000	405	1.0	1
1	2018	3000	205	1.0	1
2	2018	3000	405	1.0	1
3	2018	3000	205	1.0	1
4	2018	3000	405	1.0	1

student_nbr_hashed	school_nbr_hashed_x	mark	stu_grant_code	
0	-2023147862	442791482	51.0	0.0
1	-938810957	182935734	54.0	0.0
2	-938810957	182935734	72.0	0.0
3	-656539974	-331273503	78.0	0.0
4	-656539974	-331273503	74.0	0.0

school_nbr_hashed_y	program_label	
0	NaN	English
1	NaN	English
2	NaN	English
3	NaN	English
4	NaN	English

program_label	
English	25962
Immersion - Early	2448
Français	865
Immersion - Late	19

Name: count, dtype: int64

academic_yr	subject_code	grade_level	credit_received	loi	
581	2018	3000	205	1.0	2
1754	2018	3000	305	0.0	2
2799	2018	3000	405	1.0	1
3074	2018	3903	405	1.0	1
4933	2018	3000	205	1.0	2

student_nbr_hashed	school_nbr_hashed_x	mark	stu_grant_code	
581	734655605	1776838734	51.0	101.0
1754	-1281688102	2058282857	6.0	101.0
2799	453654357	1933180855	70.0	101.0
3074	-804407319	1933180855	74.0	101.0
4933	734655605	870530136	53.0	101.0

school_nbr_hashed_y	program_label	
581	8.705301e+08	Français
1754	-8.363998e+08	Français
2799	-2.125912e+09	Français
3074	8.705301e+08	Français
4933	8.705301e+08	Français

academic_yr	subject_code	grade_level	credit_received	loi	
337	2018	3000	405	1.0	1
338	2018	3939	405	1.0	1
383	2018	3000	305	1.0	1
384	2018	3900	455	0.5	1
385	2018	3939	405	1.0	1

student_nbr_hashed	school_nbr_hashed_x	mark	stu_grant_code	
337	381411378	1422497309	100.0	110.0
338	381411378	1422497309	100.0	110.0
383	1985979674	1422497309	99.0	110.0
384	1985979674	1422497309	98.0	110.0

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

groups = filtered_df["program_grouped"].unique()

for group in groups:
    data = filtered_df[filtered_df["program_grouped"] == group][["mark"]].dropna()
    sample = data.sample(2000, random_state=1) if len(data) > 2000 else data # limit points for plot
    plt.figure(figsize=(12,5))

    # Histogram
    plt.subplot(1,2,1)
    sns.histplot(sample, kde=True, bins=30, color='skyblue')
```

- google-gemini 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
- aiohttp 3.10.10 -> 3.11.11
- altair 4.2.2 -> 5.0.0
- bigframes 1.25.0 -> 1.29.0
- cmake 3.30.5 -> 3.31.2
- cvxpy 1.5.3 -> 3.6.0
- earthengine-api 1.2.0 -> 1.4.3
- folium 0.18.0 -> 0.19.3
- holidays 0.60 -> 0.63
- huggingface-hub 0.26.2 -> 0.27.0
- jsonpickle 3.4.2 -> 4.0.1
- kagglehub 0.3.3 -> 0.3.6
- keras 3.4.1 -> 3.5.0
- matplotlib 3.8.0 -> 3.10.0
- openai 1.54.3 -> 1.57.4
- pymc 5.18.0 -> 5.19.1
- safetensors 0.4.5 -> 0.5.0
- 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-gemini 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 [#4860](#).
 - Drive File Stream issues [#3441](#).
 - Linking to the sign-up 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
- bokch 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
- gsfcs 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
- lmfit 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
- ntk 3.8.1 -> 3.9.1

```
plt.title(f'Histogram + KDE for {group}')
plt.xlabel('Math Mark')
plt.ylabel('Frequency')

# Q-Q Plot
plt.subplot(1,2,2)
stats.probplot(sample, dist="norm", plot=plt)
plt.title(f'Q-Q Plot for {group}')

plt.tight_layout()
plt.show()
```

Histogram + KDE for English

Q-Q Plot for English

Histogram + KDE for Immersion

Q-Q Plot for Immersion

Histogram + KDE for Français

Q-Q Plot for Français

```
# Calculate number and percentage of perfect scores (100) per group
perfect_scores = filtered_df[filtered_df["mark"] == 100]

