

ProF__Anderson__Gonzalez__Zuluaga

July 13, 2025

#

UNIVERSIDAD TECNOLÓGICA DE PANAMÁ

FACULTAD DE INGENIERÍA DE SISTEMAS COMPUTACIONALES

DEPARTAMENTO DE COMPUTACIÓN Y SIMULACIÓN DE SISTEMAS

——PROYECTO FINAL: Aprendizaje Supervisado y No Supervisado——

Temas Especiales II

FACILITADOR Sr. José Carlos Rangel Ortiz

INTEGRANTES: César González, Justmary Anderson, Luisa Zuluaga

#

PARTE N.1 APRENDIZAJE SUPERVISADO

0.1 LIBRERIAS UTILIZADAS

```
[1]: # importar librerias a utilizar en el proyecto
import pandas as pd
from sklearn.preprocessing import LabelEncoder
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, label_binarize
import matplotlib.pyplot as plt
from sklearn.metrics import *
import warnings
warnings.filterwarnings("ignore")

# Importar modelos
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
```

```

from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.svm import SVR
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor

```

0.2 PREPARACIÓN DE LOS DATOS

```

[2]: #Inicializar los DataSets
try:
    df_apple_quality = pd.read_csv('apple_quality.csv', encoding='ISO-8859-1')
    print(" Dataset 'Apple Quality' cargado exitosamente.")
    display(df_apple_quality.head())
except FileNotFoundError:
    print(" ERROR: No se encontró el archivo del dataset de terrorismo.")
    print("Por favor, asegúrate de que el archivo esté en la misma carpeta que tu notebook y que el nombre sea correcto.")

print("\n" + "="*80 + "\n") # Separador visual

# --- Cargar Dataset Obligatorio (Zenodo) ---
try:
    df_Pediatric= pd.read_excel('app_data.xlsx')
    print(" Dataset 'app_data.xlsx' (Pediatric Appendicitis Dataset) cargado exitosamente.")
    display(df_Pediatric.head())
except FileNotFoundError:
    print(" ERROR: No se encontró el archivo 'app_data.xlsx'.")
    print("Asegúrate de que el archivo esté en la misma carpeta que tu notebook.")

```

Dataset 'Apple Quality' cargado exitosamente.

	A_id	Size	Weight	Sweetness	Crunchiness	Juiciness	Ripeness	\
0	0.0	-3.970049	-2.512336	5.346330	-1.012009	1.844900	0.329840	
1	1.0	-1.195217	-2.839257	3.664059	1.588232	0.853286	0.867530	
2	2.0	-0.292024	-1.351282	-1.738429	-0.342616	2.838636	-0.038033	
3	3.0	-0.657196	-2.271627	1.324874	-0.097875	3.637970	-3.413761	
4	4.0	1.364217	-1.296612	-0.384658	-0.553006	3.030874	-1.303849	

	Acidity	Quality
0	-0.491590483	good
1	-0.722809367	good
2	2.621636473	bad

```
3 0.790723217 good
4 0.501984036 good
```

```
=====
```

Dataset 'app_data.xlsx' (Pediatric Appendicitis Dataset) cargado exitosamente.

	Age	BMI	Sex	Height	Weight	Length_of_Stay	Management \
0	12.68	16.9	female	148.0	37.0	3.0	conservative
1	14.10	31.9	male	147.0	69.5	2.0	conservative
2	14.14	23.3	female	163.0	62.0	4.0	conservative
3	16.37	20.6	female	165.0	56.0	3.0	conservative
4	11.08	16.9	female	163.0	45.0	3.0	conservative

	Severity	Diagnosis_Presumptive	Diagnosis ... \
0	uncomplicated	appendicitis	appendicitis ...
1	uncomplicated	appendicitis	no appendicitis ...
2	uncomplicated	appendicitis	no appendicitis ...
3	uncomplicated	appendicitis	no appendicitis ...
4	uncomplicated	appendicitis	appendicitis ...

	Abscess_Location	Pathological_Lymph_Nodes	Lymph_Nodes_Location \
0	NaN	yes	reUB
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	yes	reUB
4	NaN	yes	reUB

	Bowel_Wall_Thickening	Conglomerate_of_Bowel_Loops	Ileus	Coprostasis \
0	NaN	NaN	NaN	NaN
1	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN

	Meteorism	Enteritis	Gynecological_Findings
0	NaN	NaN	NaN
1	yes	NaN	NaN
2	yes	yes	NaN
3	NaN	yes	NaN
4	NaN	yes	NaN

[5 rows x 58 columns]

Visualizamos los datos del Dataset de Pediatric Appendicitis

```
[3]: #visualizar cantidad y tipo de datos originales
df_Pediatric.info()
```

<class 'pandas.core.frame.DataFrame'>

RangeIndex: 782 entries, 0 to 781

Data columns (total 58 columns):

#	Column	Non-Null Count	Dtype
0	Age	781 non-null	float64
1	BMI	755 non-null	float64
2	Sex	780 non-null	object
3	Height	756 non-null	float64
4	Weight	779 non-null	float64
5	Length_of_Stay	778 non-null	float64
6	Management	781 non-null	object
7	Severity	781 non-null	object
8	Diagnosis_Presumptive	780 non-null	object
9	Diagnosis	780 non-null	object
10	Alvarado_Score	730 non-null	float64
11	Paedriatic_Appendicitis_Score	730 non-null	float64
12	Appendix_on_US	777 non-null	object
13	Appendix_Diameter	498 non-null	float64
14	Migratory_Pain	773 non-null	object
15	Lower_Right_Abd_Pain	774 non-null	object
16	Contralateral_Rebound_Tenderness	767 non-null	object
17	Coughing_Pain	766 non-null	object
18	Nausea	774 non-null	object
19	Loss_of_Appetite	772 non-null	object
20	Body_Temperature	775 non-null	float64
21	WBC_Count	776 non-null	float64
22	Neutrophil_Percentage	679 non-null	float64
23	Segmented_Neutrophils	54 non-null	float64
24	Neutrophilia	732 non-null	object
25	RBC_Count	764 non-null	float64
26	Hemoglobin	764 non-null	float64
27	RDW	756 non-null	float64
28	Thrombocyte_Count	764 non-null	float64
29	Ketones_in_Urine	582 non-null	object
30	RBC_in_Urine	576 non-null	object
31	WBC_in_Urine	583 non-null	object
32	CRP	771 non-null	float64
33	Dysuria	753 non-null	object
34	Stool	765 non-null	object
35	Peritonitis	773 non-null	object
36	Psoas_Sign	745 non-null	object
37	Ipsilateral_Rebound_Tenderness	619 non-null	object
38	US_Performed	778 non-null	object
39	US_Number	760 non-null	float64
40	Free_Fluids	719 non-null	object
41	Appendix_Wall_Layers	218 non-null	object
42	Target_Sign	138 non-null	object

43	Appendicolith	69 non-null	object
44	Perfusion	63 non-null	object
45	Perforation	81 non-null	object
46	Surrounding_Tissue_Reaction	252 non-null	object
47	Appendicular_Abscess	85 non-null	object
48	Abscess_Location	13 non-null	object
49	Pathological_Lymph_Nodes	203 non-null	object
50	Lymph_Nodes_Location	121 non-null	object
51	Bowel_Wall_Thickening	99 non-null	object
52	Conglomerate_of_Bowel_Loops	43 non-null	object
53	Ileus	60 non-null	object
54	Coprostasis	71 non-null	object
55	Meteorism	140 non-null	object
56	Enteritis	66 non-null	object
57	Gynecological_Findings	26 non-null	object

dtypes: float64(18), object(40)
memory usage: 354.5+ KB

```
[4]: df_a_limpiar = df_Pediatric.copy()

print(f"--- Limpiando el DataFrame: Pediatric Apendicitis ---")
print(f"Dimensiones originales: {df_a_limpiar.shape[0]} filas, {df_a_limpiar.
↳shape[1]} columnas")
print("\n" + "="*50 + "\n")

# --- PASO 2: Calcular y mostrar el porcentaje de nulos ---
porcentaje_nulos = df_a_limpiar.isnull().mean() * 100
porcentaje_nulos = porcentaje_nulos.sort_values(ascending=False)
print("Porcentaje de nulos por columna (top 15):")
print(porcentaje_nulos.head(15))

# --- PASO 3: Eliminar columnas y filas con nulos ---
# Eliminar columnas con datos nulos por encima del 13%
columnas_a_eliminar = porcentaje_nulos[porcentaje_nulos > 13].index
df_limpio = df_a_limpiar.drop(columns=columnas_a_eliminar)

# Eliminar las filas restantes que todavía contengan algún dato nulo
df_limpio = df_limpio.dropna()

# --- PASO 4: Mostrar el resultado de la limpieza ---
print("\n" + "="*50 + "\n")
print("Resultado de la limpieza de la Data:")
print(f"Se eliminaron {len(columnas_a_eliminar)} columnas por exceso de nulos.")
print(f"Dimensiones finales: {df_limpio.shape[0]} filas, {df_limpio.shape[1]}
↳columnas")
```

```
df_limpio.info()
```

```
--- Limpiando el DataFrame: Pediatric Appendicitis ---  
Dimensiones originales: 782 filas, 58 columnas
```

```
=====
```

Porcentaje de nulos por columna (top 15):

Abscess_Location	98.337596
Gynecological_Findings	96.675192
Conglomerate_of_Bowel_Loops	94.501279
Segmented_Neutrophils	93.094629
Ileus	92.327366
Perfusion	91.943734
Enteritis	91.560102
Appendicolith	91.176471
Coprostasis	90.920716
Perforation	89.641944
Appendicular_Abscess	89.130435
Bowel_Wall_Thickening	87.340153
Lymph_Nodes_Location	84.526854
Target_Sign	82.352941
Meteorism	82.097187

dtype: float64

```
=====
```

Resultado de la limpieza de la Data:

Se eliminaron 24 columnas por exceso de nulos.

