

```
{
  "nbformat": 4,
  "nbformat_minor": 0,
  "metadata": {
    "colab": {
      "provenance": []
    },
    "kernelspec": {
      "name": "python3",
      "display_name": "Python 3"
    },
    "language_info": {
      "name": "python"
    }
  },
  "cells": [
    {
      "cell_type": "code",
      "execution_count": 1,
      "metadata": {
        "id": "C5mFnv8XyxtX"
      },
      "outputs": [],
      "source": [
        "import pandas as pd\n",
        "import numpy as np\n",
        "import matplotlib.pyplot as plt\n",
        "import tensorflow \n",
        "from tensorflow.keras.models import Sequential\n",
        "from tensorflow.keras.layers import Layer,Dense,Dropout"
      ]
    }
  ]
}
```

```

},
{
  "cell_type": "code",
  "source": [
    "data=pd.read_csv(\"thyroidDF.csv\")"
  ],
  "metadata": {
    "id": "wbbgtfRGzVE9"
  },
  "execution_count": 14,
  "outputs": []
},
{
  "cell_type": "code",
  "source": [
    "data.head()"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 299
    },
    "id": "wkiqAe3Lzif",
    "outputId": "05912b00-eda6-4cb2-a185-16fb3a1989c2"
  },
  "execution_count": 15,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [

```

```

" age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick pregnant \\n",
"0 29 F      f      f      f f      f \n",
"1 29 F      f      f      f f      f \n",
"2 41 F      f      f      f f      f \n",
"3 36 F      f      f      f f      f \n",
"4 32 F      f      f      f f      f \n",
"\n",
" thyroid_surgery l131_treatment query_hypothyroid ... TT4 T4U_measured \\n",
"0      f      f      t ... NaN      f \n",
"1      f      f      f ... 128.0      f \n",
"2      f      f      f ... NaN      f \n",
"3      f      f      f ... NaN      f \n",
"4      f      f      f ... NaN      f \n",
"\n",
" T4U FTI_measured FTI TBG_measured TBG referral_source target patient_id \n",
"0 NaN      f NaN      f NaN      other - 840801013 \n",
"1 NaN      f NaN      f NaN      other - 840801014 \n",
"2 NaN      f NaN      t 11.0      other - 840801042 \n",
"3 NaN      f NaN      t 26.0      other - 840803046 \n",
"4 NaN      f NaN      t 36.0      other S 840803047 \n",
"\n",
"[5 rows x 31 columns]"
],
"text/html": [
"\n",
" <div id=\"df-643de415-4016-4468-aa49-fbd661342c45\">\n",
" <div class=\"colab-df-container\">\n",
" <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>age</th>\n",
" <th>sex</th>\n",
" <th>on_thyroxine</th>\n",
" <th>query_on_thyroxine</th>\n",
" <th>on_antithyroid_meds</th>\n",
" <th>sick</th>\n",
" <th>pregnant</th>\n",
" <th>thyroid_surgery</th>\n",
" <th>l131_treatment</th>\n",
" <th>query_hypothyroid</th>\n",
" <th>...</th>\n",
" <th>TT4</th>\n",
" <th>T4U_measured</th>\n",
" <th>T4U</th>\n",
" <th>FTI_measured</th>\n",
" <th>FTI</th>\n",
" <th>TBG_measured</th>\n",

```

```
" <th>TBG</th>\n",
" <th>referral_source</th>\n",
" <th>target</th>\n",
" <th>patient_id</th>\n",
" </tr>\n",
" </thead>\n",
" <tbody>\n",
" <tr>\n",
" <th>0</th>\n",
" <td>29</td>\n",
" <td>F</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>t</td>\n",
" <td>...</td>\n",
" <td>NaN</td>\n",
" <td>f</td>\n",
" <td>NaN</td>\n",
" <td>f</td>\n",
" <td>NaN</td>\n",
" <td>f</td>\n",
" <td>NaN</td>\n",
" <td>other</td>\n",
" <td>-</td>\n",
" <td>840801013</td>\n",
" </tr>\n",
```

```
<tr>\n",  
"  
    <th>1</th>\n",  
"  
    <td>29</td>\n",  
"  
    <td>F</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>...</td>\n",  
"  
    <td>128.0</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>NaN</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>NaN</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>NaN</td>\n",  
"  
    <td>other</td>\n",  
"  
    <td>-</td>\n",  
"  
    <td>840801014</td>\n",  
"  
</tr>\n",  
"  
<tr>\n",  
"  
    <th>2</th>\n",  
"  
    <td>41</td>\n",  
"  
    <td>F</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>\n",  
"  
    <td>f</td>
```

[illegible]

<td>f</td>\n"
"<td>NaN</td>\n"
"<td>f</td>\n"
"<td>NaN</td>\n"
"<td>t</td>\n"
"<td>26.0</td>\n"
"<td>other</td>\n"
"<td>-</td>\n"
"<td>840803046</td>\n"
"</tr>\n"
"<tr>\n"
"<th>4</th>\n"
"<td>32</td>\n"
"<td>F</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>...</td>\n"
"<td>NaN</td>\n"
"<td>f</td>\n"
"<td>NaN</td>\n"
"<td>f</td>\n"
"<td>NaN</td>\n"
"<td>t</td>\n"
"<td>36.0</td>\n"
"<td>other</td>\n"

[illegible]

```
"  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",
" [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-643de415-4016-4468-aa49-fbd661342c45 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-643de415-4016-4468-aa49-
fbd661342c45');\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",
    "    </div>\n",
    "    "
  ]
},
"metadata": {},

```

```
    "execution_count": 15
  }
]
},
{
  "cell_type": "code",
  "source": [
    "data.shape"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "KgCWlQTNzuO8",
    "outputId": "90dd893a-ec73-44eb-b368-959a048bdd40"
  },
  "execution_count": 16,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "(9172, 31)"
        ]
      },
      "metadata": {},
      "execution_count": 16
    }
  ]
},
{
```

```
"cell_type": "code",
"source": [
  "data.isnull().sum()"
],
"metadata": {
  "colab": {
    "base_uri": "https://localhost:8080/"
  },
  "id": "TuQtnPkbz4T6",
  "outputId": "ac260ec0-01d0-4dca-af8c-e39aac5aaf27"
},
"execution_count": 17,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
      "text/plain": [
        "age          0\n",
        "sex          307\n",
        "on_thyroxine  0\n",
        "query_on_thyroxine  0\n",
        "on_antithyroid_meds  0\n",
        "sick          0\n",
        "pregnant      0\n",
        "thyroid_surgery  0\n",
        "l131_treatment  0\n",
        "query_hypothyroid  0\n",
        "query_hyperthyroid  0\n",
        "lithium       0\n",
        "goitre        0\n",
        "tumor         0\n",
```

```

        "hypopituitary      0\n",
        "psych              0\n",
        "TSH_measured        0\n",
        "TSH                  842\n",
        "T3_measured          0\n",
        "T3                    2604\n",
        "TT4_measured          0\n",
        "TT4                   442\n",
        "T4U_measured          0\n",
        "T4U                   809\n",
        "FTI_measured          0\n",
        "FTI                    802\n",
        "TBG_measured          0\n",
        "TBG                    8823\n",
        "referral_source       0\n",
        "target                0\n",
        "patient_id            0\n",
        "dtype: int64"
    ]
},
"metadata": {},
"execution_count": 17
}
]
},
{
    "cell_type": "code",
    "source": [
        "data.drop(['TSH_measured','T3_measured','TT4_measured','T4U_measured','TBG_measured','refer",
        "ral_source','patient_id'])"
    ],

```

[illegible]


```

"cell_type": "code",
"source": [
    "#remapping target valueas ton diagnostic group\n",
    "dignoses={'A':'hypothyroid conditions',\n",
    "\t 'B':'hypothyroid conditions',\n",
    "\t 'C':'hypothyroid conditions',\n",
    "\t 'D':'hypothyroid conditions',\n",
    "\t 'E':'hypothyroid conditions',\n",
    "\t 'F':'hypothyroid conditions',\n",
    "\t 'G':'hypothyroid conditions',\n",
    "\t 'H':'hypothyroid conditions',\n",
    "\t 'I':'binding protein',\n",
    "\t 'J':'binding protein',\n",
    "\t 'K':'binding protein',\n",
    "\t 'L':'replacement therapy',\n",
    "\t 'M':'replacement therapy',\n",
    "\t 'N':'replacement therapy',\n",
    "\t 'O':'antithyroid treatment',\n",
    "\t 'P':'antithyroid treatment',\n",
    "\t 'Q':'antithyroid treatment',\n",
    "\t 'R':'miscellaneous',\n",
    "\t 'S':'miscellaneous',\n",
    "\t 'T':'miscellaneous'}\n",
    "data['target']=data['target'].map(dignoses)#remapping"
],
"metadata": {
    "colab": {
        "base_uri": "https://localhost:8080/",
        "height": 209
    },
    "id": "LVRgCKtP1OU9",