# Count total students per group
total_counts = filtered_df.groupby("program_grouped")["mark"].count()

# Count perfect scores per group
perfect_counts = perfect_scores.groupby("program_grouped")["mark"].count()

# Calculate percentage
percentage_perfect = (perfect_counts / total_counts) * 100

# Combine counts and percentages into one DataFrame
perfect_summary = percentage_perfect.reset_index().rename(columns={"mark": "percent_perfect"})
perfect_summary["count_perfect"] = perfect_counts.values
perfect_summary["total_students"] = total_counts.values

print(perfect_summary)
```

	program_grouped	percent_perfect	count_perfect	total_students
0	English	7.553347	1961	25962
1	Français	9.132948	79	865
2	Immersion	9.687889	239	2467

```
# Define percentiles to calculate
percentiles = [0.10, 0.25, 0.50, 0.75, 0.90]

# Group by program and calculate median and percentiles
percentile_stats = filtered_df.groupby("program_grouped")["mark"].quantile(percentiles).unstack
```

- pandas 2.1.4 -> 2.2.2
 - pillow 10.4.0 -> 11.0.0
 - plotnine 0.13.6 -> 0.14.1
 - polars 1.6.0 -> 1.9.0
 - protobuf 3.20.3 -> 4.25.5
 - pyarrow 14.0.2 -> 17.0.0
 - pydrive2 1.20.0 -> 1.21.1
 - pymc 5.16.2 -> 5.18.0
 - torch 2.4.1 -> 2.5.0
 - torchaudio 2.4.1 -> 2.5.0
 - torchvision 0.19.1 -> 0.20.0
 - transformers 4.44.2 -> 4.46.2
 - xarray 2024.9.0 -> 2024.10.0
- Python package inclusions
- diffusers 0.31.0
 - gitpython 3.1.43
 - langchain 0.3.7
 - openai 1.54.3
 - pygit2 1.16.0
 - pyspark 3.5.3
 - sentence-transformers 3.2.1
 - timm 1.0.11
 - wandb 0.18.6
- Library and driver upgrades
- drivefs upgraded from 89.0.2 to 98.0.0
- 2024-09-23
- Improved code snippet search
 - Updated Marketplace image and public local runtime container
 - Improved the look-and-feel of interactive form dropdowns and checkboxes
 - Fixed bugs
 - activating the skip link caused the notebook to scroll out of view
 - toggling a checkbox too much caused the page to crash
 - lightning fast drags could cause orphaned tabs
 - custom widgets snippet would show for local runtimes
- Python package upgrades
- accelerate 0.32.1 -> 0.34.2
 - arviz 0.18.0 -> 0.19
 - autograd 1.6.2 -> 1.7.0
 - bigframes 1.14.0 -> 1.18.0
 - dask 2024.7.1 -> 2024.8.0
 - distributed 2024.7.1 -> 2024.8.0
 - duckdb 0.10.3 -> 1.1.0
 - earthengine-api 0.1.416 -> 1.0.0
 - flax 0.8.4 -> 0.8.5
 - gdown 5.1.0 -> 5.2.0
 - geopandas 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
- 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

```
# Rename columns for clarity
percentile_stats.columns = ['10th_pct', '25th_pct', 'median', '75th_pct', '90th_pct']

print(percentile_stats)

# 10th_pct 25th_pct median 75th_pct 90th_pct
# program_grouped
# English 44.0 59.0 74.0 87.0 97.0
# Français 53.0 65.0 78.0 90.0 99.0
# Immersion 53.0 65.0 79.0 90.0 99.0

# Create a passing indicator: passed if credit_received > 0
filtered_df['passed'] = filtered_df['credit_received'] > 0

# Calculate total counts per group
total_counts = filtered_df.groupby('program_grouped')['passed'].count()

# Calculate passing counts per group
passing_counts = filtered_df.groupby('program_grouped')['passed'].sum()

# Calculate percentage passing
percentage_passing = (passing_counts / total_counts) * 100

# Combine into a DataFrame for display
passing_summary = percentage_passing.reset_index().rename(columns={'passed': 'percent_passing'})
passing_summary['count_passing'] = passing_counts.values
passing_summary['total_students'] = total_counts.values

print(passing_summary)

# 0 program_grouped percent_passing count_passing total_students
# 0 English 92.169324 23929 25962
# 1 Français 98.265896 850 865
# 2 Immersion 97.973247 2417 2467