Dimensiones finales: 589 filas, 34 columnas

<class 'pandas.core.frame.DataFrame'>

Index: 589 entries, 0 to 781

Data columns (total 34 columns):

#	Column	Non-Null Count	Dtype
----	-----	-----	-----
0	Age	589 non-null	float64
1	BMI	589 non-null	float64
2	Sex	589 non-null	object
3	Height	589 non-null	float64
4	Weight	589 non-null	float64
5	Length_of_Stay	589 non-null	float64
6	Management	589 non-null	object
7	Severity	589 non-null	object
8	Diagnosis_Presumptive	589 non-null	object
9	Diagnosis	589 non-null	object
10	Alvarado_Score	589 non-null	float64
11	Paedriatic_Appendicitis_Score	589 non-null	float64
12	Appendix_on_US	589 non-null	object

13	Migratory_Pain	589	non-null	object
14	Lower_Right_Abd_Pain	589	non-null	object
15	Contralateral_Rebound_Tenderness	589	non-null	object
16	Coughing_Pain	589	non-null	object
17	Nausea	589	non-null	object
18	Loss_of_Appetite	589	non-null	object
19	Body_Temperature	589	non-null	float64
20	WBC_Count	589	non-null	float64
21	Neutrophilia	589	non-null	object
22	RBC_Count	589	non-null	float64
23	Hemoglobin	589	non-null	float64
24	RDW	589	non-null	float64
25	Thrombocyte_Count	589	non-null	float64
26	CRP	589	non-null	float64
27	Dysuria	589	non-null	object
28	Stool	589	non-null	object
29	Peritonitis	589	non-null	object
30	Psoas_Sign	589	non-null	object
31	US_Performed	589	non-null	object
32	US_Number	589	non-null	float64
33	Free_Fluids	589	non-null	object

dtypes: float64(15), object(19)
memory usage: 161.1+ KB

Visualizamos los datos del Dataset de Apple Quality

```
[5]: # 1. COPIA DEL DATAFRAME ORIGINAL
df_apple_limpio = df_apple_quality.copy()

# 2. ELIMINAR COLUMNAS CON MÁS DEL 20% DE NULOS
porcentaje_nulos = df_apple_limpio.isnull().mean() * 100
columnas_a_eliminar = porcentaje_nulos[porcentaje_nulos > 20].index
df_apple_limpio = df_apple_limpio.drop(columns=columnas_a_eliminar)

print(f"Se eliminaron {len(columnas_a_eliminar)} columnas por exceso de nulos.")
print(f"Dimensiones después de eliminar columnas: {df_apple_limpio.shape}")

# 3. ELIMINAR FILAS CON NULOS (sin imputar)
df_apple_limpio = df_apple_limpio.dropna()

# 4. Mostrar resultado final
print("\n--- Resultado de la Limpieza sin Imputación ---")
print("No deberían quedar valores nulos.")
print(f"Dimensiones finales: {df_apple_limpio.shape}")
df_apple_limpio.info()

print("\nPrimeras 5 filas del DataFrame limpio:")
display(df_apple_limpio.head())
```

Se eliminaron 0 columnas por exceso de nulos.
Dimensiones después de eliminar columnas: (4001, 9)

--- Resultado de la Limpieza sin Imputación ---

No deberían quedar valores nulos.

Dimensiones finales: (4000, 9)

<class 'pandas.core.frame.DataFrame'>

Index: 4000 entries, 0 to 3999

Data columns (total 9 columns):

#	Column	Non-Null Count	Dtype
0	A_id	4000 non-null	float64
1	Size	4000 non-null	float64
2	Weight	4000 non-null	float64
3	Sweetness	4000 non-null	float64
4	Crunchiness	4000 non-null	float64
5	Juiciness	4000 non-null	float64
6	Ripeness	4000 non-null	float64
7	Acidity	4000 non-null	object
8	Quality	4000 non-null	object

dtypes: float64(7), object(2)

memory usage: 312.5+ KB

Primeras 5 filas del DataFrame limpio:

	A_id	Size	Weight	Sweetness	Crunchiness	Juiciness	Ripeness	\
0	0.0	-3.970049	-2.512336	5.346330	-1.012009	1.844900	0.329840	
1	1.0	-1.195217	-2.839257	3.664059	1.588232	0.853286	0.867530	
2	2.0	-0.292024	-1.351282	-1.738429	-0.342616	2.838636	-0.038033	
3	3.0	-0.657196	-2.271627	1.324874	-0.097875	3.637970	-3.413761	
4	4.0	1.364217	-1.296612	-0.384658	-0.553006	3.030874	-1.303849	

	Acidity	Quality
0	-0.491590483	good
1	-0.722809367	good
2	2.621636473	bad
3	0.790723217	good
4	0.501984036	good

0.3 CREACIÓN DE LOS MODELOS DE APRENDIZAJE SUPERVISADO

```
[6]: modelo1 = LogisticRegression(random_state=42)
      modelo2 = RandomForestClassifier(random_state=42)
      modelo3 = DecisionTreeClassifier(random_state=42)

      clasificadores = [
          ('Regresión Logística', modelo1),
          ('Random Forest', modelo2),
```

```

        ('Árbol de Decisión', modelo3)
    ]

```

```

[7]: # Modelos de regresión
modelo1 = LinearRegression()
modelo2 = DecisionTreeRegressor(random_state=42)
modelo3 = RandomForestRegressor(random_state=42)

modelos_regresion = [
    ('Regresión Lineal', modelo1),
    ('Árbol de Decisión', modelo2),
    ('Random Forest', modelo3)
]

```

0.4 PROBLEMA N.1 (APRENDIZAJE AUTOMATICO)

Clasificación del Tratamiento para Apendicitis Pediátrica

```

[8]: # --- Separar el DataFrame en X y Y ---
X = df_limpio.drop('Management', axis=1)
Y = df_limpio['Management']

# --- Codificar variables categóricas (como 'Sex') en X ---
X = pd.get_dummies(X, drop_first=True)

# --- Codificar la variable Y (target) a numérico ---
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y = le.fit_transform(Y)

# --- Verificación ---
print("Columnas de X codificado:", X.columns.tolist())
print("Dimensiones de X:", X.shape)
print("Dimensiones de Y codificado:", y.shape)
print("Primeros 5 valores codificados de y:", y[:5])
print("Etiquetas originales de Y:", le.classes_)

# --- Dividir datos en entrenamiento y prueba ---
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
    ↪random_state=42)

# --- Verificar dimensiones ---
print("Dimensiones de X_train:", X_train.shape)
print("Dimensiones de X_test:", X_test.shape)
print("Dimensiones de y_train:", y_train.shape)
print("Dimensiones de y_test:", y_test.shape)

```

Columnas de X codificado: ['Age', 'BMI', 'Height', 'Weight', 'Length_of_Stay', 'Alvarado_Score', 'Paedriatic_Appendicitis_Score', 'Body_Temperature', 'WBC_Count', 'RBC_Count', 'Hemoglobin', 'RDW', 'Thrombocyte_Count', 'CRP', 'US_Number', 'Sex_male', 'Severity_uncomplicated', 'Diagnosis_Presumptive_Appendizitis/ Lymphadenitis mesenterialis', 'Diagnosis_Presumptive_Gastroenteritis', 'Diagnosis_Presumptive_appendicitis', 'Diagnosis_Presumptive_chronische Appendizitis', 'Diagnosis_Presumptive_diabetische Ketoazidose, Myokarditis', 'Diagnosis_Presumptive_no appendicitis', 'Diagnosis_Presumptive_prolongierte Gastroenteritis', 'Diagnosis_no appendicitis', 'Appendix_on_US_yes', 'Migratory_Pain_yes', 'Lower_Right_Abd_Pain_yes', 'Contralateral_Rebound_Tenderness_yes', 'Coughing_Pain_yes', 'Nausea_yes', 'Loss_of_Appetite_yes', 'Neutrophilia_yes', 'Dysuria_yes', 'Stool_constipation, diarrhea', 'Stool_diarrhea', 'Stool_normal', 'Peritonitis_local', 'Peritonitis_no', 'Psoas_Sign_yes', 'Free_Fluids_yes']

Dimensiones de X: (589, 41)

Dimensiones de Y codificado: (589,)

Primeros 5 valores codificados de y: [0 0 0 0 0]

Etiquetas originales de Y: ['conservative' 'primary surgical' 'secondary surgical']

Dimensiones de X_train: (412, 41)

Dimensiones de X_test: (177, 41)

Dimensiones de y_train: (412,)

Dimensiones de y_test: (177,)

```
[9]: from sklearn.metrics import (
    accuracy_score, precision_score, recall_score, f1_score,
    confusion_matrix
)

resultados = []
matrices_confusion_train = {}
matrices_confusion_test = {}

for nombre, modelo in clasificadores:
    modelo.fit(X_train, y_train)

    # Predicciones
    y_train_pred = modelo.predict(X_train)
    y_test_pred = modelo.predict(X_test)

    # Métricas
    acc_train = accuracy_score(y_train, y_train_pred)
    acc_test = accuracy_score(y_test, y_test_pred)
    prec = precision_score(y_test, y_test_pred, average='weighted',
    ↪zero_division=0)
    rec = recall_score(y_test, y_test_pred, average='weighted')
```

```

f1 = f1_score(y_test, y_test_pred, average='weighted')

# Matrices de confusión
cm_train = confusion_matrix(y_train, y_train_pred)
cm_test = confusion_matrix(y_test, y_test_pred)
matrices_confusion_train[nombre] = cm_train
matrices_confusion_test[nombre] = cm_test

# Almacenar resultados
resultados.append({
    'Modelo': nombre,
    'Accuracy Train': acc_train,
    'Accuracy Test': acc_test,
    'Precision': prec,
    'Recall': rec,
    'F1 Score': f1
})

df_resultados = pd.DataFrame(resultados).sort_values(by='Accuracy Test',
↪ascending=False)

```

[10]: df_resultados

```

[10]:
      Modelo  Accuracy Train  Accuracy Test  Precision  Recall  \
1  Random Forest          1.000000      0.966102   0.960791  0.966102
2  Árbol de Decisión          1.000000      0.932203   0.947679  0.932203
0  Regresión Logística          0.917476      0.898305   0.900608  0.898305

      F1 Score
1  0.963420
2  0.939697
0  0.899158

```

```

[11]: for nombre, modelo in clasificadores:
        y_pred = modelo.predict(X_test)
        print("="*50)
        print(f" Modelo: {nombre}")
        print(classification_report(y_test, y_pred, target_names=le.classes_))

```

```

=====
Modelo: Regresión Logística
              precision    recall  f1-score   support

 conservative      0.94      0.92      0.93        127
 primary surgical   0.81      0.86      0.83         49
 secondary surgical  0.00      0.00      0.00          1

 accuracy              0.90              177

