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  "nbformat_minor": 0,
  "metadata": {
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    "kernelspec": {
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      "display_name": "Python 3"
    },
    "language_info": {
      "name": "python"
    }
  },
  "cells": [
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      "source": [
        "# SALES PREDICTION\n",
        "\n",
        ">Sales prediction involves forecasting the amount of a product that\n",
        ">customers will purchase, taking into account various factors such as\n",
        ">advertising expenditure, target audience segmentation, and\n",
        ">advertising platform selection."
      ],
      "metadata": {
        "id": "Anoaq3ENWp61"
      }
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```json
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   "source": [
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   "metadata": {
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   }
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   "execution_count": 7,
   "metadata": {
    "id": "PxHL5IcCWgu_"
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   "source": [
    "import numpy as np\n",
    "import pandas as pd\n",
    "import matplotlib.pyplot as plt\n",
    "import seaborn as sns"
   ]
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   "cell_type": "markdown",
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    "df.head()"
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     "base_uri": "https://localhost:8080/",
     "height": 206
    },
    "id": "bW5BtmCoXD9H",
    "outputId": "796fd3bf-cfb4-4d4d-de6c-60e77d41232d"
   },
   "execution_count": 8,
   "outputs": [
    {
     "output_type": "execute_result",
     "data": {
      "text/plain": [
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       "0  230.1   37.8     69.2   22.1\n",
       "1   44.5   39.3     45.1   10.4\n",
       "2   17.2   45.9     69.3   12.0\n",
       "3  151.5   41.3     58.5   16.5\n",
```

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   "4  180.8  10.8     58.4  17.9"
  ],
  "text/html": [
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   "    <div>\n",
   "<style scoped>\n",
   "    .dataframe tbody tr th:only-of-type {\n",
   "        vertical-align: middle;\n",
   "    }\n",
   "\n",
   "    .dataframe tbody tr th {\n",
   "        vertical-align: top;\n",
   "    }\n",
   "\n",
   "    .dataframe thead th {\n",
   "        text-align: right;\n",
   "    }\n",
   "</style>\n",
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   "  <thead>\n",
   "    <tr style=\"text-align: right;\">\n",
   "      <th></th>\n",
   "      <th>TV</th>\n",
   "      <th>Radio</th>\n",
   "      <th>Newspaper</th>\n",
   "      <th>Sales</th>\n",
   "    </tr>\n",
   "  </thead>\n",
```

```
"  <tbody>\n",
"    <tr>\n",
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"      <td>230.1</td>\n",
"      <td>37.8</td>\n",
"      <td>69.2</td>\n",
"      <td>22.1</td>\n",
"    </tr>\n",
"    <tr>\n",
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"      <td>44.5</td>\n",
"      <td>39.3</td>\n",
"      <td>45.1</td>\n",
"      <td>10.4</td>\n",
"    </tr>\n",
"    <tr>\n",
"      <th>2</th>\n",
"      <td>17.2</td>\n",
"      <td>45.9</td>\n",
"      <td>69.3</td>\n",
"      <td>12.0</td>\n",
"    </tr>\n",
"    <tr>\n",
"      <th>3</th>\n",
"      <td>151.5</td>\n",
"      <td>41.3</td>\n",
"      <td>58.5</td>\n",
"      <td>16.5</td>\n",
"    </tr>\n",
```

"   <tr>\n",

"   <th>4</th>\n",

"   <td>180.8</td>\n",

"   <td>10.8</td>\n",

"   <td>58.4</td>\n",

"   <td>17.9</td>\n",

"   </tr>\n",

" </tbody>\n",

"</table>\n",

"</div>\n",

"   <div class=\"colab-df-buttons\">\n",

"\n",

" <div class=\"colab-df-container\">\n",

"   <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-06e4a93c-de20-4d73-854b-78f17dba1bff')\"\n",

"   title=\"Convert this dataframe to an interactive table.\"\n",

"   style=\"display:none;\">\n",

"\n",

" <svg xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\" viewBox=\"0 -960 960 960\">\n",

"   <path d=\"M120-120v-720h720v720H120Zm60-500h600v-160H180v160Zm220 220h160v-160H400v160Zm0 220h160v-160H400v160ZM180-400h160v-160H180v160Zm440 0h160v-160H620v160ZM180-180h160v-160H180v160Zm440 0h160v-160H620v160Z\"/>\n",