# Create a new column to combine Immersion - Early and Late into one group
def combine_immersion(program):
    if program in ["Immersion - Early", "Immersion - Late"]:
        return "Immersion"
    else:
        return program

merged_df["program_grouped"] = merged_df["program_label"].apply(combine_immersion)

# Calculate average, std, and count of math marks by program group
program_stats = merged_df.groupby("program_grouped")["mark"].agg(["mean", "std", "count"]).reset_index()

# Display the results
print("\nAverage math mark by program group:")
print(program_stats)

# Average math mark by program group:
# program_grouped mean std count
# 0 English 71.175834 21.319582 25962
# 1 Français 76.413873 16.960802 865
# 2 Immersion 76.586137 17.218862 2467

# Define thresholds
high_threshold = 90
low_threshold = 40

# Create indicators for high and low grades
filtered_df['high_grade'] = filtered_df['mark'] > high_threshold
filtered_df['low_grade'] = filtered_df['mark'] < low_threshold

# Total counts per group
total_counts = filtered_df.groupby('program_grouped')['mark'].count()

# Counts of high grades per group
high_counts = filtered_df.groupby('program_grouped')['high_grade'].sum()

# Counts of low grades per group
low_counts = filtered_df.groupby('program_grouped')['low_grade'].sum()

# Calculate percentages
percent_high = (high_counts / total_counts) * 100
percent_low = (low_counts / total_counts) * 100

# Combine results into one DataFrame
grade_summary = pd.DataFrame({
    'percent_high_grade': percent_high,
    'count_high_grade': high_counts,
    'percent_low_grade': percent_low,
    'count_low_grade': low_counts,
    'total_students': total_counts
}).reset_index()
```

- 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 0.12 -> 0.23.1
 - panel 1.3.8 -> 1.4.5
 - requests 2.31.0 -> 2.32.3
 - scikit-learn 1.2.2 -> 1.3.2
 - scipy 1.11.4 -> 1.13.1
 - tensorboard 2.15.2 -> 2.17.0
 - tensorflow 2.15.0 -> 2.17.0
 - tf-keras 2.15.1 -> 2.17.0
 - xarray 2023.7.0 -> 2024.6.0
 - xgboost 2.0.3 -> 2.1.1
- Python package inclusions
 - einops 0.8.0

2024-07-22

- You can now embed Google sheets directly into Colab to streamline interactions with data with InteractiveSheet.
Example:
from google.colab import sheets
sh = sheets.InteractiveSheet()
df = sh.as_df()
 - Fixed multiple rendering bugs in cell editors with wide text content (i.e. text is no longer hidden or clipped)
 - Fixed multiple accessibility issues in Colab's comments feature (e.g. proper keyboard focus management, added accessibility landmarks, etc)
 - Fixed bug where AI code generation would fail for extremely long broken code snippets
 - Fixed multiple scrollbar bugs in the user secrets panel
 - Added the ability for workspace admin to purchase Colab Pro and Pro+ Subscriptions for users
 - Fixed bug where user secrets couldn't be moved to a tab
 - Fixed several focus management accessibility issues in tabs, the table of contents, the left toolbar, and the run button
 - Fixed bug where overflowing cells may be omitted when pasting from Google Sheets
 - Fixed bug where the generate code button did not activate on touch
 - Python package upgrades
 - bigframes 1.9.0 -> 1.11.1
 - cvxpy 1.3.4 -> 1.5.2
 - earthengine-api 0.1.408 -> 0.1.412
 - google-api-core 2.11.1 -> 2.19.1
 - 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
 - Scroll to cell fixes for single tabbed view and jump to cell command
 - Improved tab header behavior

```
print(grade_summary)

program_grouped percent_high_grade count_high_grade percent_low_grade \
0 English 19.482320 5058 7.661197
1 Français 22.658960 196 1.965318
2 Immersion 24.685853 609 2.513174