```

macro avg	0.58	0.59	0.59	177
weighted avg	0.90	0.90	0.90	177

```
=====
Modelo: Random Forest
      precision    recall  f1-score   support

 conservative      0.98      0.98      0.98      127
 primary surgical      0.94      0.96      0.95       49
 secondary surgical      0.00      0.00      0.00        1

 accuracy              0.97      177
 macro avg              0.64      0.65      0.64      177
 weighted avg           0.96      0.97      0.96      177
=====
```

```
=====
Modelo: Árbol de Decisión
      precision    recall  f1-score   support

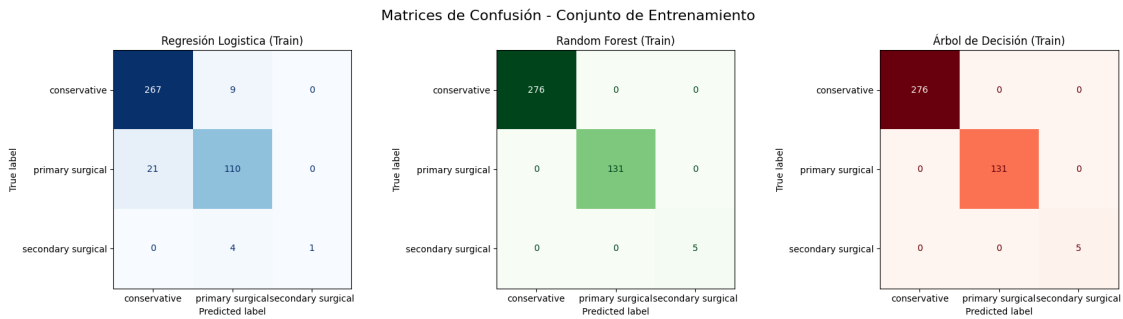
 conservative      0.97      0.97      0.97      127
 primary surgical      0.91      0.86      0.88       49
 secondary surgical      0.00      0.00      0.00        1

 accuracy              0.93      177
 macro avg              0.63      0.61      0.62      177
 weighted avg           0.95      0.93      0.94      177
=====
```

```
[12]: # Figura con matrices de entrenamiento
fig, axes = plt.subplots(1, 3, figsize=(18, 5))
etiquetas = le.classes_

for i, (nombre, _) in enumerate(clasificadores):
    ConfusionMatrixDisplay(
        confusion_matrix=matrices_confusion_train[nombre],
        display_labels=etiquetas
    ).plot(cmap=["Blues", "Greens", "Reds"][i], ax=axes[i], colorbar=False)
    axes[i].set_title(f"{nombre} (Train)")

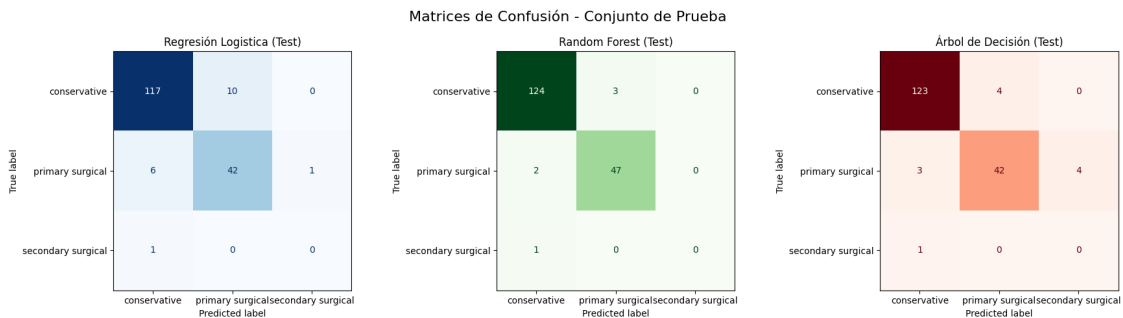
fig.suptitle("Matrices de Confusión - Conjunto de Entrenamiento", fontsize=16)
plt.tight_layout()
plt.show()
```



```
[13]: # Figura con matrices de prueba
fig, axes = plt.subplots(1, 3, figsize=(18, 5))
etiquetas = le.classes_

for i, (nombre, _) in enumerate(clasificadores):
    ConfusionMatrixDisplay(
        confusion_matrix=matrices_confusion_test[nombre],
        display_labels=etiquetas
    ).plot(cmap=["Blues", "Greens", "Reds"][i], ax=axes[i], colorbar=False)
    axes[i].set_title(f"{nombre} (Test)")

fig.suptitle("Matrices de Confusión - Conjunto de Prueba", fontsize=16)
plt.tight_layout()
plt.show()
```



```
[14]: # Binarizar y preparar clases
y_test_binarizado = label_binarize(y_test, classes=[0, 1, 2])
n_clases = y_test_binarizado.shape[1]
etiquetas = le.classes_

# Colores fijos para consistencia
colores = ['blue', 'orange', 'green'] # conservar orden: conservative,
    ↪ primary, secondary
```

```

# Crear figura
fig, axes = plt.subplots(1, 3, figsize=(18, 5))

# Tabla para resumen AUC promedio
auc_resumen = []

for i, (nombre, modelo) in enumerate(clasificadores):
    y_score = modelo.predict_proba(X_test)

    aucs_por_clase = []

    for clase in range(n_clases):
        fpr, tpr, _ = roc_curve(y_test_binarizado[:, clase], y_score[:, clase])
        roc_auc = auc(fpr, tpr)
        aucs_por_clase.append(roc_auc)

        axes[i].plot(fpr, tpr, lw=2, label=f'{etiquetas[clase]} (AUC = {roc_auc:
↪.2f})', color=colores[clase])

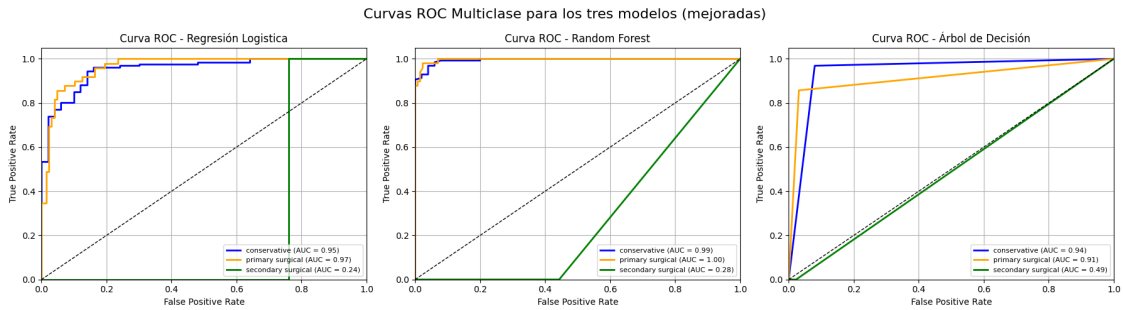
    # Gráfico de referencia
    axes[i].plot([0, 1], [0, 1], 'k--', lw=1)
    axes[i].set_xlim([0.0, 1.0])
    axes[i].set_ylim([0.0, 1.05])
    axes[i].set_xlabel('False Positive Rate')
    axes[i].set_ylabel('True Positive Rate')
    axes[i].set_title(f'Curva ROC - {nombre}')
    axes[i].legend(loc="lower right", fontsize=8)
    axes[i].grid(True)

    # Guardar AUC promedio macro
    auc_promedio = np.mean(aucs_por_clase)
    auc_resumen.append({'Modelo': nombre, 'AUC Promedio (macro)': auc_promedio})

# Título general
fig.suptitle("Curvas ROC Multiclase para los tres modelos (mejoradas)",
↪    fontsize=16)
plt.tight_layout()
plt.show()

# Tabla resumen de AUC promedio
df_auc = pd.DataFrame(auc_resumen).sort_values(by='AUC Promedio (macro)',
↪    ascending=False)
display(df_auc)

```



	Modelo	AUC Promedio (macro)
2	Árbol de Decisión	0.781945
1	Random Forest	0.756754
0	Regresión Logística	0.719507

```
[15]: import IPython.display as dsp

df_resumen_problema1 = pd.merge(df_resultados, df_auc, on='Modelo')
df_resumen_problema1.insert(0, 'Problema', 1)

columnas_ordenadas = [
    'Problema', 'Modelo', 'Accuracy Train', 'Accuracy Test',
    'Precision', 'Recall', 'F1 Score', 'AUC Promedio (macro)'
]
df_resumen_problema1 = df_resumen_problema1[columnas_ordenadas]

mejor_modelo = df_resumen_problema1.sort_values(by='Accuracy Test',
↪ascending=False).iloc[0]['Modelo']
df_resumen_problema1['Mejor Modelo'] = df_resumen_problema1['Modelo'].apply(
    lambda x: ' ' if x == mejor_modelo else ' '
)

# Mostrar tabla
dsp.display(df_resumen_problema1.round(3))
```

	Problema	Modelo	Accuracy Train	Accuracy Test	Precision \
0	1	Random Forest	1.000	0.966	0.961
1	1	Árbol de Decisión	1.000	0.932	0.948
2	1	Regresión Logística	0.917	0.898	0.901

	Recall	F1 Score	AUC Promedio (macro)	Mejor Modelo
0	0.966	0.963	0.757	
1	0.932	0.940	0.782	
2	0.898	0.899	0.720	

0.5 PROBLEMA N.2 (APRENDIZAJE AUTOMATICO)

Clasificación de la calidad de una manzana a partir de sus propiedades físico-químicas

Dataset:<https://www.kaggle.com/datasets/nelgiryewithana/apple-quality>

```
[16]: # --- Separar el DataFrame en X y ---
X = df_apple_limpio.drop('Quality', axis=1) # Quitamos la columna objetivo
y = df_apple_limpio['Quality']             # Variable objetivo binaria: 1
    ↪ 'good' / 'bad'

# --- Codificar variables categóricas (como 'Color', si existe) en X ---
X = pd.get_dummies(X, drop_first=True)

# --- Codificar la variable Y (target) a numérico ---
from sklearn.preprocessing import LabelEncoder

le = LabelEncoder()
y = le.fit_transform(y)

# --- Verificación ---
print("Columnas de X codificado:", X.columns.tolist())
print("Dimensiones de X:", X.shape)
print("Dimensiones de y codificado:", y.shape)
print("Primeros 5 valores codificados de y:", y[:5])
print("Etiquetas originales de y:", le.classes_)

# --- Dividir datos en entrenamiento y prueba ---
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
    ↪ random_state=42)

# --- Verificación de dimensiones ---
print("Dimensiones de X_train:", X_train.shape)
print("Dimensiones de X_test:", X_test.shape)
print("Dimensiones de y_train:", y_train.shape)
print("Dimensiones de y_test:", y_test.shape)
```

```
Columnas de X codificado: ['A_id', 'Size', 'Weight', 'Sweetness', 'Crunchiness',
'Juiciness', 'Ripeness', 'Acidity_-0.001593958', 'Acidity_-0.003109107',
'Acidity_-0.008136378', 'Acidity_-0.009153027', 'Acidity_-0.011438035',
'Acidity_-0.011582814', 'Acidity_-0.012061768', 'Acidity_-0.012433307',
'Acidity_-0.012611428', 'Acidity_-0.014252196', 'Acidity_-0.014548296',
'Acidity_-0.01630256', 'Acidity_-0.017094245', 'Acidity_-0.021751811',
'Acidity_-0.021881716', 'Acidity_-0.022774534', 'Acidity_-0.024607366',
'Acidity_-0.024782906', 'Acidity_-0.025322858', 'Acidity_-0.026114955',
'Acidity_-0.026177532', 'Acidity_-0.0287965', 'Acidity_-0.029111848',
'Acidity_-0.030533085', 'Acidity_-0.030536884', 'Acidity_-0.031126053',
```