" </svg>\n",

"   </button>\n",

"\n",

" <style>\n",

"   .colab-df-container {\n",

"   display:flex;\n",

"   gap: 12px;\n",

```
"    }\n",
"\n",
"    .colab-df-convert {\n",
"      background-color: #E8F0FE;\n",
"      border: none;\n",
"      border-radius: 50%;\n",
"      cursor: pointer;\n",
"      display: none;\n",
"      fill: #1967D2;\n",
"      height: 32px;\n",
"      padding: 0 0 0 0;\n",
"      width: 32px;\n",
"    }\n",
"\n",
"    .colab-df-convert:hover {\n",
"      background-color: #E2EBFA;\n",
"      box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n",
"      fill: #174EA6;\n",
"    }\n",
"\n",
"    .colab-df-buttons div {\n",
"      margin-bottom: 4px;\n",
"    }\n",
"\n",
"    [theme=dark] .colab-df-convert {\n",
"      background-color: #3B4455;\n",
"      fill: #D2E3FC;\n",
"    }\n",
"\n",
```

```
"    [theme=dark] .colab-df-convert:hover {\n",
"      background-color: #434B5C;\n",
"      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n",
"      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n",
"      fill: #FFFFFF;\n",
"    }\n",
"  </style>\n",
"\n",
"    <script>\n",
"      const buttonEl =\n",
"        document.querySelector('#df-06e4a93c-de20-4d73-854b-78f17dba1bff button.colab-df-convert');\n",
"      buttonEl.style.display =\n",
"        google.colab.kernel.accessAllowed ? 'block' : 'none';\n",
"\n",
"      async function convertToInteractive(key) {\n",
"        const element = document.querySelector('#df-06e4a93c-de20-4d73-854b-78f17dba1bff');\n",
"        const dataTable =\n",
"          await google.colab.kernel.invokeFunction('convertToInteractive',\n",
"                                    [key], {});\n",
"        if (!dataTable) return;\n",
"\n",
"        const docLinkHtml = 'Like what you see? Visit the ' +\n",
"          '<a target=\"_blank\" href=https://colab.research.google.com/notebooks/data_table.ipynb>data table notebook</a>'\n",
"          + ' to learn more about interactive tables.';\n",
"        element.innerHTML = '';\n",
"        dataTable['output_type'] = 'display_data';\n",
"        await google.colab.output.renderOutput(dataTable, element);\n",
```

```
"            const docLink = document.createElement('div');\n",

"            docLink.innerHTML = docLinkHtml;\n",

"            element.appendChild(docLink);\n",

"        }\n",

"    </script>\n",

"  </div>\n",

"\n",

"\n",

"<div id=\"df-e5caa507-b295-42ee-a869-56f851e20f44\">\n",

"  <button class=\"colab-df-quickchart\" onclick=\"quickchart('df-e5caa507-b295-42ee-a869-
56f851e20f44')\"\n",

"            title=\"Suggest charts.\"\n",

"            style=\"display:none;\">\n",

"\n",

"<svg xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\"viewBox=\"0 0 24 24\"\n",

"     width=\"24px\">\n",

"    <g>\n",

"        <path d=\"M19 3H5c-1.1 0-2 .9-2 2v14c0 1.1.9 2 2 2h14c1.1 0 2-.9 2-2V5c0-1.1-.9-2-2-
2zM9 17H7v-7h2v7zm4 0h-2V7h2v10zm4 0h-2v-4h2v4z\"/>\n",

"    </g>\n",

"</svg>\n",

"  </button>\n",

"\n",

"<style>\n",

"  .colab-df-quickchart {\n",

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"      --fill-color: #1967D2;\n",

"      --hover-bg-color: #E2EBFA;\n",

"      --hover-fill-color: #174EA6;\n",
```

```
    "    --disabled-fill-color: #AAA;\n",

    "    --disabled-bg-color: #DDD;\n",

    "  }\n",

"\n",

"  [theme=dark] .colab-df-quickchart {\n",

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    "    --fill-color: #D2E3FC;\n",

    "    --hover-bg-color: #434B5C;\n",

    "    --hover-fill-color: #FFFFFF;\n",

    "    --disabled-bg-color: #3B4455;\n",

    "    --disabled-fill-color: #666;\n",

    "  }\n",

"\n",

"  .colab-df-quickchart {\n",

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    "  border: none;\n",