```

[illegible]

```
},
"execution_count": 19,
"outputs": []
},
{
  "cell_type": "code",
  "source": [
    "data['target'].value_counts()"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "E6X2fAod4LYd",
    "outputId": "0a195227-c00e-40b4-b06c-2efbc6e7b701"
  },
  "execution_count": 20,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "-    6771\n",
          "K    436\n",
          "G    359\n",
          "I    346\n",
          "F    233\n",
          "R    196\n",
          "A    147\n",
          "L    115\n",
          "M    111\n",
```

```
"N    110\n",
"S    85\n",
"GK   49\n",
"AK   46\n",
"J    30\n",
"B    21\n",
"MK   16\n",
"Q    14\n",
"O    14\n",
"C|I  12\n",
"KJ   11\n",
"GI   10\n",
"H|K   8\n",
"D     8\n",
"FK    6\n",
"C     6\n",
"P     5\n",
"MI    2\n",
"LJ    1\n",
"GKJ   1\n",
"OI    1\n",
"D|R   1\n",
"E     1\n",
"Name: target, dtype: int64"
]
},
"metadata": {},
"execution_count": 20
}
]
},
```

```

{
  "cell_type": "code",
  "source": [
    "data[data.age>100]"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 268
    },
    "id": "Y51n1xPW4fCM",
    "outputId": "0be75a13-9504-475e-8fbf-52454e68f6db"
  },
  "execution_count": 21,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "   age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick  \\n",
          "2976  455  F         f             f             f f  \\n",
          "5710 65511  M         f             f             f f  \\n",
          "6392 65512  M         f             f             f f  \\n",
          "8105 65526  F         f             f             f f  \\n",
          "\\n",
          "   pregnant thyroid_surgery l131_treatment query_hypothyroid ...  TT4  \\n",
          "2976    f             f             f             f ... 118.0  \\n",
          "5710    f             f             f             f ... 113.0  \\n",
          "6392    f             f             f             f ... 112.0  \\n",
          "8105    f             f             f             f ... 132.0  \\n",
          "\\n",

```

```

"  T4U_measured  T4U FTI_measured  FTI TBG_measured TBG referral_source \\n",
"2976          t 1.13          t 104.0          f NaN          SVI  \n",
"5710          t 1.08          t 104.0          f NaN          other \n",
"6392          t 0.84          t 133.0          f NaN          other \n",
"8105          t 1.02          t 129.0          f NaN          other \n",
"\n",
"  target patient_id \n",
"2976  - 850530001 \n",
"5710  - 860210008 \n",
"6392  - 860403050 \n",
"8105  - 861014041 \n",
"\n",
"[4 rows x 31 columns]"
],
"text/html": [
"\n",
" <div id=\"df-fbdefa58-27b1-49d3-b8a7-faf7a16c6299\">\n",
"  <div class=\"colab-df-container\">\n",
"    <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>age</th>\n",
" <th>sex</th>\n",
" <th>on_thyroxine</th>\n",
" <th>query_on_thyroxine</th>\n",
" <th>on_antithyroid_meds</th>\n",
" <th>sick</th>\n",
" <th>pregnant</th>\n",
" <th>thyroid_surgery</th>\n",
" <th>l131_treatment</th>\n",
" <th>query_hypothyroid</th>\n",
" <th>...</th>\n",
" <th>TT4</th>\n",
" <th>T4U_measured</th>\n",
" <th>T4U</th>\n",
" <th>FTI_measured</th>\n",
" <th>FTI</th>\n",
" <th>TBG_measured</th>\n",
" <th>TBG</th>\n",
" <th>referral_source</th>\n",
" <th>target</th>\n",
" <th>patient_id</th>\n",
" </tr>\n",
" </thead>\n",
" <tbody>\n",
" <tr>\n",
" <th>2976</th>\n",

```


[illegible]

<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>...</td>\n"
"
<td>113.0</td>\n"
"
<td>t</td>\n"
"
<td>1.08</td>\n"
"
<td>t</td>\n"
"
<td>104.0</td>\n"
"
<td>
f</td>\n"
"
<td>NaN</td>\n"
"
<td>other</td>\n"
"
<td>-</td>\n"
"
<td>860210008</td>\n"
"
</tr>\n"
"
<tr>\n"
"
<th>6392</th>\n"
"
<td>65512</td>\n"
"
<td>M</td>\n"
"
<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>
f</td>\n"
"
<td>...</td>\n"
"
<td>112.0</td>\n"
"
<td>t</td>\n"
"
<td>
0.84</td>\n"

<td>t</td>\n"
"<td>133.0</td>\n"
"<td>f</td>\n"
"<td>NaN</td>\n"
"<td>other</td>\n"
"<td>-</td>\n"
"<td>860403050</td>\n"
"</tr>\n"
"<tr>\n"
"<th>8105</th>\n"
"<td>65526</td>\n"
"<td>F</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>f</td>\n"
"<td>...</td>\n"
"<td>132.0</td>\n"
"<td>t</td>\n"
"<td>1.02</td>\n"
"<td>t</td>\n"
"<td>129.0</td>\n"
"<td>f</td>\n"
"<td>NaN</td>\n"
"<td>other</td>\n"
"<td>-</td>\n"
"<td>861014041</td>\n"

```

" </tr>\n",
" </tbody>\n",
"</table>\n",
"<p>4 rows × 31 columns</p>\n",
"</div>\n",
" <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-fbdefa58-27b1-49d3-b8a7-faf7a16c6299')\">\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 0 24 24\">\n",
"     width=\"24px\">\n",
" <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\n",
" <path d=\"M18.56 5.44l.94 2.06.94-2.06-.94-2.06-.94 2.06-.94 2.06.94zm-11 11l8.5 8.5l.94-2.06.94-2.06-.94-2.06-.94 2.06-.94 2.06.94zm10 10l.94 2.06.94-2.06-.94-2.06-.94 2.06-.94-2.06.94zm-2.06-.94-2.06-.94 2.06-.94 2.06-.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52 0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-2.05 0-2.83L4 21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86zM5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41 20z\"/>\n",
" </svg>\n",
" </button>\n",
"     \n",
" <style>\n",
" .colab-df-container {\n",
"     display: flex;\n",
"     flex-wrap: wrap;\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",
" [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-fbdefa58-27b1-49d3-b8a7-faf7a16c6299 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-fbdefa58-27b1-49d3-b8a7-faf7a16c6299');\n",
"        const dataTable =\n",
"            await google.colab.kernel.invokeFunction('convertToInteractive',\n",
"                [key], {});\n",
"        if (!dataTable) return;\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",
" </div>\n",
" "
]
},
"metadata": {},
"execution_count": 21
}
]

```

```

},
{
  "cell_type": "code",
  "source": [
    "#splitting the data values as x and y\n",
    "x=data.iloc[:0:-1]\n",
    "y=data.iloc[:, -1]"
  ],
  "metadata": {
    "id": "k988rKGI7vN3"
  },
  "execution_count": 22,
  "outputs": []
},
{
  "cell_type": "code",
  "source": [
    "x"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 487
    },
    "id": "QWftPJn8C8k",
    "outputId": "e69c8aea-57b6-4834-fd18-0a40ad94e0a4"
  },
  "execution_count": 23,
  "outputs": [
    {
      "output_type": "execute_result",

```

```

"data": {
  "text/plain": [
    "   age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick  \\n",
    "9171 31  M      f      f      f f  \\n",
    "9170 47  F      f      f      f f  \\n",
    "9169 69  M      f      f      f f  \\n",
    "9168 22  M      f      f      f f  \\n",
    "9167 56  M      f      f      f f  \\n",
    "... ..  ..      ...      ...      ... ..  \\n",
    "5   60  F      f      f      f f  \\n",
    "4   32  F      f      f      f f  \\n",
    "3   36  F      f      f      f f  \\n",
    "2   41  F      f      f      f f  \\n",
    "1   29  F      f      f      f f  \\n",
    "\\n",
    "   pregnant thyroid_surgery l131_treatment query_hypothyroid ...  TT4  \\n",
    "9171      f      f      f      t ... 66.0  \\n",
    "9170      f      f      f      f ... 75.0  \\n",
    "9169      f      f      f      f ... 113.0  \\n",
    "9168      f      f      f      f ... 91.0  \\n",
    "9167      f      f      f      f ... 64.0  \\n",
    "...      ...      ...      ...      ... ..  \\n",
    "5      f      f      f      f ... NaN  \\n",
    "4      f      f      f      f ... NaN  \\n",
    "3      f      f      f      f ... NaN  \\n",
    "2      f      f      f      f ... NaN  \\n",
    "1      f      f      f      f ... 128.0  \\n",
    "\\n",
    "   T4U_measured  T4U FTI_measured  FTI TBG_measured  TBG  \\n",
    "9171      t 1.02      t 65.0      f NaN  \\n",
    "9170      t 0.85      t 88.0      f NaN  \\n",