'Acidity_-0.032305611', 'Acidity_-0.033737529', 'Acidity_-0.035106956',
'Acidity_-0.035775461', 'Acidity_-0.037423169', 'Acidity_-0.037817127',
'Acidity_-0.03893581', 'Acidity_-0.040585042', 'Acidity_-0.041491395',
'Acidity_-0.04287989', 'Acidity_-0.043227512', 'Acidity_-0.043436179',
'Acidity_-0.045183862', 'Acidity_-0.045203447', 'Acidity_-0.045751867',
'Acidity_-0.046495034', 'Acidity_-0.049403327', 'Acidity_-0.049725888',
'Acidity_-0.050037559', 'Acidity_-0.052342248', 'Acidity_-0.052965085',
'Acidity_-0.055333999', 'Acidity_-0.058448189', 'Acidity_-0.058599695',
'Acidity_-0.059952688', 'Acidity_-0.060036533', 'Acidity_-0.060371554',
'Acidity_-0.062892903', 'Acidity_-0.064020014', 'Acidity_-0.064257729',
'Acidity_-0.064418364', 'Acidity_-0.064779143', 'Acidity_-0.067216749',
'Acidity_-0.067312574', 'Acidity_-0.06847672', 'Acidity_-0.068995237',
'Acidity_-0.069598119', 'Acidity_-0.069879417', 'Acidity_-0.07028261',
'Acidity_-0.071538203', 'Acidity_-0.072155984', 'Acidity_-0.079761693',
'Acidity_-0.083171176', 'Acidity_-0.083337968', 'Acidity_-0.08337454',
'Acidity_-0.086582903', 'Acidity_-0.087134055', 'Acidity_-0.088663441',
'Acidity_-0.08899782', 'Acidity_-0.089084964', 'Acidity_-0.089930972',
'Acidity_-0.090021116', 'Acidity_-0.092992357', 'Acidity_-0.093251563',
'Acidity_-0.095012373', 'Acidity_-0.100716598', 'Acidity_-0.101481348',
'Acidity_-0.101619167', 'Acidity_-0.101724645', 'Acidity_-0.103006945',
'Acidity_-0.104389292', 'Acidity_-0.105291052', 'Acidity_-0.105424932',
'Acidity_-0.112472887', 'Acidity_-0.113157751', 'Acidity_-0.114319001',
'Acidity_-0.114346995', 'Acidity_-0.116073579', 'Acidity_-0.116938612',
'Acidity_-0.117891307', 'Acidity_-0.12163975', 'Acidity_-0.121784757',
'Acidity_-0.122705371', 'Acidity_-0.123379089', 'Acidity_-0.125013797',
'Acidity_-0.127366597', 'Acidity_-0.127804206', 'Acidity_-0.129357025',
'Acidity_-0.129697828', 'Acidity_-0.131763548', 'Acidity_-0.13201002',
'Acidity_-0.132407603', 'Acidity_-0.135212578', 'Acidity_-0.138584021',
'Acidity_-0.139888201', 'Acidity_-0.140260908', 'Acidity_-0.142374841',
'Acidity_-0.142418513', 'Acidity_-0.145661877', 'Acidity_-0.147493032',
'Acidity_-0.148094755', 'Acidity_-0.150866596', 'Acidity_-0.153170021',
'Acidity_-0.153359887', 'Acidity_-0.154144723', 'Acidity_-0.154609697',
'Acidity_-0.155022519', 'Acidity_-0.155481559', 'Acidity_-0.155530675',
'Acidity_-0.155858708', 'Acidity_-0.156731288', 'Acidity_-0.157130678',
'Acidity_-0.157924585', 'Acidity_-0.15793634', 'Acidity_-0.158018044',
'Acidity_-0.159626345', 'Acidity_-0.159879504', 'Acidity_-0.160666067',
'Acidity_-0.160762434', 'Acidity_-0.162040748', 'Acidity_-0.163210965',
'Acidity_-0.1640507', 'Acidity_-0.165532307', 'Acidity_-0.166238213',
'Acidity_-0.166840905', 'Acidity_-0.166934434', 'Acidity_-0.171433286',
'Acidity_-0.171514808', 'Acidity_-0.171976702', 'Acidity_-0.172241138',
'Acidity_-0.175329442', 'Acidity_-0.176108441', 'Acidity_-0.180186783',
'Acidity_-0.180916277', 'Acidity_-0.181076729', 'Acidity_-0.181237683',
'Acidity_-0.184644788', 'Acidity_-0.185962292', 'Acidity_-0.187720712',
'Acidity_-0.190202595', 'Acidity_-0.19350131', 'Acidity_-0.19466949',
'Acidity_-0.195057181', 'Acidity_-0.195111846', 'Acidity_-0.19729751',
'Acidity_-0.198068641', 'Acidity_-0.199364539', 'Acidity_-0.20004532',
'Acidity_-0.201099027', 'Acidity_-0.201583219', 'Acidity_-0.20164097',
'Acidity_-0.205165577', 'Acidity_-0.206759919', 'Acidity_-0.207245857',

'Acidity_-0.207891707', 'Acidity_-0.208976341', 'Acidity_-0.209055894',
'Acidity_-0.209677379', 'Acidity_-0.209986622', 'Acidity_-0.211490845',
'Acidity_-0.212057285', 'Acidity_-0.212711899', 'Acidity_-0.213484699',
'Acidity_-0.214724499', 'Acidity_-0.218830741', 'Acidity_-0.219795307',
'Acidity_-0.221104798', 'Acidity_-0.221227947', 'Acidity_-0.222391791',
'Acidity_-0.22261528', 'Acidity_-0.222751026', 'Acidity_-0.223255333',
'Acidity_-0.225686776', 'Acidity_-0.226509407', 'Acidity_-0.228236467',
'Acidity_-0.229714061', 'Acidity_-0.232190647', 'Acidity_-0.23537231',
'Acidity_-0.236998031', 'Acidity_-0.237104575', 'Acidity_-0.237263801',
'Acidity_-0.240021926', 'Acidity_-0.240177877', 'Acidity_-0.24299231',
'Acidity_-0.24524675', 'Acidity_-0.246022141', 'Acidity_-0.247001025',
'Acidity_-0.247436221', 'Acidity_-0.247542181', 'Acidity_-0.248249837',
'Acidity_-0.250708498', 'Acidity_-0.251871449', 'Acidity_-0.253866598',
'Acidity_-0.2553206', 'Acidity_-0.259443433', 'Acidity_-0.264234402',
'Acidity_-0.264526021', 'Acidity_-0.26541206', 'Acidity_-0.266609261',
'Acidity_-0.266775155', 'Acidity_-0.268075678', 'Acidity_-0.268519733',
'Acidity_-0.268954307', 'Acidity_-0.269680302', 'Acidity_-0.270118466',
'Acidity_-0.270345315', 'Acidity_-0.272164508', 'Acidity_-0.274575749',
'Acidity_-0.275670961', 'Acidity_-0.280116277', 'Acidity_-0.280325343',
'Acidity_-0.281977942', 'Acidity_-0.282558364', 'Acidity_-0.2828032',
'Acidity_-0.286911456', 'Acidity_-0.287477036', 'Acidity_-0.289741446',
'Acidity_-0.292091057', 'Acidity_-0.293212613', 'Acidity_-0.293752288',
'Acidity_-0.294918041', 'Acidity_-0.297218327', 'Acidity_-0.297336319',
'Acidity_-0.297613936', 'Acidity_-0.299100961', 'Acidity_-0.299899373',
'Acidity_-0.304185954', 'Acidity_-0.304780024', 'Acidity_-0.306520094',
'Acidity_-0.308598616', 'Acidity_-0.3088289', 'Acidity_-0.311928118',
'Acidity_-0.312796419', 'Acidity_-0.313392864', 'Acidity_-0.315721218',
'Acidity_-0.318278176', 'Acidity_-0.319050723', 'Acidity_-0.319752434',
'Acidity_-0.320548874', 'Acidity_-0.320573507', 'Acidity_-0.321599953',
'Acidity_-0.325436857', 'Acidity_-0.328378522', 'Acidity_-0.331566813',
'Acidity_-0.332070551', 'Acidity_-0.33283833', 'Acidity_-0.337194942',
'Acidity_-0.338260538', 'Acidity_-0.342965528', 'Acidity_-0.347664165',
'Acidity_-0.348891561', 'Acidity_-0.352363349', 'Acidity_-0.352533686',
'Acidity_-0.3529432', 'Acidity_-0.353434952', 'Acidity_-0.354309056',
'Acidity_-0.356564039', 'Acidity_-0.358597278', 'Acidity_-0.359520606',
'Acidity_-0.360762862', 'Acidity_-0.361346892', 'Acidity_-0.362249992',
'Acidity_-0.362616748', 'Acidity_-0.364658365', 'Acidity_-0.364772303',
'Acidity_-0.365323639', 'Acidity_-0.366087423', 'Acidity_-0.369305737',
'Acidity_-0.369886702', 'Acidity_-0.37030521', 'Acidity_-0.370717416',
'Acidity_-0.37089119', 'Acidity_-0.372651142', 'Acidity_-0.373300429',
'Acidity_-0.37351141', 'Acidity_-0.376803568', 'Acidity_-0.378882061',
'Acidity_-0.380388345', 'Acidity_-0.3815496', 'Acidity_-0.382318078',
'Acidity_-0.384522554', 'Acidity_-0.387311965', 'Acidity_-0.388277768',
'Acidity_-0.388747934', 'Acidity_-0.393146676', 'Acidity_-0.39362185',
'Acidity_-0.393669424', 'Acidity_-0.395249528', 'Acidity_-0.395376725',
'Acidity_-0.396177027', 'Acidity_-0.396285908', 'Acidity_-0.398543188',
'Acidity_-0.398598247', 'Acidity_-0.400220952', 'Acidity_-0.401394668',
'Acidity_-0.401986967', 'Acidity_-0.402378588', 'Acidity_-0.402743578',