    "  border-radius: 50%;\n",

    "  cursor: pointer;\n",

    "  display: none;\n",

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    "  height: 32px;\n",

    "  padding: 0;\n",

    "  width: 32px;\n",

    "  }\n",

"\n",

"  .colab-df-quickchart:hover {\n",

    "  background-color: var(--hover-bg-color);\n",

    "  box-shadow: 0 1px 2px rgba(60, 64, 67, 0.3), 0 1px 3px 1px rgba(60, 64, 67, 0.15);\n",

    "  fill: var(--button-hover-fill-color);\n",
```

```
"  }\n",
"\n",
"  .colab-df-quickchart-complete:disabled,\n",
"  .colab-df-quickchart-complete:disabled:hover {\n",
"    background-color: var(--disabled-bg-color);\n",
"    fill: var(--disabled-fill-color);\n",
"    box-shadow: none;\n",
"  }\n",
"\n",
"  .colab-df-spinner {\n",
"    border: 2px solid var(--fill-color);\n",
"    border-color: transparent;\n",
"    border-bottom-color: var(--fill-color);\n",
"    animation:\n",
"      spin 1s steps(1) infinite;\n",
"  }\n",
"\n",
"  @keyframes spin {\n",
"    0% {\n",
"      border-color: transparent;\n",
"      border-bottom-color: var(--fill-color);\n",
"      border-left-color: var(--fill-color);\n",
"    }\n",
"    20% {\n",
"      border-color: transparent;\n",
"      border-left-color: var(--fill-color);\n",
"      border-top-color: var(--fill-color);\n",
"    }\n",
"    30% {\n",
```

```
"      border-color: transparent;\n",
"      border-left-color: var(--fill-color);\n",
"      border-top-color: var(--fill-color);\n",
"      border-right-color: var(--fill-color);\n",
"    }\n",
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"      border-right-color: var(--fill-color);\n",
"      border-top-color: var(--fill-color);\n",
"    }\n",
"    60% {\n",
"      border-color: transparent;\n",
"      border-right-color: var(--fill-color);\n",
"    }\n",
"    80% {\n",
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"      border-right-color: var(--fill-color);\n",
"      border-bottom-color: var(--fill-color);\n",
"    }\n",
"    90% {\n",
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"      border-bottom-color: var(--fill-color);\n",
"    }\n",
"  }\n",
"</style>\n",
"\n",
"  <script>\n",
"    async function quickchart(key) {\n",
"      const quickchartButtonEl =\n",
```

```
"          document.querySelector('#' + key + ' button');\n",
"          quickchartButtonEl.disabled = true;  // To prevent multiple clicks.\n",
"          quickchartButtonEl.classList.add('colab-df-spinner');\n",
"          try {\n",
"            const charts = await google.colab.kernel.invokeFunction(\n",
"                'suggestCharts', [key], {});\n",
"          } catch (error) {\n",
"            console.error('Error during call to suggestCharts:', error);\n",
"          }\n",
"          quickchartButtonEl.classList.remove('colab-df-spinner');\n",
"          quickchartButtonEl.classList.add('colab-df-quickchart-complete');\n",
"        }\n",
"        (() => {\n",
"          let quickchartButtonEl =\n",
"            document.querySelector('#df-e5caa507-b295-42ee-a869-56f851e20f44 button');\n",
"          quickchartButtonEl.style.display =\n",
"            google.colab.kernel.accessAllowed ? 'block' : 'none';\n",
"        })();\n",
"      </script>\n",
"</div>\n",
"    </div>\n",
"  </div>\n"
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    },
    "metadata": {},
    "execution_count": 8
   }
  ]
 },
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    "id": "nCFpnkznYzjD",
    "outputId": "53a861f8-76cb-433a-e227-bd2ed6103720"
  },
  "execution_count": 9,
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      "data": {
        "text/plain": [
          "(200, 4)"
        ]
      },
      "metadata": {},
      "execution_count": 9
    }
  ]
},
{
  "cell_type": "code",
  "source": [
```