```



```

"9169      t 1.27      t 89.0      f NaN  \n",
"9168      t 0.92      t 99.0      f NaN  \n",
"9167      t 0.83      t 77.0      f NaN  \n",
"...      ... ..      ... ..      \n",
"5         f NaN      f NaN      t 26.0 \n",
"4         f NaN      f NaN      t 36.0 \n",
"3         f NaN      f NaN      t 26.0 \n",
"2         f NaN      f NaN      t 11.0 \n",
"1         f NaN      f NaN      f NaN  \n",
"\n",
"  referral_source target patient_id \n",
"9171      other    - 870119035 \n",
"9170      other    - 870119027 \n",
"9169      SVI      I 870119025 \n",
"9168      SVI      - 870119023 \n",
"9167      SVI      - 870119022 \n",
"...      ... ..      ... \n",
"5         other    - 840803048 \n",
"4         other    S 840803047 \n",
"3         other    - 840803046 \n",
"2         other    - 840801042 \n",
"1         other    - 840801014 \n",
"\n",
"[9171 rows x 31 columns]"
],
"text/html": [
  "\n",
  " <div id=\"df-c46cd4ea-e54f-4340-b4fe-11ee95ed1cc1\">\n",
  " <div class=\"colab-df-container\">\n",
  " <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>age</th>\n",
"     <th>sex</th>\n",
"     <th>on_thyroxine</th>\n",
"     <th>query_on_thyroxine</th>\n",
"     <th>on_antithyroid_meds</th>\n",
"     <th>sick</th>\n",
"     <th>pregnant</th>\n",
"     <th>thyroid_surgery</th>\n",
"     <th>l131_treatment</th>\n",
"     <th>query_hypothyroid</th>\n",
"     <th>...</th>\n",
"     <th>TT4</th>\n",
"     <th>T4U_measured</th>\n",
"     <th>T4U</th>\n",
"     <th>FTI_measured</th>

```

```
" <th>FTI</th>\n",
" <th>TBG_measured</th>\n",
" <th>TBG</th>\n",
" <th>referral_source</th>\n",
" <th>target</th>\n",
" <th>patient_id</th>\n",
" </tr>\n",
" </thead>\n",
" <tbody>\n",
" <tr>\n",
" <th>9171</th>\n",
" <td>31</td>\n",
" <td>M</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>f</td>\n",
" <td>t</td>\n",
" <td>...</td>\n",
" <td>66.0</td>\n",
" <td>t</td>\n",
" <td>1.02</td>\n",
" <td>t</td>\n",
" <td>65.0</td>\n",
" <td>f</td>\n",
" <td>NaN</td>\n",
" <td>other</td>\n",
" <td>-</td>\n"
```

870119035
9170
47
F
f
f
f
f
f
f
f
f
f
f
f
f
...
75.0
t
0.85
t
88.0
f
NaN
other
-
870119027
9169
69
M
f

[illegible]

[illegible]

[illegible]

[illegible]

<td>	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>...</td>\n"
"	<td>NaN</td>\n"
"	<td>
"	f</td>\n"
"	<td>NaN</td>\n"
"	<td>
"	f</td>\n"
"	<td>NaN</td>\n"
"	<td>t</td>\n"
"	<td>36.0</td>\n"
"	<td>other</td>\n"
"	<td>S</td>\n"
"	<td>840803047</td>\n"
"	</tr>\n"
"	<tr>\n"
"	<th>3</th>\n"
"	<td>36</td>\n"
"	<td>F</td>\n"
"	<td>
"	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>
"	f</td>\n"
"	<td>...</td>\n"
"	<td>NaN</td>\n"
"	<td>
"	f</td>\n"
"	<td>NaN</td>\n"

<td>
f</td>\n"
"
<td>NaN</td>\n"
"
<td>t</td>\n"
"
<td>26.0</td>\n"
"
<td>other</td>\n"
"
<td>-</td>\n"
"
<td>840803046</td>\n"
"
</tr>\n"
"
<tr>\n"
"
<th>2</th>\n"
"
<td>41</td>\n"
"
<td>F</td>\n"
"
<td>f</td>\n"
"
<td>f</td>\n"
"
<td>f</td>\n"
"
<td>f</td>\n"
"
<td>f</td>\n"
"
<td>f</td>\n"
"
<td>...</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"
"
<td>t</td>\n"
"
<td>11.0</td>\n"
"
<td>other</td>\n"
"
<td>-</td>\n"
"
<td>840801042</td>\n"

[illegible]

```

"      title=\"Convert this dataframe to an interactive table.\\n\\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\",
"      <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\\n\",
"      <path d=\"M18.56 5.44l.94 2.06.94-2.06-.94-2.06-.94 2.06-.94 2.06.94zm-
11 1l8.5 8.5l.94-2.06 2.06-.94-2.06-.94l8.5 2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06-.94-
2.06-.94-.94-2.06-.94 2.06-2.06.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52
0-1.04.2-1.43.59l10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83l4 21.41c.39.39.9.59 1.41.59.51 0 1.02-
.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86z\"M5.41 20l4 18.59l7.72-7.72 1.47 1.35l5.41
20z\"/>\\n\",
"    </svg>\\n\",
"    </button>\\n\",
"    \\n\",
"    <style>\\n\",
"    .colab-df-container {\\n\",
"      display:flex;\\n\",
"      flex-wrap:wrap;\\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",
"  [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-c46cd4ea-e54f-4340-b4fe-11ee95ed1cc1 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-c46cd4ea-e54f-4340-b4fe-
11ee95ed1cc1');\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"\n",
        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",
        </div>\n",
        " "

    ]
  },
  "metadata": {},
  "execution_count": 23
}
]
},
{
  "cell_type": "code",
  "source": [
    "y"
  ],

```

```
"metadata": {
  "colab": {
    "base_uri": "https://localhost:8080/"
  },
  "id": "8FpTSjLW8JTG",
  "outputId": "c38799d4-51de-44d3-926f-a2bce1926544"
},
"execution_count": 24,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
      "text/plain": [
        "0      840801013\n",
        "1      840801014\n",
        "2      840801042\n",
        "3      840803046\n",
        "4      840803047\n",
        "...    \n",
        "9167   870119022\n",
        "9168   870119023\n",
        "9169   870119025\n",
        "9170   870119027\n",
        "9171   870119035\n",
        "Name: patient_id, Length: 9172, dtype: int64"
      ]
    },
    },
  "metadata": {},
  "execution_count": 24
}
```

```

},
{
  "cell_type": "code",
  "source": [
    "x['sex'].unique()"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "sT0e6J0D8QcV",
    "outputId": "80dfcab1-1174-4fad-8892-1f90c53a1d20"
  },
  "execution_count": 26,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "array(['M', 'F', nan], dtype=object)"
        ]
      },
      "metadata": {},
      "execution_count": 26
    }
  ]
},
{
  "cell_type": "code",
  "source": [
    "x['sex'].replace(np.nan,'F',inplace=True)"
  ]
}

```



```

],
"metadata": {
  "colab": {
    "base_uri": "https://localhost:8080/"
  },
  "id": "iftC53JO8ezC",
  "outputId": "67cbe674-84cd-497e-d6a4-ed6f1bd405a0"
},
"execution_count": 27,
"outputs": [
  {
    "output_type": "stream",
    "name": "stderr",
    "text": [
      "<ipython-input-27-720c3f96a604>:1: SettingWithCopyWarning: \n",
      "A value is trying to be set on a copy of a slice from a DataFrame\n",
      "\n",
      "See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#returning-a-view-versus-a-copy\n",
      "  x['sex'].replace(np.nan,'F',inplace=True)\n"
    ]
  }
],
},
{
  "cell_type": "code",
  "source": [
    "x['sex'].value_counts()"
  ],
  "metadata": {
    "colab": {

```

```

    "base_uri": "https://localhost:8080/"
  },
  "id": "4l5GERcy8xeV",
  "outputId": "0e9db1c0-d13e-4482-cc1d-d73864211afb"
},
"execution_count": 28,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
      "text/plain": [
        "F   6379\n",
        "M   2792\n",
        "Name: sex, dtype: int64"
      ]
    },
    "metadata": {},
    "execution_count": 28
  }
],
{
  "cell_type": "code",
  "source": [
    "#Converting the data type\n",
    "\n",
    "x['age']=x['age'].astype('float')\n",
    "x['TSH']=x['TSH'].astype('float')\n",
    "x['T3']=x['T3'].astype('float')\n",
    "x['TT4']=x['TT4'].astype('float')\n",
    "x['T4U']=x['T4U'].astype('float')\n",