'Acidity_-0.402743899', 'Acidity_-0.404406676', 'Acidity_-0.404411056',
'Acidity_-0.405650725', 'Acidity_-0.409655793', 'Acidity_-0.409698609',
'Acidity_-0.410368282', 'Acidity_-0.414499767', 'Acidity_-0.415019589',
'Acidity_-0.417714457', 'Acidity_-0.417913889', 'Acidity_-0.419030643',
'Acidity_-0.419815008', 'Acidity_-0.420776079', 'Acidity_-0.423856214',
'Acidity_-0.424229645', 'Acidity_-0.426531147', 'Acidity_-0.426703685',
'Acidity_-0.427016765', 'Acidity_-0.429252652', 'Acidity_-0.429658576',
'Acidity_-0.43079891', 'Acidity_-0.431719785', 'Acidity_-0.433008056',
'Acidity_-0.434602915', 'Acidity_-0.435061046', 'Acidity_-0.436040062',
'Acidity_-0.43826909', 'Acidity_-0.439551693', 'Acidity_-0.441318604',
'Acidity_-0.442167341', 'Acidity_-0.442221981', 'Acidity_-0.445254562',
'Acidity_-0.445385345', 'Acidity_-0.445502635', 'Acidity_-0.446923846',
'Acidity_-0.448345002', 'Acidity_-0.449605316', 'Acidity_-0.450351301',
'Acidity_-0.452403545', 'Acidity_-0.452462829', 'Acidity_-0.453097422',
'Acidity_-0.453107702', 'Acidity_-0.454867529', 'Acidity_-0.456343829',
'Acidity_-0.458133124', 'Acidity_-0.458505316', 'Acidity_-0.459299267',
'Acidity_-0.461544176', 'Acidity_-0.463927147', 'Acidity_-0.464272899',
'Acidity_-0.46500337', 'Acidity_-0.465744571', 'Acidity_-0.466357237',
'Acidity_-0.467195847', 'Acidity_-0.467479407', 'Acidity_-0.468873071',
'Acidity_-0.471432166', 'Acidity_-0.472352512', 'Acidity_-0.474934654',
'Acidity_-0.475460518', 'Acidity_-0.475792246', 'Acidity_-0.476322949',
'Acidity_-0.476339027', 'Acidity_-0.476545377', 'Acidity_-0.481364103',
'Acidity_-0.481429777', 'Acidity_-0.482243679', 'Acidity_-0.483888959',
'Acidity_-0.484022389', 'Acidity_-0.485425281', 'Acidity_-0.485887104',
'Acidity_-0.486259057', 'Acidity_-0.486725293', 'Acidity_-0.487158383',
'Acidity_-0.487297287', 'Acidity_-0.488345281', 'Acidity_-0.490572827',
'Acidity_-0.490589561', 'Acidity_-0.491173801', 'Acidity_-0.491266303',
'Acidity_-0.491447074', 'Acidity_-0.491590483', 'Acidity_-0.491652551',
'Acidity_-0.493836065', 'Acidity_-0.493978613', 'Acidity_-0.494913274',
'Acidity_-0.495153874', 'Acidity_-0.498427512', 'Acidity_-0.500546815',
'Acidity_-0.500785638', 'Acidity_-0.502763647', 'Acidity_-0.505211353',
'Acidity_-0.506908778', 'Acidity_-0.508210454', 'Acidity_-0.509261855',
'Acidity_-0.510457242', 'Acidity_-0.512978748', 'Acidity_-0.51325681',
'Acidity_-0.514661791', 'Acidity_-0.515157585', 'Acidity_-0.518724707',
'Acidity_-0.518849651', 'Acidity_-0.520586153', 'Acidity_-0.521118184',
'Acidity_-0.522776192', 'Acidity_-0.523976498', 'Acidity_-0.524903868',
'Acidity_-0.525431727', 'Acidity_-0.52823467', 'Acidity_-0.52902919',
'Acidity_-0.530663222', 'Acidity_-0.531192355', 'Acidity_-0.533024496',
'Acidity_-0.533379941', 'Acidity_-0.533808885', 'Acidity_-0.534094288',
'Acidity_-0.534298775', 'Acidity_-0.539101247', 'Acidity_-0.53944205',
'Acidity_-0.540070346', 'Acidity_-0.541750458', 'Acidity_-0.542510772',
'Acidity_-0.544761148', 'Acidity_-0.544826103', 'Acidity_-0.549522887',
'Acidity_-0.549825346', 'Acidity_-0.550468315', 'Acidity_-0.550514699',
'Acidity_-0.551683935', 'Acidity_-0.553338298', 'Acidity_-0.556703085',
'Acidity_-0.556968634', 'Acidity_-0.558208683', 'Acidity_-0.55847561',
'Acidity_-0.559362496', 'Acidity_-0.559688927', 'Acidity_-0.56257843',
'Acidity_-0.562910005', 'Acidity_-0.566140943', 'Acidity_-0.568033409',
'Acidity_-0.571770884', 'Acidity_-0.572295971', 'Acidity_-0.574108525',

'Acidity_-0.575085932', 'Acidity_-0.575898292', 'Acidity_-0.575944026',
'Acidity_-0.576675064', 'Acidity_-0.577515827', 'Acidity_-0.580636807',
'Acidity_-0.584857573', 'Acidity_-0.586266336', 'Acidity_-0.58628671',
'Acidity_-0.586411241', 'Acidity_-0.587674412', 'Acidity_-0.587753816',
'Acidity_-0.588996732', 'Acidity_-0.590615714', 'Acidity_-0.591156761',
'Acidity_-0.593803367', 'Acidity_-0.594522307', 'Acidity_-0.594941438',
'Acidity_-0.595644653', 'Acidity_-0.598258687', 'Acidity_-0.600034154',
'Acidity_-0.600271979', 'Acidity_-0.600943284', 'Acidity_-0.603270824',
'Acidity_-0.603548753', 'Acidity_-0.607660179', 'Acidity_-0.609772001',
'Acidity_-0.613702772', 'Acidity_-0.615545776', 'Acidity_-0.616023504',
'Acidity_-0.618401567', 'Acidity_-0.621715231', 'Acidity_-0.622331787',
'Acidity_-0.62391155', 'Acidity_-0.624850579', 'Acidity_-0.625379668',
'Acidity_-0.625875999', 'Acidity_-0.627642994', 'Acidity_-0.630160574',
'Acidity_-0.632589366', 'Acidity_-0.633685208', 'Acidity_-0.635232848',
'Acidity_-0.636625891', 'Acidity_-0.641906912', 'Acidity_-0.642410731',
'Acidity_-0.64743073', 'Acidity_-0.649064514', 'Acidity_-0.651472669',
'Acidity_-0.651763831', 'Acidity_-0.651893154', 'Acidity_-0.657783225',
'Acidity_-0.662106626', 'Acidity_-0.662878148', 'Acidity_-0.666486737',
'Acidity_-0.66938657', 'Acidity_-0.671464525', 'Acidity_-0.675343239',
'Acidity_-0.676107581', 'Acidity_-0.679285685', 'Acidity_-0.679388519',
'Acidity_-0.680335038', 'Acidity_-0.681570939', 'Acidity_-0.683793916',
'Acidity_-0.683917462', 'Acidity_-0.684437591', 'Acidity_-0.686163646',
'Acidity_-0.687521898', 'Acidity_-0.689292785', 'Acidity_-0.693294222',
'Acidity_-0.693438851', 'Acidity_-0.693510247', 'Acidity_-0.69651361',
'Acidity_-0.698871555', 'Acidity_-0.701531939', 'Acidity_-0.703213729',
'Acidity_-0.70466805', 'Acidity_-0.70515812', 'Acidity_-0.70532865',
'Acidity_-0.705385436', 'Acidity_-0.70578237', 'Acidity_-0.708988229',
'Acidity_-0.709214531', 'Acidity_-0.709236896', 'Acidity_-0.710313296',
'Acidity_-0.711558086', 'Acidity_-0.712190722', 'Acidity_-0.714199104',
'Acidity_-0.720917908', 'Acidity_-0.721453515', 'Acidity_-0.721606341',
'Acidity_-0.721931929', 'Acidity_-0.722809367', 'Acidity_-0.72650885',
'Acidity_-0.727764951', 'Acidity_-0.728190556', 'Acidity_-0.728537862',
'Acidity_-0.731351697', 'Acidity_-0.733235908', 'Acidity_-0.739283923',
'Acidity_-0.740705926', 'Acidity_-0.7445219', 'Acidity_-0.7459267',
'Acidity_-0.746742282', 'Acidity_-0.747510868', 'Acidity_-0.74790279',
'Acidity_-0.747989889', 'Acidity_-0.748039619', 'Acidity_-0.751640827',
'Acidity_-0.751744832', 'Acidity_-0.754772933', 'Acidity_-0.756159031',
'Acidity_-0.756864314', 'Acidity_-0.757241868', 'Acidity_-0.758083109',
'Acidity_-0.758572586', 'Acidity_-0.760862459', 'Acidity_-0.761850508',
'Acidity_-0.762112528', 'Acidity_-0.76275429', 'Acidity_-0.765000312',
'Acidity_-0.765057007', 'Acidity_-0.76858734', 'Acidity_-0.771035039',
'Acidity_-0.771607308', 'Acidity_-0.771769254', 'Acidity_-0.772829229',
'Acidity_-0.773422808', 'Acidity_-0.777125843', 'Acidity_-0.777963277',
'Acidity_-0.778000656', 'Acidity_-0.779829007', 'Acidity_-0.779940614',
'Acidity_-0.780995024', 'Acidity_-0.782277871', 'Acidity_-0.782556409',
'Acidity_-0.783602296', 'Acidity_-0.786841505', 'Acidity_-0.791890878',
'Acidity_-0.791927318', 'Acidity_-0.792172479', 'Acidity_-0.794370301',
'Acidity_-0.7949044', 'Acidity_-0.796702202', 'Acidity_-0.796702882',