count_low_grade total_students
0 1989 25962
1 17 865
2 62 2467

pip install pingouin

Collecting pingouin
  Downloading pingouin-0.5.5-py3-none-any.whl.metadata (19 kB)
Requirement already satisfied: matplotlib in c:\users\user\miniconda3\envs\dsi_participa
Requirement already satisfied: numpy in c:\users\user\miniconda3\envs\dsi_participant\l
Requirement already satisfied: pandas>=1.5 in c:\users\user\miniconda3\envs\dsi_particip
Collecting pandas-flavor (from pingouin)
  Downloading pandas_flavor-0.7.0-py3-none-any.whl.metadata (6.7 kB)
Requirement already satisfied: scikit-learn>=1.2 in c:\users\user\miniconda3\envs\dsi_pa
Requirement already satisfied: scipy in c:\users\user\miniconda3\envs\dsi_participant\l
Requirement already satisfied: seaborn in c:\users\user\miniconda3\envs\dsi_participant\
Requirement already satisfied: statsmodels in c:\users\user\miniconda3\envs\dsi_particip
Collecting tabulate (from pingouin)
  Downloading tabulate-0.9.0-py3-none-any.whl.metadata (34 kB)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\user\miniconda3\envs\d
Requirement already satisfied: pytz>=2020.1 in c:\users\user\miniconda3\envs\dsi_partici
Requirement already satisfied: tzdata>=2022.7 in c:\users\user\miniconda3\envs\dsi_parti
Requirement already satisfied: joblib>=1.2.0 in c:\users\user\miniconda3\envs\dsi_partic
Requirement already satisfied: threadpoolctl>=3.1.0 in c:\users\user\miniconda3\envs\dsi_
Requirement already satisfied: contourpy>=1.0.1 in c:\users\user\miniconda3\envs\dsi_par
Requirement already satisfied: cycler>=0.10 in c:\users\user\miniconda3\envs\dsi_partici
Requirement already satisfied: fonttools>=4.22.0 in c:\users\user\miniconda3\envs\dsi_pa
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\user\miniconda3\envs\dsi_pa
Requirement already satisfied: packaging>=20.0 in c:\users\user\miniconda3\envs\dsi_part
Requirement already satisfied: pillow>=8 in c:\users\user\miniconda3\envs\dsi_participant
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\user\miniconda3\envs\dsi_par
Requirement already satisfied: importlib-resources>=3.2.0 in c:\users\user\miniconda3\en
Collecting xarray (from pandas-flavor>pingouin)
  Downloading xarray-2024.7.0-py3-none-any.whl.metadata (11 kB)
Requirement already satisfied: patsy>=0.5.6 in c:\users\user\miniconda3\envs\dsi_partici
Requirement already satisfied: zipp>=3.1.0 in c:\users\user\miniconda3\envs\dsi_particip
Requirement already satisfied: six in c:\users\user\miniconda3\envs\dsi_participant\lib\
Downloading pingouin-0.5.5-py3-none-any.whl (284 kB)
----- 0.0/204.4 kB ? eta -:--:--
----- 122.9/204.4 kB ? eta -:--:--
----- 184.3/204.4 kB 3.7 MB/s eta 0:00:01
----- 194.6/204.4 kB 2.0 MB/s eta 0:00:01
----- 194.6/204.4 kB 2.0 MB/s eta 0:00:01
----- 194.6/204.4 kB 2.0 MB/s eta 0:00:01
----- 194.6/204.4 kB 2.0 MB/s eta 0:00:01
----- 204.4/204.4 kB 620.2 kB/s eta 0:00:00
Downloading pandas_flavor-0.7.0-py3-none-any.whl (8.4 kB)
Downloading tabulate-0.9.0-py3-none-any.whl (35 kB)
Downloading xarray-2024.7.0-py3-none-any.whl (1.2 MB)
----- 0.0/1.2 MB ? eta -:--:--
----- 0.1/1.2 MB 1.9 MB/s eta 0:00:01
----- 0.2/1.2 MB 3.6 MB/s eta 0:00:01
----- 0.3/1.2 MB 3.1 MB/s eta 0:00:01
----- 0.6/1.2 MB 3.3 MB/s eta 0:00:01
----- 0.6/1.2 MB 3.2 MB/s eta 0:00:01
----- 0.6/1.2 MB 3.2 MB/s eta 0:00:01
----- 0.8/1.2 MB 2.5 MB/s eta 0:00:01
----- 1.0/1.2 MB 2.6 MB/s eta 0:00:01
----- 1.2/1.2 MB 3.0 MB/s eta 0:00:01
----- 1.2/1.2 MB 3.0 MB/s eta 0:00:01
----- 1.2/1.2 MB 2.3 MB/s eta 0:00:00
Installing collected packages: tabulate, xarray, pandas-flavor, pingouin
Successfully installed pandas-flavor-0.7.0 pingouin-0.5.5 tabulate-0.9.0 xarray-2024.7.0

import pingouin as pg

# Make sure your math marks are numeric and remove missing values
filtered_df = merged_df.dropna(subset=["mark", "program_grouped"])
filtered_df["mark"] = pd.to_numeric(filtered_df["mark"], errors="coerce")
filtered_df = filtered_df.dropna(subset=["mark"])