```

```

"x['FTI']=x['FTI'].astype('float') \n",
"x['TBG']=x['TBG'].astype('float')"
],
"metadata": {
  "id": "bifQfbrY9Cbq"
},
"execution_count": 54,
"outputs": []
},
{
  "cell_type": "code",
  "source": [
    "x.info()"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "mf7ras27-OEL",
    "outputId": "cdb309dd-9344-4857-d8e5-a6aee67e4cda"
  },
  "execution_count": 55,
  "outputs": [
    {
      "output_type": "stream",
      "name": "stdout",
      "text": [
        "<class 'pandas.core.frame.DataFrame'>\n",
        "RangeIndex: 9172 entries, 0 to 9171\n",
        "Data columns (total 30 columns):\n",
        " #   Column          Non-Null Count  Dtype  \n",

```

"--- ----- \n",
" 0 age 9172 non-null float64\n",
" 1 sex 9172 non-null object\n",
" 2 on_thyroxine 9172 non-null object\n",
" 3 query_on_thyroxine 9172 non-null object\n",
" 4 on_antithyroid_meds 9172 non-null object\n",
" 5 sick 9172 non-null object\n",
" 6 pregnant 9172 non-null object\n",
" 7 thyroid_surgery 9172 non-null object\n",
" 8 l131_treatment 9172 non-null object\n",
" 9 query_hypothyroid 9172 non-null object\n",
" 10 query_hyperthyroid 9172 non-null object\n",
" 11 lithium 9172 non-null object\n",
" 12 goitre 9172 non-null object\n",
" 13 tumor 9172 non-null object\n",
" 14 hypopituitary 9172 non-null object\n",
" 15 psych 9172 non-null object\n",
" 16 TSH_measured 9172 non-null object\n",
" 17 TSH 8330 non-null float64\n",
" 18 T3_measured 9172 non-null object\n",
" 19 T3 6568 non-null float64\n",
" 20 TT4_measured 9172 non-null object\n",
" 21 TT4 8730 non-null float64\n",
" 22 T4U_measured 9172 non-null object\n",
" 23 T4U 8363 non-null float64\n",
" 24 FTI_measured 9172 non-null object\n",
" 25 FTI 8370 non-null float64\n",
" 26 TBG_measured 9172 non-null object\n",
" 27 TBG 349 non-null float64\n",
" 28 referral_source 9172 non-null object\n",
" 29 target 9172 non-null object\n",

```

        "dtypes: float64(7), object(23)\n",
        "memory usage: 2.1+ MB\n"
    ]
}
]
},
{
    "cell_type": "code",
    "source": [
        "#Encoding the categorical data \n",
        "#Encoding the independent (output)\n",
        "from sklearn.preprocessing import OrdinalEncoder,LabelEncoder\n",
        "#Categorical data\n",
        "\n",
        "\n",
        "Ordinal_Encoder=OrdinalEncoder(dtype='int64')\n",
        "x.iloc[:,1:16]=Ordinal_Encoder.fit_transform(x.iloc[:,1:16])\n",
        "#Ordinal_Encoder.fit_transform(x[['sex']])"
    ],
    "metadata": {
        "colab": {
            "base_uri": "https://localhost:8080/"
        },
        "id": "XUOBAjht-SUE",
        "outputId": "530a8d0b-8534-461a-a125-46b9adee7092"
    },
    "execution_count": 31,
    "outputs": [
        {
            "output_type": "stream",
            "name": "stderr",

```

```

"text": [
  "<ipython-input-31-d6dc6e57b5fd>:8: SettingWithCopyWarning: \n",
  "A value is trying to be set on a copy of a slice from a DataFrame.\n",
  "Try using .loc[row_indexer,col_indexer] = value instead\n",
  "\n",
  "See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#returning-a-view-versus-a-copy\n",
  " x.iloc[:,1:16]=Ordinal_Encoder.fit_transform(x.iloc[:,1:16])\n"
]
},
{
  "cell_type": "code",
  "source": [
    "x"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 487
    },
    "id": "glkcFy-WApUj",
    "outputId": "b167eff7-5436-45af-f33f-7d5ac1a6f04f"
  },
  "execution_count": 32,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [

```

```

"   age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick \\n",
"9171 31.0 1      0      0      0 0 \n",
"9170 47.0 0      0      0      0 0 \n",
"9169 69.0 1      0      0      0 0 \n",
"9168 22.0 1      0      0      0 0 \n",
"9167 56.0 1      0      0      0 0 \n",
"...   ...   ...      ...      ...      ... \n",
"5   60.0 0      0      0      0 0 \n",
"4   32.0 0      0      0      0 0 \n",
"3   36.0 0      0      0      0 0 \n",
"2   41.0 0      0      0      0 0 \n",
"1   29.0 0      0      0      0 0 \n",
"\n",
"   pregnant thyroid_surgery l131_treatment query_hypothyroid ... \\n",
"9171      0      0      0      1 ... \n",
"9170      0      0      0      0 ... \n",
"9169      0      0      0      0 ... \n",
"9168      0      0      0      0 ... \n",
"9167      0      0      0      0 ... \n",
"...   ...      ...      ...      ... \n",
"5      0      0      0      0 ... \n",
"4      0      0      0      0 ... \n",
"3      0      0      0      0 ... \n",
"2      0      0      0      0 ... \n",
"1      0      0      0      0 ... \n",
"\n",
"   TT4 T4U_measured T4U FTI_measured FTI TBG_measured TBG \\n",
"9171 66.0      t 1.02      t 65.0      f NaN \n",
"9170 75.0      t 0.85      t 88.0      f NaN \n",
"9169 113.0     t 1.27      t 89.0      f NaN \n",
"9168 91.0      t 0.92      t 99.0      f NaN \n",

```

```

"9167 64.0      t 0.83      t 77.0      f NaN \n",
"...      ...      ...      ...      ...      ... \n",
"5   NaN      f NaN      f NaN      t 26.0 \n",
"4   NaN      f NaN      f NaN      t 36.0 \n",
"3   NaN      f NaN      f NaN      t 26.0 \n",
"2   NaN      f NaN      f NaN      t 11.0 \n",
"1  128.0      f NaN      f NaN      f NaN \n",
"\n",
"  referral_source target patient_id \n",
"9171      other  - 870119035 \n",
"9170      other  - 870119027 \n",
"9169      SVI   I 870119025 \n",
"9168      SVI   - 870119023 \n",
"9167      SVI   - 870119022 \n",
"...      ...   ...   ... \n",
"5      other  - 840803048 \n",
"4      other  S 840803047 \n",
"3      other  - 840803046 \n",
"2      other  - 840801042 \n",
"1      other  - 840801014 \n",
"\n",
"[9171 rows x 31 columns]"
],
"text/html": [
"\n",
" <div id=\"df-33ff743d-3f97-406b-8b19-f143325fb952\">\n",
" <div class=\"colab-df-container\">\n",
" <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>age</th>\n",
" <th>sex</th>\n",
" <th>on_thyroxine</th>\n",
" <th>query_on_thyroxine</th>\n",
" <th>on_antithyroid_meds</th>\n",
" <th>sick</th>\n",
" <th>pregnant</th>\n",
" <th>thyroid_surgery</th>\n",
" <th>l131_treatment</th>\n",
" <th>query_hypothyroid</th>\n",
" <th>...</th>\n",
" <th>TT4</th>\n",
" <th>T4U_measured</th>\n",
" <th>T4U</th>\n",
" <th>FTI_measured</th>\n",
" <th>FTI</th>\n",
" <th>TBG_measured</th>\n",

```

```
"  <th>TBG</th>\n",
"  <th>referral_source</th>\n",
"  <th>target</th>\n",
"  <th>patient_id</th>\n",
" </tr>\n",
" </thead>\n",
" <tbody>\n",
"  <tr>\n",
"    <th>9171</th>\n",
"    <td>31.0</td>\n",
"    <td>1</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>1</td>\n",
"    <td>...</td>\n",
"    <td>66.0</td>\n",
"    <td>t</td>\n",
"    <td>1.02</td>\n",
"    <td>t</td>\n",
"    <td>65.0</td>\n",
"    <td>f</td>\n",
"    <td>NaN</td>\n",
"    <td>other</td>\n",
"    <td>-</td>\n",
"    <td>870119035</td>\n",
"  </tr>\n",
```

```
"    <tr>\n",
"        <th>9170</th>\n",
"        <td>47.0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>...</td>\n",
"        <td>75.0</td>\n",
"        <td>t</td>\n",
"        <td>0.85</td>\n",
"        <td>t</td>\n",
"        <td>88.0</td>\n",
"        <td>f</td>\n",
"        <td>NaN</td>\n",
"        <td>other</td>\n",
"        <td>-</td>\n",
"        <td>870119027</td>\n",
"    </tr>\n",
"    <tr>\n",
"        <th>9169</th>\n",
"        <td>69.0</td>\n",
"        <td>1</td>\n",
"        <td>0</td>\n",
"        <td>0</td>\n",
"        <td>0</td>
```