'Acidity_-0.799352658', 'Acidity_-0.801235143', 'Acidity_-0.801434151',
'Acidity_-0.803958746', 'Acidity_-0.805294862', 'Acidity_-0.810135014',
'Acidity_-0.811324293', 'Acidity_-0.812285956', 'Acidity_-0.81231003',
'Acidity_-0.813438826', 'Acidity_-0.813557818', 'Acidity_-0.81558716',
'Acidity_-0.815654524', 'Acidity_-0.815660285', 'Acidity_-0.816365227',
'Acidity_-0.818700955', 'Acidity_-0.819232392', 'Acidity_-0.82028043',
'Acidity_-0.820290944', 'Acidity_-0.821002238', 'Acidity_-0.822828237',
'Acidity_-0.824822105', 'Acidity_-0.826248186', 'Acidity_-0.826906012',
'Acidity_-0.82719456', 'Acidity_-0.827880576', 'Acidity_-0.831360337',
'Acidity_-0.831599748', 'Acidity_-0.831623942', 'Acidity_-0.832732459',
'Acidity_-0.833616032', 'Acidity_-0.835054852', 'Acidity_-0.836107034',
'Acidity_-0.836166022', 'Acidity_-0.836539152', 'Acidity_-0.837065778',
'Acidity_-0.838856348', 'Acidity_-0.839104478', 'Acidity_-0.840986776',
'Acidity_-0.841695386', 'Acidity_-0.841906665', 'Acidity_-0.842503239',
'Acidity_-0.844435863', 'Acidity_-0.844719722', 'Acidity_-0.846369849',
'Acidity_-0.851295192', 'Acidity_-0.852910474', 'Acidity_-0.853948036',
'Acidity_-0.856481232', 'Acidity_-0.856561122', 'Acidity_-0.858438387',
'Acidity_-0.859936938', 'Acidity_-0.865797956', 'Acidity_-0.866138499',
'Acidity_-0.868245492', 'Acidity_-0.873064683', 'Acidity_-0.876620761',
'Acidity_-0.87745592', 'Acidity_-0.882947341', 'Acidity_-0.884502772',
'Acidity_-0.88488274', 'Acidity_-0.885985558', 'Acidity_-0.887194383',
'Acidity_-0.88752163', 'Acidity_-0.894186563', 'Acidity_-0.896947428',
'Acidity_-0.899930932', 'Acidity_-0.900825856', 'Acidity_-0.900962827',
'Acidity_-0.905208948', 'Acidity_-0.905345771', 'Acidity_-0.908360248',
'Acidity_-0.909613055', 'Acidity_-0.911224331', 'Acidity_-0.912395857',
'Acidity_-0.912977459', 'Acidity_-0.916131', 'Acidity_-0.917775403',
'Acidity_-0.918587296', 'Acidity_-0.920848181', 'Acidity_-0.921203548',
'Acidity_-0.921238606', 'Acidity_-0.921359724', 'Acidity_-0.923307315',
'Acidity_-0.924374191', 'Acidity_-0.925759589', 'Acidity_-0.928323609',
'Acidity_-0.930151642', 'Acidity_-0.930807428', 'Acidity_-0.931903755',
'Acidity_-0.932228278', 'Acidity_-0.932557413', 'Acidity_-0.936970586',
'Acidity_-0.93849036', 'Acidity_-0.938837813', 'Acidity_-0.941217156',
'Acidity_-0.944009775', 'Acidity_-0.944209504', 'Acidity_-0.94467615',
'Acidity_-0.945080106', 'Acidity_-0.946008716', 'Acidity_-0.947002551',
'Acidity_-0.94853192', 'Acidity_-0.950800307', 'Acidity_-0.95186741',
'Acidity_-0.953286976', 'Acidity_-0.953665479', 'Acidity_-0.953914561',
'Acidity_-0.955725798', 'Acidity_-0.960916549', 'Acidity_-0.961003564',
'Acidity_-0.961164357', 'Acidity_-0.961324304', 'Acidity_-0.964795146',
'Acidity_-0.964945495', 'Acidity_-0.965657546', 'Acidity_-0.969689707',
'Acidity_-0.970235117', 'Acidity_-0.970844205', 'Acidity_-0.973028819',
'Acidity_-0.977348263', 'Acidity_-0.97791175', 'Acidity_-0.980073421',
'Acidity_-0.98138767', 'Acidity_-0.981738246', 'Acidity_-0.985096387',
'Acidity_-0.987967575', 'Acidity_-0.987979264', 'Acidity_-0.990261265',
'Acidity_-0.990545561', 'Acidity_-0.99116221', 'Acidity_-0.99235719',
'Acidity_-0.993894782', 'Acidity_-0.994363844', 'Acidity_-0.995586036',
'Acidity_-0.998086414', 'Acidity_-1.0020498', 'Acidity_-1.003866289',
'Acidity_-1.005574147', 'Acidity_-1.007957945', 'Acidity_-1.008545765',
'Acidity_-1.010206942', 'Acidity_-1.012158006', 'Acidity_-1.013110289',

'Acidity_-1.01323595', 'Acidity_-1.014262058', 'Acidity_-1.015782155',
'Acidity_-1.016481028', 'Acidity_-1.016744147', 'Acidity_-1.016751894',
'Acidity_-1.016811874', 'Acidity_-1.01691619', 'Acidity_-1.018861092',
'Acidity_-1.021048144', 'Acidity_-1.021940944', 'Acidity_-1.022076896',
'Acidity_-1.022113594', 'Acidity_-1.022736521', 'Acidity_-1.02428096',
'Acidity_-1.02746287', 'Acidity_-1.03071463', 'Acidity_-1.031509395',
'Acidity_-1.032193774', 'Acidity_-1.033433159', 'Acidity_-1.037023221',
'Acidity_-1.037591443', 'Acidity_-1.037979931', 'Acidity_-1.03820733',
'Acidity_-1.038278443', 'Acidity_-1.038366412', 'Acidity_-1.041618262',
'Acidity_-1.044119', 'Acidity_-1.045022463', 'Acidity_-1.046069507',
'Acidity_-1.047266468', 'Acidity_-1.049762868', 'Acidity_-1.052173301',
'Acidity_-1.056070673', 'Acidity_-1.057525635', 'Acidity_-1.059747757',
'Acidity_-1.065906691', 'Acidity_-1.071621924', 'Acidity_-1.072149163',
'Acidity_-1.072446111', 'Acidity_-1.073124668', 'Acidity_-1.073303814',
'Acidity_-1.074466736', 'Acidity_-1.074677266', 'Acidity_-1.074680749',
'Acidity_-1.075780377', 'Acidity_-1.075812207', 'Acidity_-1.075872105',
'Acidity_-1.078644834', 'Acidity_-1.080151306', 'Acidity_-1.082842655',
'Acidity_-1.083532988', 'Acidity_-1.083620788', 'Acidity_-1.085596232',
'Acidity_-1.089252346', 'Acidity_-1.094247351', 'Acidity_-1.094367441',
'Acidity_-1.094727349', 'Acidity_-1.0954011', 'Acidity_-1.097949458',
'Acidity_-1.098018395', 'Acidity_-1.098326042', 'Acidity_-1.098696642',
'Acidity_-1.101446241', 'Acidity_-1.101755862', 'Acidity_-1.102217986',
'Acidity_-1.103758111', 'Acidity_-1.104954734', 'Acidity_-1.10912618',
'Acidity_-1.109341247', 'Acidity_-1.109603654', 'Acidity_-1.11395109',
'Acidity_-1.115162513', 'Acidity_-1.115966245', 'Acidity_-1.116251429',
'Acidity_-1.117317375', 'Acidity_-1.117440894', 'Acidity_-1.119954024',
'Acidity_-1.120162817', 'Acidity_-1.12185085', 'Acidity_-1.122796031',
'Acidity_-1.126932496', 'Acidity_-1.129854827', 'Acidity_-1.13105906',
'Acidity_-1.131353718', 'Acidity_-1.131703903', 'Acidity_-1.13294028',
'Acidity_-1.134481826', 'Acidity_-1.135254622', 'Acidity_-1.136878191',
'Acidity_-1.138202266', 'Acidity_-1.139213205', 'Acidity_-1.141635635',
'Acidity_-1.146541689', 'Acidity_-1.149860234', 'Acidity_-1.151269301',
'Acidity_-1.15329372', 'Acidity_-1.153843133', 'Acidity_-1.15563525',
'Acidity_-1.158128067', 'Acidity_-1.160508623', 'Acidity_-1.161427669',
'Acidity_-1.162362718', 'Acidity_-1.164808614', 'Acidity_-1.165522925',
'Acidity_-1.168716844', 'Acidity_-1.169836168', 'Acidity_-1.170213868',
'Acidity_-1.170504546', 'Acidity_-1.17091649', 'Acidity_-1.171343556',
'Acidity_-1.171349328', 'Acidity_-1.17180874', 'Acidity_-1.172440423',
'Acidity_-1.174097332', 'Acidity_-1.175107477', 'Acidity_-1.176531722',
'Acidity_-1.182859869', 'Acidity_-1.187467937', 'Acidity_-1.187544333',
'Acidity_-1.188430018', 'Acidity_-1.188675877', 'Acidity_-1.189820366',
'Acidity_-1.190605373', 'Acidity_-1.19106958', 'Acidity_-1.191132861',
'Acidity_-1.192430581', 'Acidity_-1.192975776', 'Acidity_-1.198656978',
'Acidity_-1.198752546', 'Acidity_-1.200659973', 'Acidity_-1.203748849',
'Acidity_-1.204729283', 'Acidity_-1.205361339', 'Acidity_-1.207574424',
'Acidity_-1.209371265', 'Acidity_-1.217526316', 'Acidity_-1.218056239',
'Acidity_-1.219137533', 'Acidity_-1.219637157', 'Acidity_-1.22320905',
'Acidity_-1.223954372', 'Acidity_-1.227993857', 'Acidity_-1.228239389',

'Acidity_-1.228662319', 'Acidity_-1.229254586', 'Acidity_-1.230442485',
'Acidity_-1.231201967', 'Acidity_-1.231269108', 'Acidity_-1.231954325',
'Acidity_-1.233923989', 'Acidity_-1.236918712', 'Acidity_-1.237117724',
'Acidity_-1.238271661', 'Acidity_-1.242029527', 'Acidity_-1.243639196',
'Acidity_-1.244090836', 'Acidity_-1.244207232', 'Acidity_-1.244418116',
'Acidity_-1.245114712', 'Acidity_-1.247215776', 'Acidity_-1.248234595',
'Acidity_-1.25036695', 'Acidity_-1.256130956', 'Acidity_-1.260379857',
'Acidity_-1.263063979', 'Acidity_-1.263137235', 'Acidity_-1.266261118',
'Acidity_-1.26652009', 'Acidity_-1.267032978', 'Acidity_-1.270915474',
'Acidity_-1.272654789', 'Acidity_-1.276436424', 'Acidity_-1.277183124',
'Acidity_-1.278020409', 'Acidity_-1.283199906', 'Acidity_-1.284494762',
'Acidity_-1.288854244', 'Acidity_-1.290563234', 'Acidity_-1.29240429',
'Acidity_-1.294135499', 'Acidity_-1.29448487', 'Acidity_-1.299867748',
'Acidity_-1.310354517', 'Acidity_-1.310787649', 'Acidity_-1.312242503',
'Acidity_-1.316498558', 'Acidity_-1.316709464', 'Acidity_-1.317115885',
'Acidity_-1.31740779', 'Acidity_-1.319501638', 'Acidity_-1.326927462',
'Acidity_-1.331010488', 'Acidity_-1.331629395', 'Acidity_-1.333122234',
'Acidity_-1.3334791', 'Acidity_-1.334611391', 'Acidity_-1.334654393',
'Acidity_-1.335152047', 'Acidity_-1.336415136', 'Acidity_-1.336576589',
'Acidity_-1.33782954', 'Acidity_-1.339717006', 'Acidity_-1.341074605',
'Acidity_-1.341537581', 'Acidity_-1.341609287', 'Acidity_-1.344693541',
'Acidity_-1.345222378', 'Acidity_-1.346727343', 'Acidity_-1.347701929',
'Acidity_-1.353458176', 'Acidity_-1.353715891', 'Acidity_-1.354379192',
'Acidity_-1.356287356', 'Acidity_-1.356739922', 'Acidity_-1.356950956',
'Acidity_-1.361078055', 'Acidity_-1.361351188', 'Acidity_-1.365127445',
'Acidity_-1.365244029', 'Acidity_-1.365828711', 'Acidity_-1.369954154',
'Acidity_-1.370209837', 'Acidity_-1.370836529', 'Acidity_-1.37216003',
'Acidity_-1.373321887', 'Acidity_-1.373330522', 'Acidity_-1.375301757',
'Acidity_-1.37665721', 'Acidity_-1.37682618', 'Acidity_-1.37733815',
'Acidity_-1.377681864', 'Acidity_-1.379642791', 'Acidity_-1.381367881',
'Acidity_-1.382419645', 'Acidity_-1.382849117', 'Acidity_-1.383503368',
'Acidity_-1.384707721', 'Acidity_-1.385460542', 'Acidity_-1.38729856',
'Acidity_-1.392445032', 'Acidity_-1.393716037', 'Acidity_-1.394008361',
'Acidity_-1.394149587', 'Acidity_-1.394184455', 'Acidity_-1.394846266',
'Acidity_-1.394863422', 'Acidity_-1.396166003', 'Acidity_-1.39693378',
'Acidity_-1.400045838', 'Acidity_-1.403613427', 'Acidity_-1.407064656',
'Acidity_-1.409884405', 'Acidity_-1.410296641', 'Acidity_-1.413254569',
'Acidity_-1.413630612', 'Acidity_-1.414392056', 'Acidity_-1.414626558',
'Acidity_-1.416347007', 'Acidity_-1.416918958', 'Acidity_-1.419024768',
'Acidity_-1.420395519', 'Acidity_-1.422775542', 'Acidity_-1.424672113',
'Acidity_-1.42480894', 'Acidity_-1.424985366', 'Acidity_-1.425231325',
'Acidity_-1.426638729', 'Acidity_-1.428508854', 'Acidity_-1.428807471',
'Acidity_-1.429723526', 'Acidity_-1.430272117', 'Acidity_-1.430429857',
'Acidity_-1.432245547', 'Acidity_-1.433368628', 'Acidity_-1.437493738',
'Acidity_-1.437745983', 'Acidity_-1.43801903', 'Acidity_-1.44427643',
'Acidity_-1.444479812', 'Acidity_-1.445193398', 'Acidity_-1.446176434',
'Acidity_-1.447407664', 'Acidity_-1.447751284', 'Acidity_-1.448802504',
'Acidity_-1.449308157', 'Acidity_-1.451499763', 'Acidity_-1.453396762',