     "df.describe()"
   ],
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     "height": 300
    },
    "id": "yy560mxWXUuL",
    "outputId": "0bb91614-139b-4143-b101-11ca7425e926"
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     "data": {
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       "mean   147.042500   23.264000   30.554000   15.130500\n",
       "std   85.854236   14.846809   21.778621   5.283892\n",
       "min   0.700000   0.000000   0.300000   1.600000\n",
       "25%   74.375000   9.975000   12.750000   11.000000\n",
       "50%   149.750000   22.900000   25.750000   16.000000\n",
       "75%   218.825000   36.525000   45.100000   19.050000\n",
       "max   296.400000   49.600000 114.000000   27.000000"
      ],
      "text/html": [
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```
"    <div>\n",
"<style scoped>\n",
"    .dataframe tbody tr th:only-of-type {\n",
"        vertical-align: middle;\n",
"    }\n",
"\n",
"    .dataframe tbody tr th {\n",
"        vertical-align: top;\n",
"    }\n",
"\n",
"    .dataframe thead th {\n",
"        text-align: right;\n",
"    }\n",
"</style>\n",
"<table border=\"1\" class=\"dataframe\">\n",
"  <thead>\n",
"    <tr style=\"text-align: right;\">\n",
"      <th></th>\n",
"      <th>TV</th>\n",
"      <th>Radio</th>\n",
"      <th>Newspaper</th>\n",
"      <th>Sales</th>\n",
"    </tr>\n",
"  </thead>\n",
"  <tbody>\n",
"    <tr>\n",
"      <th>count</th>\n",
"      <td>200.000000</td>\n",
"      <td>200.000000</td>\n",
```

```
"    <td>200.000000</td>\n",
"    <td>200.000000</td>\n",
"  </tr>\n",
"  <tr>\n",
"    <th>mean</th>\n",
"    <td>147.042500</td>\n",
"    <td>23.264000</td>\n",
"    <td>30.554000</td>\n",
"    <td>15.130500</td>\n",
"  </tr>\n",
"  <tr>\n",
"    <th>std</th>\n",
"    <td>85.854236</td>\n",
"    <td>14.846809</td>\n",
"    <td>21.778621</td>\n",
"    <td>5.283892</td>\n",
"  </tr>\n",
"  <tr>\n",
"    <th>min</th>\n",
"    <td>0.700000</td>\n",
"    <td>0.000000</td>\n",
"    <td>0.300000</td>\n",
"    <td>1.600000</td>\n",
"  </tr>\n",
"  <tr>\n",
"    <th>25%</th>\n",
"    <td>74.375000</td>\n",
"    <td>9.975000</td>\n",
"    <td>12.750000</td>\n",
```

```
"      <td>11.000000</td>\n",
"    </tr>\n",
"    <tr>\n",
"      <th>50%</th>\n",
"      <td>149.750000</td>\n",
"      <td>22.900000</td>\n",
"      <td>25.750000</td>\n",
"      <td>16.000000</td>\n",
"    </tr>\n",
"    <tr>\n",
"      <th>75%</th>\n",
"      <td>218.825000</td>\n",
"      <td>36.525000</td>\n",
"      <td>45.100000</td>\n",
"      <td>19.050000</td>\n",
"    </tr>\n",
"    <tr>\n",
"      <th>max</th>\n",
"      <td>296.400000</td>\n",
"      <td>49.600000</td>\n",
"      <td>114.000000</td>\n",
"      <td>27.000000</td>\n",
"    </tr>\n",
"  </tbody>\n",
"</table>\n",
"</div>\n",
"    <div class=\"colab-df-buttons\">\n",
"\n",
"  <div class=\"colab-df-container\">\n",
```