[illegible]

<td>t</td>\n",
"<td>0.92</td>\n",
"<td>t</td>\n",
"<td>99.0</td>\n",
"<td>f</td>\n",
"<td>NaN</td>\n",
"<td>SVI</td>\n",
"<td>-</td>\n",
"<td>870119023</td>\n",
"</tr>\n",
"<tr>\n",
"<th>9167</th>\n",
"<td>56.0</td>\n",
"<td>1</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>...</td>\n",
"<td>64.0</td>\n",
"<td>t</td>\n",
"<td>0.83</td>\n",
"<td>t</td>\n",
"<td>77.0</td>\n",
"<td>f</td>\n",
"<td>NaN</td>\n",
"<td>SVI</td>\n",

[illegible]

[illegible]

<td>
0</td>\n"
"
<td>...</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"
"
<td>t</td>\n"
"
<td>36.0</td>\n"
"
<td>other</td>\n"
"
<td>S</td>\n"
"
<td>840803047</td>\n"
"
</tr>\n"
"
<tr>\n"
"
<th>3</th>\n"
"
<td>36.0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>0</td>\n"
"
<td>...</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"
"
<td>f</td>\n"
"
<td>NaN</td>\n"

<td>t</td>\n",
"<td>26.0</td>\n",
"<td>other</td>\n",
"<td>-</td>\n",
"<td>840803046</td>\n",
"</tr>\n",
"<tr>\n",
"<th>2</th>\n",
"<td>41.0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>...</td>\n",
"<td>NaN</td>\n",
"<td>f</td>\n",
"<td>NaN</td>\n",
"<td>f</td>\n",
"<td>NaN</td>\n",
"<td>t</td>\n",
"<td>11.0</td>\n",
"<td>other</td>\n",
"<td>-</td>\n",
"<td>840801042</td>\n",
"</tr>\n",
"<tr>\n",

```
"    <th>1</th>\n",
"    <td>29.0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>0</td>\n",
"    <td>...</td>\n",
"    <td>128.0</td>\n",
"    <td>f</td>\n",
"    <td>NaN</td>\n",
"    <td>f</td>\n",
"    <td>NaN</td>\n",
"    <td>f</td>\n",
"    <td>NaN</td>\n",
"    <td>other</td>\n",
"    <td>-</td>\n",
"    <td>840801014</td>\n",
"  </tr>\n",
" </tbody>\n",
"</table>\n",
"<p>9171 rows × 31 columns</p>\n",
"</div>\n",
"  <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-33ff743d-3f97-406b-8b19-f143325fb952')\">\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 0 24 24"\n",
"    width="24px">\n",
" <path d="M0 0h24v24H0V0z" fill="none"/>\n",
" <path d="M18.56 5.44l.94 2.06.94-2.06-.94-2.06-.94-2.06-.94 2.06-2.06.94zm-11 11l8.5 8.5l.94-2.06 2.06-.94-2.06-.94L8.5 2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06-.94-2.06-.94-2.06-.94-2.06-.94 2.06-2.06.94z"/><path d="M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52 0-1.04-.2-1.43-.59L10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83L4 21.41c.39.39.95.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86z" data-bbox="17.41 7.96 21.41 11.96" style="fill:#1967D2;stroke:#1967D2;stroke-width:1px;stroke-dasharray: 5px 5px;"/>

```

```

"    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",
"  [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-33ff743d-3f97-406b-8b19-f143325fb952 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-33ff743d-3f97-406b-8b19-
f143325fb952');\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\"'\n",
        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",
        "</div>\n",
        " "
    ]
  },
  "metadata": {},
  "execution_count": 32
}
]
},
{
  "cell_type": "code",
  "source": [
    "x.replace(np.nan,'0',inplace=True)"
  ],
  "metadata": {
    "colab": {

```

```
    "base_uri": "https://localhost:8080/"
  },
  "id": "QA2SU10PAwmB",
  "outputId": "4d658006-fe6c-492d-8ff8-4d872a8d24e2"
},
"execution_count": 34,
"outputs": [
  {
    "output_type": "stream",
    "name": "stderr",
    "text": [
      "<ipython-input-34-be653e34d38c>:1: SettingWithCopyWarning: \n",
      "A value is trying to be set on a copy of a slice from a DataFrame\n",
      "\n",
      "See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#returning-a-view-versus-a-copy\n",
      "  x.replace(np.nan,'0',inplace=True)\n"
    ]
  }
]
},
{
  "cell_type": "code",
  "source": [
    "x"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 487
    }
  },
}
```

```

"id": "FSTrleysBTql",
"outputId": "524b4991-77fa-4b42-c0dd-0a12aa41a3fb"
},
"execution_count": 35,
"outputs": [
{
"output_type": "execute_result",
"data": {
"text/plain": [
"   age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick \\n",
"9171 31.0 1      0      0      0 0 \\n",
"9170 47.0 0      0      0      0 0 \\n",
"9169 69.0 1      0      0      0 0 \\n",
"9168 22.0 1      0      0      0 0 \\n",
"9167 56.0 1      0      0      0 0 \\n",
"...   ...      ...      ...      ... \\n",
"5   60.0 0      0      0      0 0 \\n",
"4   32.0 0      0      0      0 0 \\n",
"3   36.0 0      0      0      0 0 \\n",
"2   41.0 0      0      0      0 0 \\n",
"1   29.0 0      0      0      0 0 \\n",
"\\n",
"   pregnant thyroid_surgery l131_treatment query_hypothyroid ... \\n",
"9171      0      0      0      1 ... \\n",
"9170      0      0      0      0 ... \\n",
"9169      0      0      0      0 ... \\n",
"9168      0      0      0      0 ... \\n",
"9167      0      0      0      0 ... \\n",
"...   ...      ...      ...      ... \\n",
"5       0      0      0      0 ... \\n",
"4       0      0      0      0 ... \\n",

```

```

"3      0      0      0      0 ... \n",
"2      0      0      0      0 ... \n",
"1      0      0      0      0 ... \n",
"\n",
"      TT4 T4U_measured T4U FTI_measured FTI TBG_measured TBG \\n",
"9171 66.0      t 1.02      t 65.0      f 0 \n",
"9170 75.0      t 0.85      t 88.0      f 0 \n",
"9169 113.0     t 1.27      t 89.0      f 0 \n",
"9168 91.0      t 0.92      t 99.0      f 0 \n",
"9167 64.0      t 0.83      t 77.0      f 0 \n",
"...     ...     ...     ...     ...     ...     \n",
"5      0      f 0      f 0      t 26.0 \n",
"4      0      f 0      f 0      t 36.0 \n",
"3      0      f 0      f 0      t 26.0 \n",
"2      0      f 0      f 0      t 11.0 \n",
"1 128.0      f 0      f 0      f 0 \n",
"\n",
"      referral_source target patient_id \n",
"9171      other      - 870119035 \n",
"9170      other      - 870119027 \n",
"9169      SVI      I 870119025 \n",
"9168      SVI      - 870119023 \n",
"9167      SVI      - 870119022 \n",
"...      ...     ...     \n",
"5      other      - 840803048 \n",
"4      other      S 840803047 \n",
"3      other      - 840803046 \n",
"2      other      - 840801042 \n",
"1      other      - 840801014 \n",
"\n",
"[9171 rows x 31 columns]"

```



```

],
"text/html": [
  "\n",
  " <div id=\"df-c79e01c7-e019-47ea-9a48-367ccf05167f\">\n",
  "   <div class=\"colab-df-container\">\n",
  "     <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>age</th>\n",
  "     <th>sex</th>\n",
  "     <th>on_thyroxine</th>\n",
  "     <th>query_on_thyroxine</th>\n",
  "     <th>on_antithyroid_meds</th>\n",
  "     <th>sick</th>\n",
  "     <th>pregnant</th>\n",
  "     <th>thyroid_surgery</th>\n",

```

```

" <th>l131_treatment</th>\n",
" <th>query_hypothyroid</th>\n",
" <th>...</th>\n",
" <th>TT4</th>\n",
" <th>T4U_measured</th>\n",
" <th>T4U</th>\n",
" <th>FTI_measured</th>\n",
" <th>FTI</th>\n",
" <th>TBG_measured</th>\n",
" <th>TBG</th>\n",
" <th>referral_source</th>\n",
" <th>target</th>\n",
" <th>patient_id</th>\n",
" </tr>\n",
" </thead>\n",
" <tbody>\n",
" <tr>\n",
" <th>9171</th>\n",
" <td>31.0</td>\n",
" <td>1</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>1</td>\n",
" <td>...</td>\n",
" <td>66.0</td>\n",
" <td>t</td>\n",