'Acidity_-1.453878333', 'Acidity_-1.454219836', 'Acidity_-1.455314217',
'Acidity_-1.455839994', 'Acidity_-1.456133779', 'Acidity_-1.457355855',
'Acidity_-1.460898327', 'Acidity_-1.465539339', 'Acidity_-1.466012486',
'Acidity_-1.470125066', 'Acidity_-1.473537531', 'Acidity_-1.474773962',
'Acidity_-1.474869921', 'Acidity_-1.47788311', 'Acidity_-1.478188555',
'Acidity_-1.479707559', 'Acidity_-1.483232895', 'Acidity_-1.484347485',
'Acidity_-1.485660777', 'Acidity_-1.486048914', 'Acidity_-1.487431453',
'Acidity_-1.487521965', 'Acidity_-1.488721191', 'Acidity_-1.490858227',
'Acidity_-1.492676524', 'Acidity_-1.494699742', 'Acidity_-1.494874657',
'Acidity_-1.495112616', 'Acidity_-1.498635305', 'Acidity_-1.498656037',
'Acidity_-1.499622518', 'Acidity_-1.499881687', 'Acidity_-1.501630364',
'Acidity_-1.504922768', 'Acidity_-1.506333071', 'Acidity_-1.507584962',
'Acidity_-1.50774414', 'Acidity_-1.507770861', 'Acidity_-1.50782307',
'Acidity_-1.509871219', 'Acidity_-1.514089626', 'Acidity_-1.517382368',
'Acidity_-1.519371671', 'Acidity_-1.519654387', 'Acidity_-1.521261721',
'Acidity_-1.525738047', 'Acidity_-1.526119857', 'Acidity_-1.527393023',
'Acidity_-1.528270534', 'Acidity_-1.529713032', 'Acidity_-1.532051498',
'Acidity_-1.539788142', 'Acidity_-1.540711874', 'Acidity_-1.552642907',
'Acidity_-1.55746322', 'Acidity_-1.559156989', 'Acidity_-1.559336557',
'Acidity_-1.562123182', 'Acidity_-1.563236348', 'Acidity_-1.564030154',
'Acidity_-1.568007387', 'Acidity_-1.569037068', 'Acidity_-1.570153891',
'Acidity_-1.570350881', 'Acidity_-1.573617152', 'Acidity_-1.576527775',
'Acidity_-1.576681863', 'Acidity_-1.587952145', 'Acidity_-1.58956899',
'Acidity_-1.590177926', 'Acidity_-1.590347457', 'Acidity_-1.590747921',
'Acidity_-1.597359527', 'Acidity_-1.604760616', 'Acidity_-1.606343106',
'Acidity_-1.609770097', 'Acidity_-1.611315674', 'Acidity_-1.611571284',
'Acidity_-1.611753292', 'Acidity_-1.612598392', 'Acidity_-1.614529778',
'Acidity_-1.614855762', 'Acidity_-1.615105438', 'Acidity_-1.618615272',
'Acidity_-1.618798405', 'Acidity_-1.62268429', 'Acidity_-1.626572021',
'Acidity_-1.626797333', 'Acidity_-1.629769541', 'Acidity_-1.632354203',
'Acidity_-1.633272132', 'Acidity_-1.633641993', 'Acidity_-1.634403901',
'Acidity_-1.635295535', 'Acidity_-1.635404402', 'Acidity_-1.636458548',
'Acidity_-1.636582685', 'Acidity_-1.6375486', 'Acidity_-1.638679394',
'Acidity_-1.642436844', 'Acidity_-1.645758888', 'Acidity_-1.652114056',
'Acidity_-1.652992023', 'Acidity_-1.654340482', 'Acidity_-1.655330392',
'Acidity_-1.658382639', 'Acidity_-1.660211588', 'Acidity_-1.660639485',
'Acidity_-1.661294173', 'Acidity_-1.662029824', 'Acidity_-1.664081084',
'Acidity_-1.667016198', 'Acidity_-1.667203637', 'Acidity_-1.668711571',
'Acidity_-1.673578429', 'Acidity_-1.674314414', 'Acidity_-1.675279484',
'Acidity_-1.677969421', 'Acidity_-1.679271349', 'Acidity_-1.679607938',
'Acidity_-1.680924092', 'Acidity_-1.680970102', 'Acidity_-1.684387471',
'Acidity_-1.684659207', 'Acidity_-1.685764024', 'Acidity_-1.692936537',
'Acidity_-1.695979688', 'Acidity_-1.698730403', 'Acidity_-1.70027429',
'Acidity_-1.700396069', 'Acidity_-1.70344056', 'Acidity_-1.705311656',
'Acidity_-1.710943166', 'Acidity_-1.711394876', 'Acidity_-1.712375191',
'Acidity_-1.712621136', 'Acidity_-1.714085315', 'Acidity_-1.714875597',
'Acidity_-1.716680472', 'Acidity_-1.717266777', 'Acidity_-1.718581873',
'Acidity_-1.71883793', 'Acidity_-1.720987553', 'Acidity_-1.721947865',

'Acidity_-1.721968946', 'Acidity_-1.722186761', 'Acidity_-1.722948342',
'Acidity_-1.724640045', 'Acidity_-1.725885201', 'Acidity_-1.72694203',
'Acidity_-1.72733069', 'Acidity_-1.732498176', 'Acidity_-1.73329254',
'Acidity_-1.733447098', 'Acidity_-1.73387327', 'Acidity_-1.735117708',
'Acidity_-1.736012279', 'Acidity_-1.7377166', 'Acidity_-1.737783398',
'Acidity_-1.739287372', 'Acidity_-1.743420492', 'Acidity_-1.745919587',
'Acidity_-1.746685633', 'Acidity_-1.747239147', 'Acidity_-1.750078184',
'Acidity_-1.750282866', 'Acidity_-1.750481108', 'Acidity_-1.751339472',
'Acidity_-1.752809114', 'Acidity_-1.755744072', 'Acidity_-1.756110692',
'Acidity_-1.758251832', 'Acidity_-1.759214369', 'Acidity_-1.76715476',
'Acidity_-1.770887232', 'Acidity_-1.774588694', 'Acidity_-1.778796745',
'Acidity_-1.78125695', 'Acidity_-1.781651819', 'Acidity_-1.785736934',
'Acidity_-1.786390953', 'Acidity_-1.78744711', 'Acidity_-1.788594744',
'Acidity_-1.788673364', 'Acidity_-1.789660235', 'Acidity_-1.791648302',
'Acidity_-1.793667469', 'Acidity_-1.795486331', 'Acidity_-1.79884063',
'Acidity_-1.800760146', 'Acidity_-1.800893018', 'Acidity_-1.805347812',
'Acidity_-1.808142083', 'Acidity_-1.812256803', 'Acidity_-1.814628148',
'Acidity_-1.815198368', 'Acidity_-1.818450848', 'Acidity_-1.81845168',
'Acidity_-1.819622356', 'Acidity_-1.820405061', 'Acidity_-1.822560505',
'Acidity_-1.824904108', 'Acidity_-1.826704357', 'Acidity_-1.833064431',
'Acidity_-1.838594058', 'Acidity_-1.838806737', 'Acidity_-1.839627396',
'Acidity_-1.839709536', 'Acidity_-1.844098803', 'Acidity_-1.845646416',
'Acidity_-1.849898792', 'Acidity_-1.851003324', 'Acidity_-1.852173203',
'Acidity_-1.853269386', 'Acidity_-1.854692443', 'Acidity_-1.865114573',
'Acidity_-1.865832708', 'Acidity_-1.870967196', 'Acidity_-1.873596372',
'Acidity_-1.874856057', 'Acidity_-1.876145015', 'Acidity_-1.877867469',
'Acidity_-1.8810387', 'Acidity_-1.88350261', 'Acidity_-1.885500472',
'Acidity_-1.886004821', 'Acidity_-1.888234231', 'Acidity_-1.888768607',
'Acidity_-1.894868531', 'Acidity_-1.900758276', 'Acidity_-1.904348537',
'Acidity_-1.906380646', 'Acidity_-1.906439223', 'Acidity_-1.911790438',
'Acidity_-1.911851627', 'Acidity_-1.916665389', 'Acidity_-1.916873036',
'Acidity_-1.917976581', 'Acidity_-1.918349804', 'Acidity_-1.919457867',
'Acidity_-1.922671396', 'Acidity_-1.92648196', 'Acidity_-1.926771608',
'Acidity_-1.927133746', 'Acidity_-1.930633745', 'Acidity_-1.931833592',
'Acidity_-1.932152263', 'Acidity_-1.932296411', 'Acidity_-1.933512989',
'Acidity_-1.93413049', 'Acidity_-1.935700362', 'Acidity_-1.936085259',
'Acidity_-1.937411735', 'Acidity_-1.94031386', 'Acidity_-1.941251654',
'Acidity_-1.944981661', 'Acidity_-1.946933753', 'Acidity_-1.947408878',
'Acidity_-1.950320823', 'Acidity_-1.952773954', 'Acidity_-1.953020778',
'Acidity_-1.955656366', 'Acidity_-1.956538847', 'Acidity_-1.957389142',
'Acidity_-1.962664226', 'Acidity_-1.963420629', 'Acidity_-1.964058807',
'Acidity_-1.964758344', 'Acidity_-1.96567694', 'Acidity_-1.966063033',
'Acidity_-1.968351619', 'Acidity_-1.977000824', 'Acidity_-1.979824612',
'Acidity_-1.981574246', 'Acidity_-1.98172907', 'Acidity_-1.982356',
'Acidity_-1.98381094', 'Acidity_-1.990831514', 'Acidity_-1.990957758',
'Acidity_-1.992564683', 'Acidity_-1.998524116', 'Acidity_-1.998824673',
'Acidity_-2.001538354', 'Acidity_-2.005624759', 'Acidity_-2.008544885',
'Acidity_-2.011518699', 'Acidity_-2.018944333', 'Acidity_-2.020660357',