```
    "    <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-08dad05a-fc03-4156-a921-40949d299ab2')\"\n",
    "            title=\"Convert this dataframe to an interactive table.\"\n",
    "            style=\"display:none;\">\n",
    "\n",
    "  <svg xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\" viewBox=\"0 -960 960 960\">\n",
    "    <path d=\"M120-120v-720h720v720H120Zm60-500h600v-160H180v160Zm220 220h160v-160H400v160Zm0 220h160v-160H400v160ZM180-400h160v-160H180v160Zm440 0h160v-160H620v160ZM180-180h160v-160H180v160Zm440 0h160v-160H620v160Z\"/>\n",
    "  </svg>\n",
    "    </button>\n",
    "\n",
    "  <style>\n",
    "    .colab-df-container {\n",
    "      display:flex;\n",
    "      gap: 12px;\n",
    "    }\n",
    "\n",
    "    .colab-df-convert {\n",
    "      background-color: #E8F0FE;\n",
    "      border: none;\n",
    "      border-radius: 50%;\n",
    "      cursor: pointer;\n",
    "      display: none;\n",
    "      fill: #1967D2;\n",
    "      height: 32px;\n",
    "      padding: 0 0 0 0;\n",
    "      width: 32px;\n",
    "    }\n",
```

```
"\n",
"    .colab-df-convert:hover {\n",
"      background-color: #E2EBFA;\n",
"      box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n",
"      fill: #174EA6;\n",
"    }\n",
"\n",
"    .colab-df-buttons div {\n",
"      margin-bottom: 4px;\n",
"    }\n",
"\n",
"    [theme=dark] .colab-df-convert {\n",
"      background-color: #3B4455;\n",
"      fill: #D2E3FC;\n",
"    }\n",
"\n",
"    [theme=dark] .colab-df-convert:hover {\n",
"      background-color: #434B5C;\n",
"      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n",
"      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n",
"      fill: #FFFFFF;\n",
"    }\n",
"  </style>\n",
"\n",
"    <script>\n",
"      const buttonEl =\n",
"        document.querySelector('#df-08dad05a-fc03-4156-a921-40949d299ab2 button.colab-df-convert');\n",
"      buttonEl.style.display =\n",
```

```
"        google.colab.kernel.accessAllowed ? 'block' : 'none';\n",
"\n",
"      async function convertToInteractive(key) {\n",
"        const element = document.querySelector('#df-08dad05a-fc03-4156-a921-40949d299ab2');\n",
"        const dataTable =\n",
"          await google.colab.kernel.invokeFunction('convertToInteractive',\n",
"                                    [key], {});\n",
"        if (!dataTable) return;\n",
"\n",
"        const docLinkHtml = 'Like what you see? Visit the ' +\n",
"          '<a target=\"_blank\" href=https://colab.research.google.com/notebooks/data_table.ipynb>data table notebook</a>'\n",
"          + ' to learn more about interactive tables.';\n",
"        element.innerHTML = '';\n",
"        dataTable['output_type'] = 'display_data';\n",
"        await google.colab.output.renderOutput(dataTable, element);\n",
"        const docLink = document.createElement('div');\n",
"        docLink.innerHTML = docLinkHtml;\n",
"        element.appendChild(docLink);\n",
"      }\n",
"    </script>\n",
"  </div>\n",
"\n",
"\n",
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"   width=\"24px\">\n",

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"      width: 32px;\n",
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"      fill: var(--button-hover-fill-color);\n",
"    }\n",
"\n",
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"    .colab-df-quickchart-complete:disabled:hover {\n",
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"      fill: var(--disabled-fill-color);\n",
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"\n",
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```
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"  }\n",
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"    async function quickchart(key) {\n",
"      const quickchartButtonEl =\n",
"        document.querySelector('#' + key + ' button');\n",
"      quickchartButtonEl.disabled = true;  // To prevent multiple clicks.\n",
"      quickchartButtonEl.classList.add('colab-df-spinner');\n",
"      try {\n",
"        const charts = await google.colab.kernel.invokeFunction(\n",
"          'suggestCharts', [key], {});\n",
"      } catch (error) {\n",
"        console.error('Error during call to suggestCharts:', error);\n",
"      }\n",
"      quickchartButtonEl.classList.remove('colab-df-spinner');\n",
"      quickchartButtonEl.classList.add('colab-df-quickchart-complete');\n",
"    }\n",
"    (() => {\n",
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        "      quickchartButtonEl.style.display =\n",

        "        google.colab.kernel.accessAllowed ? 'block' : 'none';\n",

        "    })();\n",

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   "Avg expense spend is lowest on Radio\n",

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