```

" <td>1.02</td>\n",
" <td>t</td>\n",
" <td>65.0</td>\n",
" <td>f</td>\n",
" <td>0</td>\n",
" <td>other</td>\n",
" <td>-</td>\n",
" <td>870119035</td>\n",
" </tr>\n",
" <tr>\n",
" <th>9170</th>\n",
" <td>47.0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>...</td>\n",
" <td>75.0</td>\n",
" <td>t</td>\n",
" <td>0.85</td>\n",
" <td>t</td>\n",
" <td>88.0</td>\n",
" <td>f</td>\n",
" <td>0</td>\n",
" <td>other</td>\n",
" <td>-</td>\n",

" <td>870119027</td>\n",
" </tr>\n",
" <tr>\n",
" <th>9169</th>\n",
" <td>69.0</td>\n",
" <td>1</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>...</td>\n",
" <td>113.0</td>\n",
" <td>t</td>\n",
" <td>1.27</td>\n",
" <td>t</td>\n",
" <td>89.0</td>\n",
" <td>f</td>\n",
" <td>0</td>\n",
" <td>SVI</td>\n",
" <td>l</td>\n",
" <td>870119025</td>\n",
" </tr>\n",
" <tr>\n",
" <th>9168</th>\n",
" <td>22.0</td>\n",
" <td>1</td>\n",
" <td>0</td>\n",

[illegible]

[illegible]

" <td>...</td>\n",
" <td>...</td>\n",
" <td>...</td>\n",
" <td>...</td>\n",
" </tr>\n",
" <tr>\n",
" <th>5</th>\n",
" <td>60.0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>0</td>\n",
" <td>...</td>\n",
" <td>0</td>\n",
" <td>f</td>\n",
" <td>0</td>\n",
" <td>f</td>\n",
" <td>0</td>\n",
" <td>t</td>\n",
" <td>26.0</td>\n",
" <td>other</td>\n",
" <td>-</td>\n",
" <td>840803048</td>\n",
" </tr>\n",
" <tr>\n",
" <th>4</th>\n",

[illegible]

[illegible]

<td>f</td>\n",
"<td>0</td>\n",
"<td>t</td>\n",
"<td>11.0</td>\n",
"<td>other</td>\n",
"<td>-</td>\n",
"<td>840801042</td>\n",
"</tr>\n",
"<tr>\n",
"<th>1</th>\n",
"<td>29.0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>0</td>\n",
"<td>...</td>\n",
"<td>128.0</td>\n",
"<td>f</td>\n",
"<td>0</td>\n",
"<td>f</td>\n",
"<td>0</td>\n",
"<td>f</td>\n",
"<td>0</td>\n",
"<td>other</td>\n",
"<td>-</td>\n",
"<td>840801014</td>\n"

```

" </tr>\n",
" </tbody>\n",
"</table>\n",
"<p>9171 rows × 31 columns</p>\n",
"</div>\n",
"  <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-c79e01c7-e019-47ea-9a48-367ccf05167f')\">\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 0 24 24\">\n",
"      width=\"24px\">\n",
"    <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\n",
"    <path d=\"M18.56 5.44l.94 2.06.94-2.06-.94-2.06-.94 2.06-.94 2.06.94zm-11 11l8.5 8.5l.94-2.06.94-2.06-.94-2.06-.94 2.06-.94 2.06.94zm10 10l.94 2.06.94-2.06-.94-2.06-.94 2.06-.94-2.06.94zm-2.06-.94-2.06-.94 2.06-2.06.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52 0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-2.05 0-2.83L4 21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86z\"M5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41 20z\"/>\n",
"    </svg>\n",
"  </button>\n",
"  \n",
"  <style>\n",
"    .colab-df-container {\n",
"      display: flex;\n",
"      flex-wrap: wrap;\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",
" [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-c79e01c7-e019-47ea-9a48-367ccf05167f 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-c79e01c7-e019-47ea-9a48-367ccf05167f');\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",
" </div>\n",
" "
]
},
"metadata": {},
"execution_count": 35
}
]

```

```

},
{
  "cell_type": "code",
  "source": [
    "label_encoder=LabelEncoder()\n",
    "y_dt=label_encoder.fit_transform(y)"
  ],
  "metadata": {
    "id": "nnn6ZZsnBZ0q"
  },
  "execution_count": 56,
  "outputs": []
},
{
  "cell_type": "code",
  "source": [
    "y=pd.DataFrame(y_dt, columns=['target'])"
  ],
  "metadata": {
    "id": "ozTqvGYHBucJ"
  },
  "execution_count": 57,
  "outputs": []
},
{
  "cell_type": "code",
  "source": [
    "y"
  ],
  "metadata": {
    "colab": {

```

```

    "base_uri": "https://localhost:8080/"
  },
  "id": "hgdVzN24B-RZ",
  "outputId": "46140c83-bc04-42fd-a922-fbb455e8f7c3"
},
"execution_count": 38,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
      "text/plain": [
        "0      840801013\n",
        "1      840801014\n",
        "2      840801042\n",
        "3      840803046\n",
        "4      840803047\n",
        "...    \n",
        "9167   870119022\n",
        "9168   870119023\n",
        "9169   870119025\n",
        "9170   870119027\n",
        "9171   870119035\n",
        "Name: patient_id, Length: 9172, dtype: int64"
      ]
    },
    "execution_count": 38
  }
]
},
{

```

```

"cell_type": "code",
"source": [
    "x=data.iloc[:,0:-1]\\n",
    "y=data.iloc[:, -1]"
],
"metadata": {
    "id": "22zJfzCwCIFn"
},
"execution_count": 39,
"outputs": []
},
{
    "cell_type": "code",
    "source": [
        "x"
    ],
    "metadata": {
        "colab": {
            "base_uri": "https://localhost:8080/",
            "height": 487
        },
        "id": "OKbcjBRPCZdX",
        "outputId": "97fb8304-5bc9-4ad7-9521-26028af496e0"
    },
    "execution_count": 40,
    "outputs": [
        {
            "output_type": "execute_result",
            "data": {
                "text/plain": [
                    "   age sex on_thyroxine query_on_thyroxine on_antithyroid_meds sick \\n\\n",

```


"0	29	F	f	f	f f \n",
"1	29	F	f	f	f f \n",
"2	41	F	f	f	f f \n",
"3	36	F	f	f	f f \n",
"4	32	F	f	f	f f \n",
"...	\n",
"9167	56	M	f	f	f f \n",
"9168	22	M	f	f	f f \n",
"9169	69	M	f	f	f f \n",
"9170	47	F	f	f	f f \n",
"9171	31	M	f	f	f f \n",
\n",					

" pregnant thyroid_surgery l131_treatment query_hypothyroid ... \\n",

"0	f	f	f	t ... \n",
"1	f	f	f	f ... \n",
"2	f	f	f	f ... \n",
"3	f	f	f	f ... \n",
"4	f	f	f	f ... \n",
"... \n",
"9167	f	f	f	f ... \n",
"9168	f	f	f	f ... \n",
"9169	f	f	f	f ... \n",
"9170	f	f	f	f ... \n",
"9171	f	f	f	t ... \n",
\n",				

" TT4_measured TT4 T4U_measured T4U FTI_measured FTI TBG_measured \\n",

"0	f NaN	f NaN	f NaN	f \n",
"1	t 128.0	f NaN	f NaN	f \n",
"2	f NaN	f NaN	f NaN	t \n",
"3	f NaN	f NaN	f NaN	t \n",
"4	f NaN	f NaN	f NaN	t \n",

```

"...      ...      ...      ...      ...      ...      ... \n",
"9167      t  64.0      t  0.83      t  77.0      f \n",
"9168      t  91.0      t  0.92      t  99.0      f \n",
"9169      t 113.0      t  1.27      t  89.0      f \n",
"9170      t  75.0      t  0.85      t  88.0      f \n",
"9171      t  66.0      t  1.02      t  65.0      f \n",
"\n",
"  TBG referral_source target \n",
"0  NaN      other  - \n",
"1  NaN      other  - \n",
"2  11.0      other  - \n",
"3  26.0      other  - \n",
"4  36.0      other  S \n",
"...      ...      ...      ... \n",
"9167  NaN      SVI  - \n",
"9168  NaN      SVI  - \n",
"9169  NaN      SVI  I \n",
"9170  NaN      other  - \n",
"9171  NaN      other  - \n",
"\n",
"[9172 rows x 30 columns]"
],
"text/html": [
"\n",
" <div id=\"df-8c57d2b9-dda1-4c49-aaa3-fc5fbbd594c8\">\n",
" <div class=\"colab-df-container\">\n",
" <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>age</th>\n",
"      <th>sex</th>\n",
"      <th>on_thyroxine</th>\n",
"      <th>query_on_thyroxine</th>\n",
"      <th>on_antithyroid_meds</th>\n",
"      <th>sick</th>\n",
"      <th>pregnant</th>\n",
"      <th>thyroid_surgery</th>\n",
"      <th>l131_treatment</th>\n",
"      <th>query_hypothyroid</th>\n",
"      <th>...</th>\n",
"      <th>TT4_measured</th>\n",
"      <th>TT4</th>\n",
"      <th>T4U_measured</th>\n",
"      <th>T4U</th>\n",
"      <th>FTI_measured</th>\n",
"      <th>FTI</th>\n",
"      <th>TBG_measured</th>\n",