# Run Welch's ANOVA
welch_result = pg.welch_anova(dv="mark", between="program_grouped", data=filtered_df)

# Show the results
print("Welch's ANOVA Results:")
print(welch_result)

Welch's ANOVA Results:
      Source  ddf01      ddf02      F      p-unc      np2
0  program_grouped      2  1943.75768  136.015849  5.168403e-56  0.00661

# Post-hoc test: Games-Howell pairwise comparisons
posthoc = pg.pairwise_gameshowell(dv="mark", between="program_grouped", data=filtered_df)
```

- 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' supload_files.async
 - Added syntax highlighting to %writefile cells
 - Cuda dependencies that come with Torch are cached for faster downloads for packages that require Torch and its dependencies ([GitHub Issue](#))
 - Python package upgrades
 - bigframes 0.24.0 -> 1.0.0
 - duckdb 0.9.2 -> 0.10.1
 - google-cloud-aiplatform 1.43.0 -> 1.47.0
 - jax 0.4.23 -> 0.4.26
- ### 2024-03-13
- Fixed bug that sometimes caused UserSecrets to move / disappear
 - Improved messaging for mounting drive in an unsupported environment ([GitHub Issue](#))
 - Python package upgrades
 - torch 2.1.0 -> 2.2.1
 - torchaudio 2.1.0 -> 2.2.1
 - torchvision 0.16.0 -> 0.17.1
 - torchtext 0.16.0 -> 0.17.1
 - PyMC 5.7.2 -> 5.10.4
 - BigFrames 0.21.0 -> 0.24.0
 - google-cloud-aiplatform 1.42.1 -> 1.43.0
 - tornado 6.3.2 -> 6.3.3
- ### 2024-02-21
- Try out Gemma on [Colab!](#)
 - Allow unicode in form text inputs
 - Display documentation and link to source when displaying functions
 - Display image-like ndarrays as images
 - Improved UX around quick charts and execution error suggestions
 - 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 lemons 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