```

```
"    <th>TBG</th>\n",
"    <th>referral_source</th>\n",
"    <th>target</th>\n",
"  </tr>\n",
" </thead>\n",
" <tbody>\n",
"   <tr>\n",
"     <th>0</th>\n",
"     <td>29</td>\n",
"     <td>F</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>f</td>\n",
"     <td>t</td>\n",
"     <td>...</td>\n",
"     <td>f</td>\n",
"     <td>NaN</td>\n",
"     <td>f</td>\n",
"     <td>NaN</td>\n",
"     <td>f</td>\n",
"     <td>NaN</td>\n",
"     <td>f</td>\n",
"     <td>NaN</td>\n",
"     <td>other</td>\n",
"     <td>-</td>\n",
"   </tr>\n",
" <tr>\n",
```

"	<th>1</th>\n"
"	<td>29</td>\n"
"	<td>F</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>...</td>\n"
"	<td>t</td>\n"
"	<td>128.0</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>other</td>\n"
"	<td>-</td>\n"
"	</tr>\n"
"	<tr>\n"
"	<th>2</th>\n"
"	<td>41</td>\n"
"	<td>F</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"

[illegible]

	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>t</td>\n"
"	<td>26.0</td>\n"
"	<td>other</td>\n"
"	<td>-</td>\n"
"	</tr>\n"
"	<tr>\n"
"	<th>4</th>\n"
"	<td>32</td>\n"
"	<td>F</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>...</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>t</td>\n"
"	<td>36.0</td>\n"
"	<td>other</td>\n"

[illegible]

[illegible]

[illegible]

	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>SVI</td>\n"
"	<td>l</td>\n"
"	</tr>\n"
"	<tr>\n"
"	<th>9170</th>\n"
"	<td>47</td>\n"
"	<td>F</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>f</td>\n"
"	<td>...</td>\n"
"	<td>t</td>\n"
"	<td>75.0</td>\n"
"	<td>t</td>\n"
"	<td>0.85</td>\n"
"	<td>t</td>\n"
"	<td>88.0</td>\n"
"	<td>f</td>\n"
"	<td>NaN</td>\n"
"	<td>other</td>\n"
"	<td>-</td>\n"
"	</tr>\n"
"	<tr>\n"
"	<th>9171</th>\n"

```

"    <td>31</td>\n",
"    <td>M</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>f</td>\n",
"    <td>t</td>\n",
"    <td>...</td>\n",
"    <td>t</td>\n",
"    <td>66.0</td>\n",
"    <td>t</td>\n",
"    <td>1.02</td>\n",
"    <td>t</td>\n",
"    <td>65.0</td>\n",
"    <td>f</td>\n",
"    <td>NaN</td>\n",
"    <td>other</td>\n",
"    <td>-</td>\n",
"  </tr>\n",
" </tbody>\n",
"</table>\n",
"<p>9172 rows × 30 columns</p>\n",
"</div>\n",
"  <button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-8c57d2b9-dda1-4c49-aaa3-fc5fbbd594c8')\">\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 0 24 24"\n",
"   width="24px">\n",
"   <path d="M0 0h24v24H0V0z" fill="none"/>\n",
"   <path d="M18.56 5.44l.94 2.06.94-2.06-.94-2.06-.94-2.06-.94 2.06-2.06.94zm-
11 1l8.5 8.5l.94-2.06 2.06-.94-2.06-.94L8.5 2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06-.94-
2.06-.94-.94-2.06-.94 2.06-2.06.94z"/><path d="M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52
0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83L4 21.41c.39.39.9.59 1.41.59.51 0 1.02-
.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86zM5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41
20z"/>\n",
" </svg>\n",
"   </button>\n",
"   \n",
" <style>\n",
"   .colab-df-container {\n",
"     display: flex;\n",
"     flex-wrap: wrap;\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",
"  [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-8c57d2b9-dda1-4c49-aaa3-fc5fbbd594c8 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-8c57d2b9-dda1-4c49-aaa3-
fc5fbbd594c8');\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",
" </div>\n",
" "
]
},
"metadata": {},
"execution_count": 40
}
]
},
{
"cell_type": "code",
"source": [
"from sklearn.model_selection import train_test_split\n",
"x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.20,random_state=0)"
],
"metadata": {
"id": "6LB7V3PLCcwd"
}
}

```

```

},
"execution_count": 41,
"outputs": []
},
{
  "cell_type": "code",
  "source": [
    "from imblearn.over_sampling import SMOTE\n",
    "y_train.value_counts()"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "kwZLoVDmC7Kf",
    "outputId": "f6e79f37-66ba-4862-e62a-8c4f1ae2abd7"
  },
  "execution_count": 42,
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "860730007  1\n",
          "850920074  1\n",
          "860910043  1\n",
          "850527065  1\n",
          "850612027  1\n",
          "      ..\n",
          "860819029  1\n",
          "851018026  1\n",

```



```

      "860305010  1\n",
      "851224017  1\n",
      "850513001  1\n",
      "Name: patient_id, Length: 7337, dtype: int64"
    ]
  },
  "metadata": {},
  "execution_count": 42
}
]
},
{
  "cell_type": "code",
  "source": [
    "os=SMOTE(random_state=0,k_neighbors=1)\n",
    "x_bal,y_bal=os.fit_resample(x_train,y_train)\n",
    "x_test_bal,y_test_bal=os.fit_resample(x_test,y_test)"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 362
    },
    "id": "j6Z7dMgrDpiR",
    "outputId": "ea0c5e4c-5630-499e-fd55-30ecd546f582"
  },
  "execution_count": 60,
  "outputs": [
    {
      "output_type": "error",
      "ename": "ValueError",

```

```

"evaluate": "ignored",

"traceback": [

  "\u001b[0;31m-----\u001b[0m",

  "\u001b[0;31mValueError\u001b[0m                                Traceback (most recent call last)",

  "\u001b[0;32m<ipython-input-60-483abc55c779>\u001b[0m in \u001b[0;36m<cell line:
2>\u001b[0;34m()\u001b[0m\n\u001b[1;32m    1\u001b[0m \u001b[0m\u001b[0mos\u001b[0m\n\u001b[0;34m\u001b[0m\u001b[0m\u001b[0mSMOTE\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0mrandom_state\u001b[0m\u001b[0m\u001b[0;34m=
\u001b[0m\u001b[0m\u001b[0;36m0\u001b[0m\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0m\u001b[0mk_neighbors\u001b[0
1\u001b[0m\u001b[0m\u001b[0;34m=\u001b[0m\u001b[0m\u001b[0;36m1\u001b[0m\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m
m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0;32m----> 2\u001b[0m\u001b[0;31m
\u001b[0m\u001b[0mx_bal\u001b[0m\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0m\u001b[0my_bal\u001b[0m\u001b[0m\u001b[0;34m=\u001b[0
0\u001b[0m\u001b[0mos\u001b[0m\u001b[0m\u001b[0;34m.\u001b[0m\u001b[0mfit_resample\u001b[0m\u001b[0m\u001b[0;34m(
1\u001b[0m\u001b[0mx_train\u001b[0m\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0my_train\u001b[0
1\u001b[0m\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\n\u001b[0
0\u001b[0m\u001b[1;32m    3\u001b[0m\u001b[0m
\u001b[0m\u001b[0mx_test_bal\u001b[0m\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0m\u001b[0my_test_bal\u001b[0m\u001b[0m\u001b[0;34m=
\u001b[0m\u001b[0mos\u001b[0m\u001b[0m\u001b[0;34m.\u001b[0m\u001b[0mfit_resample\u001b[0m
\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0mx_test\u001b[0m\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0my_te
st\u001b[0m\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\n"

  "\u001b[0;32m/usr/local/lib/python3.9/dist-packages/imblearn/base.py\u001b[0m in
\u001b[0;36mfit_resample\u001b[0m\u001b[0;34m(self, X, y)\u001b[0m\n\u001b[1;32m    201\u001b[0m\u001b[0m
\u001b[1;32m    202\u001b[0m\u001b[0m
\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m_validate_params\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m
\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
1\u001b[0m\u001b[0m\u001b[0;32m--> 203\u001b[0m\u001b[0;31m    \u001b[0m\u001b[0;32mreturn\u001b[0m\u001b[0m
\u001b[0m\u001b[0msuper\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m.\u001b[0m
1\u001b[0m\u001b[0m\u001b[0mfit_resample\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0mX\u001b[0m\u001b[0m\u001b[0;34m,
\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0m
\u001b[0m\u001b[0my\u001b[0m\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
\u001b[1;32m    204\u001b[0m\u001b[0m
\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
\u001b[1;32m    205\u001b[0m\u001b[0m
\u001b[0;32mdef\u001b[0m\u001b[0m
\u001b[0m\u001b[0more_tags\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0mself\u001b[0m\u001b[0m\u001b[0;34m
m)\u001b[0m\u001b[0m\u001b[0;34m:\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\n"

  "\u001b[0;32m/usr/local/lib/python3.9/dist-packages/imblearn/base.py\u001b[0m in
\u001b[0;36mfit_resample\u001b[0m\u001b[0;34m(self, X, y)\u001b[0m\n\u001b[1;32m    80\u001b[0m\u001b[0m
\u001b[0;34m\u001b[0m\u001b[0m\u001b[0mcheck_classification_targets\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0my\u001b[0m\u001b[0m\u001b[0;34m
\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
1;32m    81\u001b[0m\u001b[0m    \u001b[0m\u001b[0marrays_transformer\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m=\u001b[0m
\u001b[0m\u001b[0mArraysTransformer\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0m\u001b[0mX\u001b[0m\u001b[0m\u001b[0;34m\u001b[0m\u001b[0m\u001b[0m\u001b[0m\u001b[0m
;34m,\u001b[0m\u001b[0m

```



```

    }
  ]
},
{
  "cell_type": "code",
  "source": [
    "from sklearn.preprocessing import StandardScaler\n",
    "sc=StandardScaler()\n",
    "x_bal=sc.fit_transform(x_bal)\n",
    "x_test_bal=sc.transform(x_test_bal)"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 393
    },
    "id": "397zweEsEfv6",
    "outputId": "bef6b154-ea66-4370-e50d-71a586587ad5"
  },
  "execution_count": 68,
  "outputs": [
    {
      "output_type": "error",
      "ename": "ImportError",
      "evalue": "ignored",
      "traceback": [
        "\u001b[0;31m-----\u001b[0m",
        "\u001b[0;31mImportError\u001b[0m                                Traceback (most recent call last)",
        "\u001b[0;32m<ipython-input-68-e439d398236e>\u001b[0m in \u001b[0;36m<cell line: 1>\u001b[0m\n1>\u001b[0;34m()\u001b[0m\n\u001b[0;32m----> 1\u001b[0m \u001b[0;32mfrom\u001b[0m \u001b[0m\n\u001b[0;34msklearn\u001b[0m \u001b[0;34m.\u001b[0m \u001b[0;34mpreprocessing\u001b[0m\n\u001b[0;32mimport\u001b[0m

```

```

\0mStandardScalar\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0m\
n\0m\0m\0m\0;32m 2\0m\0m
\0m\0m\0m\0m\0m\0;34m=\0m\0m\0m\0m\0m\0m\0;3
4m(\0m\0m\0m\0;34m)\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0
0m\n\0m\0;32m 3\0m\0m
\0m\0m\0m\0m\0m\0;34m=\0m\0m\0m\0m\0m\0m\0;34m.\0m\
0m\0m\0m\0m\0m\0;34m(\0m\0m\0m\0m\0m\0m\0m\0m\0m\0
1b\0;34m)\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0m\n\0m\0;32m
4\0m\0m\0m
\0m\0m\0m\0m\0m\0;34m=\0m\0m\0m\0m\0m\0m\0m\0;34m.\
0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0m\0
m\0m\0;34m)\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0;34m\0m\0m\0m\n",

```

```

"\0;31mImportError\0m: cannot import name 'StandardScalar' from
'sklearn.preprocessing' (/usr/local/lib/python3.9/dist-packages/sklearn/preprocessing/__init__.py)",

```

```

"""

```

```

"\0;31m-----
\0;32m\nNOTE: If your import is failing due to a missing package, you can\nmanually install
dependencies using either !pip or !apt.\n\nTo view examples of installing some common
dependencies, click the\n\"Open Examples\" button below.\n\0;31m-----
-----\0m\n"

```

```

],

```

```

"errorDetails": {

```

```

  "actions": [

```

```

    {

```

```

      "action": "open_url",

```

```

      "actionText": "Open Examples",

```

```

      "url": "/notebooks/snippets/importing_libraries.ipynb"

```

```

    }

```

```

  ]

```

```

}

```

```

}

```

```

]

```

```

},

```

```

{

```

```

  "cell_type": "code",

```

```

  "source": [

```

```

    "x_bal"

```



```
"metadata": {  
    "colab": {  
        "base_uri": "https://localhost:8080/",  
        "height": 172  
    },  
    "id": "9iJAwJQqFZsV",  
    "outputId": "9efc4d33-5235-45cf-a192-659b68956a20"  
},  
"execution_count": 47,  
"outputs": [  
    {  
        "output_type": "error",  
        "ename": "NameError",  
        "evaluate": "ignored",  
        "traceback": [  
            "\u001b[0;31m-----\u001b[0m",  
            "\u001b[0;31mNameError\u001b[0m                                Traceback (most recent call last)",  
            "\u001b[0;32m<ipython-input-47-f2a7ed159754>\u001b[0m in \u001b[0;36m<cell line:  
1>\u001b[0;34m()\u001b[0m\n\u001b[0;32m----> 1\u001b[0;31m  
\u001b[0mx_test_bal\u001b[0m=\u001b[0mpd.DataFrame(\u001b[0mcolumns=columns)\u001b[0m  
\u001b[0mx_test_bal\u001b[0m[\u001b[0m'x'\u001b[0m]=\u001b[0mnp.random.randn(len(columns))\u001b[0m  
\u001b[0m\u001b[0m"
```

```
,
{
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/",
      "height": 172
    },
    "id": "ZnPEQI65Fujz",
    "outputId": "2ae77304-5ac4-426d-e8bc-23edf49842a5"
  },
  "execution_count": 48,
  "outputs": [
    {
      "output_type": "error",
      "ename": "NameError",
      "evalue": "ignored",
      "traceback": [
        "\u001b[0;31m-----\u001b[0m",
        "\u001b[0;31mNameError\u001b[0m                                Traceback (most recent call last)",
        "\u001b[0;32m<ipython-input-48-be6c6981e988>\u001b[0m in \u001b[0;36m<cell line: 1>\u001b[0;34m()\u001b[0m\n\u001b[0;32m----> 1\u001b[0;31m\n\u001b[0mx_bal\u001b[0m\u001b[0;34m=\u001b[0m\u001b[0mpd\u001b[0m\u001b[0;34m.\u001b[0m\u001b[0mDataFrame\u001b[0m\u001b[0;34m(\u001b[0m\u001b[0mx_bal\u001b[0m\u001b[0;34m.\u001b[0m\u001b[0mData\u001b[0m\u001b[0;34m,\u001b[0m\u001b[0mcolumns\u001b[0m\u001b[0;34m=\u001b[0m\u001b[0mcolumns\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0;34m)\u001b[0m\u001b[0;34m\u001b[0m\n\u001b[0;31mNameError\u001b[0m: name 'x_bal' is not defined"
      ]
    }
  ],
  "cell_type": "code",
  "source": [
```

```
"x_bal"
],
"metadata": {
    "colab": {
        "base_uri": "https://localhost:8080/",
        "height": 172
    },
    "id": "FsaPejMRF332",
    "outputId": "ec737091-5b60-41c6-fbbe-fa5d3e454aff"
},
"execution_count": 50,
"outputs": [
    {
        "output_type": "error",
        "ename": "NameError",
        "evaluel": "ignored",
        "traceback": [
            "\u001b[0;31m-----\u001b[0m",
            "\u001b[0;31mNameError\u001b[0m                                Traceback (most recent call last)",
            "\u001b[0;32m<ipython-input-50-5fda9bf814cd>\u001b[0m in \u001b[0;36m<cell line: 1>\u001b[0m\n\u001b[0;34m()\u001b[0m\n\u001b[0;32m----> 1\u001b[0m\n\u001b[0mx_bal\u001b[0m\n\u001b[0;34m\u001b[0m\n\u001b[0;34m\u001b[0m\n\u001b[0m",
            "\u001b[0;31mNameError\u001b[0m: name 'x_bal' is not defined"
        ]
    }
]
{
    "cell_type": "code",
    "source": [
        "from sklearn.inspection import permutation_importance\n"
```


}
]
}