```
# Show the results
print("Games-Howell post-hoc comparisons:")
print(posthoc)
```

↻ Games-Howell post-hoc comparisons:

	A	B	mean(A)	mean(B)	diff	se	T	\
0	English	Français	71.175834	76.413873	-5.238039	0.591669	-8.852986	
1	English	Immersion	71.175834	76.586137	-5.410303	0.371050	-14.581056	
2	Français	Immersion	76.413873	76.586137	-0.172264	0.672857	-0.256019	

	df	pval	hedges
0	957.273634	4.096723e-13	-0.247150
1	3230.353865	0.000000e+00	-0.257681
2	1531.171124	9.645135e-01	-0.010041

- 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_scroll()` ([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
- Python package upgrades
 - CUDA 11.8 to CUDA 12.2
 - tensorflow 2.14.0 -> 2.15.0
 - tensorboard 2.14.0 -> 2.15.0
 - keras 2.14.0 -> 2.15.0
 - Nvidia drivers 525.105.17 -> 535.104.05
 - tensorflow-gcs-config 2.14.0 -> 2.15.0
 - bigframes 0.13.0 -> 0.17.0
 - geemap 0.28.2 -> 0.29.6
 - pyarrow 9.0.0 -> 10.0.1
 - google-generativeai 0.2.2 -> 0.3.1
 - jax 0.4.20 -> 0.4.23
 - jaxlib 0.4.20 -> 0.4.23
- Python package inclusions
 - kagglehub 0.1.4
 - google-cloud-aiplatform 1.38.1

2023-11-27

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

2023-11-08

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

2023-10-23

- Updated the [Open notebook](#) dialog for better usability and support for smaller screen sizes
- Added smart paste support for data from Google Sheets for R notebooks
- Enabled showing release notes in a tab
- Launched AI coding features for Pro/Pro+ users in Australia, Canada, India, 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
- torchtex 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

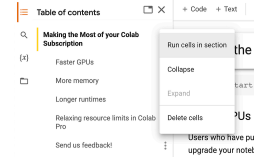
- Added the ability to scope an AI generated suggestion to a specific Pandas dataframe ([tweet](#))
- Added Colab link previews to Docs ([tweet](#))
- Added smart paste support for data from Google Sheets
- Increased font size of dropdowns in interactive forms
- Improved rendering of the notebook when 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](#))
- 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](#))
- 
- The 'Notebook settings' dialog box is shown. It has a title bar 'Notebook settings' and a subtitle 'Runtime type Python 3'. Under 'Hardware accelerator', there is a dropdown menu set to 'None'. There are two checkboxes: 'Automatically run the first cell or section' (which is checked) and 'Print code cell output when saving this notebook' (which is unchecked). At the bottom right are 'Cancel' and 'Save' buttons.
- 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
 - 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:
 - gcfs 2023.6.0
 - geopandas 0.13.2
 - google-cloud-functions 1.13.0
 - grpc-google-iam-v1 0.12.6
 - multidict 6.0.4
 - tensorboard-data-server 0.7.1

2023-06-02

- Released the new site [colab.google](#)
- Published Colab's Docker runtime image to us-docker.pkg.dev/colab-images/public/runtime ([tweet](#), [instructions](#))
- Launched support for Google children accounts ([tweet](#))
- Launched DagsHub integration ([tweet](#), [post](#))
- Upgraded to Monaco Editor Version 0.37.1
- Fixed various Vim keybinding bugs
- Fixed issue where the N and P letters sometimes couldn't be typed ([#3664](#))
- Fixed rendering support for compositional inputs ([#3660](#), [#3679](#))
- Fixed lag in notebooks with lots of cells ([#3676](#))
- Improved support for R by adding a Runtime type notebook setting (Edit -> Notebook settings)
- Improved documentation for connecting to a local runtime (Connect -> Connect to a local runtime)
- Python package updates:
 - holidays 0.23 -> 0.25
 - jax 0.4.8 -> 0.4.10
 - jaxlib 0.4.8 -> 0.4.10
 - pip 23.0.1 -> 23.1.2
 - tensorflow-probability 0.19.0 -> 0.20.1
 - torch 2.0.0 -> 2.0.1
 - torchaudio 2.0.1 -> 2.0.2
 - torchdata 0.6.0 -> 0.6.1
 - torchtext 0.15.1 -> 0.15.2
 - torchvision 0.15.1 -> 0.15.2
 - tornado 6.2 -> 6.3.1

2023-05-05

- Released GPU type selection for paid users, allowing them to choose a preferred NVIDIA GPU
- Upgraded R from 4.2.3 to 4.3.0
- Upgraded Python from 3.9.16 to 3.10.11
- Python package updates:
 - attrs 22.2.0 -> attrs 23.1.0
 - earthengine-api 0.1.349 -> earthengine-api 0.1.350

- flax 0.6.8 -> 0.6.9
- grpcio 1.53.0 -> 1.54.0
- ntcclient 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

- 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
 - xld 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
 - tiffle 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
 - driftnet 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
 - dmsspython 2.2.1 -> 2.3.0
 - fspec 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-sluggify 7.0.0 -> 8.0.0
 - sqlalchemy 1.4.46 -> 2.0.0
 - tensorflow-io-gcs-filesystem 0.29.0 -> 0.30.0
 - tiffle 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-httpb2 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 0.16
 - 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
 - xird 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, Prot, and Pay As You Go](#) to 19 additional countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Hungary, Latvia, Lithuania, Norway, Portugal, Romania, Slovakia, Slovenia, and Sweden ([invest](#))
 - 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 read-only 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 pyzmq 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](#)), drives 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, drives 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, drives from 59.0.3 to 60.0.2, pytorch from 1.11 to 1.12, jax & jaxlib from 0.3.8 to 0.3.14, opencv-python from 4.1.2.30 to 4.6.0.66, spaCy from 3.3.1 to 3.4.0, and dlib from 19.18.0 to 19.24.0
- Fix Open `in` tab doc link which was rendering incorrectly ([GitHub issue](#))
- Add a preference for the default tab orientation to the Site section of the settings menu under Tools → Settings
- Show a warning for USE_AUTH_EPHEM usage when running `authenticate_user` on a TPU runtime ([code](#))

2022-07-01

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

2022-06-10

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

2022-05-20

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

2022-04-29

- Added 🐼 mode (under Miscellaneous in Tools → Settings)
- Added "Disconnect and delete runtime" option to the menu next to the Connect button
- Improved rendering of filter options in an interactive table
- Added gtf-its 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_service_account()` 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 [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