'Acidity_-2.022186257', 'Acidity_-2.03105815', 'Acidity_-2.031178367',
'Acidity_-2.032169189', 'Acidity_-2.033170149', 'Acidity_-2.036698853',
'Acidity_-2.037169723', 'Acidity_-2.044768947', 'Acidity_-2.045652882',
'Acidity_-2.045779422', 'Acidity_-2.045905812', 'Acidity_-2.046503511',
'Acidity_-2.046627469', 'Acidity_-2.047689391', 'Acidity_-2.052738211',
'Acidity_-2.053694418', 'Acidity_-2.05390054', 'Acidity_-2.054184632',
'Acidity_-2.057901543', 'Acidity_-2.058734686', 'Acidity_-2.061053621',
'Acidity_-2.068531974', 'Acidity_-2.069189399', 'Acidity_-2.06921183',
'Acidity_-2.072047579', 'Acidity_-2.072508474', 'Acidity_-2.073924429',
'Acidity_-2.076113997', 'Acidity_-2.077222982', 'Acidity_-2.081906248',
'Acidity_-2.085341847', 'Acidity_-2.087742829', 'Acidity_-2.088865252',
'Acidity_-2.090361332', 'Acidity_-2.090557189', 'Acidity_-2.092763864',
'Acidity_-2.094162271', 'Acidity_-2.101646699', 'Acidity_-2.106325457',
'Acidity_-2.108192127', 'Acidity_-2.108683493', 'Acidity_-2.109832124',
'Acidity_-2.109986332', 'Acidity_-2.114689564', 'Acidity_-2.120654024',
'Acidity_-2.121538832', 'Acidity_-2.124795261', 'Acidity_-2.125177292',
'Acidity_-2.130460727', 'Acidity_-2.13497313', 'Acidity_-2.135251693',
'Acidity_-2.137039909', 'Acidity_-2.13744482', 'Acidity_-2.139487225',
'Acidity_-2.141371139', 'Acidity_-2.141922762', 'Acidity_-2.143204755',
'Acidity_-2.144244362', 'Acidity_-2.146023387', 'Acidity_-2.146420065',
'Acidity_-2.14777319', 'Acidity_-2.148650397', 'Acidity_-2.149219277',
'Acidity_-2.150778123', 'Acidity_-2.152558033', 'Acidity_-2.15334928',
'Acidity_-2.154356678', 'Acidity_-2.160378945', 'Acidity_-2.161802976',
'Acidity_-2.163384024', 'Acidity_-2.170958563', 'Acidity_-2.171343633',
'Acidity_-2.171938158', 'Acidity_-2.17447647', 'Acidity_-2.177388359',
'Acidity_-2.178295845', 'Acidity_-2.17857139', 'Acidity_-2.178990218',
'Acidity_-2.179352823', 'Acidity_-2.179682618', 'Acidity_-2.18279681',
'Acidity_-2.185649097', 'Acidity_-2.186644764', 'Acidity_-2.187043062',
'Acidity_-2.189896681', 'Acidity_-2.190126509', 'Acidity_-2.191083585',
'Acidity_-2.192343114', 'Acidity_-2.195098992', 'Acidity_-2.195781505',
'Acidity_-2.197877521', 'Acidity_-2.200125883', 'Acidity_-2.201604888',
'Acidity_-2.202142041', 'Acidity_-2.202971097', 'Acidity_-2.204610725',
'Acidity_-2.204790514', 'Acidity_-2.206017085', 'Acidity_-2.208685041',
'Acidity_-2.211441171', 'Acidity_-2.212114432', 'Acidity_-2.212947993',
'Acidity_-2.214664806', 'Acidity_-2.218992645', 'Acidity_-2.225723904',
'Acidity_-2.229719806', 'Acidity_-2.230315931', 'Acidity_-2.235372635',
'Acidity_-2.236208646', 'Acidity_-2.246384251', 'Acidity_-2.24664311',
'Acidity_-2.249965831', 'Acidity_-2.251067315', 'Acidity_-2.261259327',
'Acidity_-2.268126637', 'Acidity_-2.269809075', 'Acidity_-2.271361874',
'Acidity_-2.273601407', 'Acidity_-2.273704682', 'Acidity_-2.280808773',
'Acidity_-2.281440707', 'Acidity_-2.281646448', 'Acidity_-2.283013329',
'Acidity_-2.284637715', 'Acidity_-2.290337606', 'Acidity_-2.291247659',
'Acidity_-2.292075129', 'Acidity_-2.292964433', 'Acidity_-2.298875523',
'Acidity_-2.301153993', 'Acidity_-2.304147763', 'Acidity_-2.305923979',
'Acidity_-2.306351404', 'Acidity_-2.309132459', 'Acidity_-2.312181684',
'Acidity_-2.312430431', 'Acidity_-2.314749819', 'Acidity_-2.31541651',
'Acidity_-2.315433582', 'Acidity_-2.317160544', 'Acidity_-2.318115994',
'Acidity_-2.321158436', 'Acidity_-2.327119827', 'Acidity_-2.334165601',

'Acidity_-2.334245356', 'Acidity_-2.334378234', 'Acidity_-2.336331708',
'Acidity_-2.337145932', 'Acidity_-2.339589704', 'Acidity_-2.343132224',
'Acidity_-2.343748011', 'Acidity_-2.348485773', 'Acidity_-2.349616349',
'Acidity_-2.349972115', 'Acidity_-2.350263746', 'Acidity_-2.35095113',
'Acidity_-2.352559669', 'Acidity_-2.362080615', 'Acidity_-2.365989395',
'Acidity_-2.36761053', 'Acidity_-2.368449883', 'Acidity_-2.371781666',
'Acidity_-2.372509423', 'Acidity_-2.37639469', 'Acidity_-2.378220329',
'Acidity_-2.380826862', 'Acidity_-2.383259187', 'Acidity_-2.384086925',
'Acidity_-2.386929328', 'Acidity_-2.392702312', 'Acidity_-2.394496757',
'Acidity_-2.395380818', 'Acidity_-2.397691796', 'Acidity_-2.398270661',
'Acidity_-2.403035562', 'Acidity_-2.403243223', 'Acidity_-2.403308571',
'Acidity_-2.403407092', 'Acidity_-2.406163774', 'Acidity_-2.41369341',
'Acidity_-2.420080801', 'Acidity_-2.423093249', 'Acidity_-2.428275981',
'Acidity_-2.429393469', 'Acidity_-2.436285918', 'Acidity_-2.43979642',
'Acidity_-2.445712666', 'Acidity_-2.448352787', 'Acidity_-2.449484525',
'Acidity_-2.449861733', 'Acidity_-2.450416593', 'Acidity_-2.450763672',
'Acidity_-2.454533933', 'Acidity_-2.461445782', 'Acidity_-2.463749104',
'Acidity_-2.469547062', 'Acidity_-2.47129927', 'Acidity_-2.47195567',
'Acidity_-2.475505407', 'Acidity_-2.478055932', 'Acidity_-2.484300312',
'Acidity_-2.486120112', 'Acidity_-2.491870668', 'Acidity_-2.492708194',
'Acidity_-2.49304192', 'Acidity_-2.496322081', 'Acidity_-2.501304538',
'Acidity_-2.506381031', 'Acidity_-2.509839932', 'Acidity_-2.51282819',
'Acidity_-2.516542927', 'Acidity_-2.517100408', 'Acidity_-2.520334223',
'Acidity_-2.525250744', 'Acidity_-2.526343018', 'Acidity_-2.528922726',
'Acidity_-2.531913018', 'Acidity_-2.538324231', 'Acidity_-2.545404117',
'Acidity_-2.546855975', 'Acidity_-2.549854264', 'Acidity_-2.550249431',
'Acidity_-2.553685122', 'Acidity_-2.554458565', 'Acidity_-2.556006369',
'Acidity_-2.556007083', 'Acidity_-2.556911326', 'Acidity_-2.558510083',
'Acidity_-2.561564247', 'Acidity_-2.568301692', 'Acidity_-2.569348843',
'Acidity_-2.570587079', 'Acidity_-2.570864991', 'Acidity_-2.572776035',
'Acidity_-2.5762885', 'Acidity_-2.577715569', 'Acidity_-2.58188348',
'Acidity_-2.583858134', 'Acidity_-2.585610903', 'Acidity_-2.586663686',
'Acidity_-2.587893347', 'Acidity_-2.589079481', 'Acidity_-2.589271476',
'Acidity_-2.589555547', 'Acidity_-2.589597715', 'Acidity_-2.597220268',
'Acidity_-2.599374036', 'Acidity_-2.600424018', 'Acidity_-2.600627211',
'Acidity_-2.602720262', 'Acidity_-2.60312352', 'Acidity_-2.609107132',
'Acidity_-2.612310691', 'Acidity_-2.615350549', 'Acidity_-2.620271545',
'Acidity_-2.62072577', 'Acidity_-2.621325047', 'Acidity_-2.628356827',
'Acidity_-2.635915732', 'Acidity_-2.636844815', 'Acidity_-2.639847185',
'Acidity_-2.639978091', 'Acidity_-2.643474086', 'Acidity_-2.645657128',
'Acidity_-2.647164684', 'Acidity_-2.650827913', 'Acidity_-2.657511668',
'Acidity_-2.661384616', 'Acidity_-2.661679446', 'Acidity_-2.662369178',
'Acidity_-2.674506672', 'Acidity_-2.678681961', 'Acidity_-2.680302067',
'Acidity_-2.686256143', 'Acidity_-2.686719062', 'Acidity_-2.693037463',
'Acidity_-2.694542386', 'Acidity_-2.694676285', 'Acidity_-2.698721567',
'Acidity_-2.701406904', 'Acidity_-2.702976078', 'Acidity_-2.704740981',
'Acidity_-2.711856524', 'Acidity_-2.715597414', 'Acidity_-2.720479949',
'Acidity_-2.720651525', 'Acidity_-2.727464441', 'Acidity_-2.727666723',

'Acidity_-2.730679347', 'Acidity_-2.734030154', 'Acidity_-2.736862892',
'Acidity_-2.738833565', 'Acidity_-2.742458438', 'Acidity_-2.746453526',
'Acidity_-2.748016953', 'Acidity_-2.749218073', 'Acidity_-2.757038944',
'Acidity_-2.75899695', 'Acidity_-2.760396429', 'Acidity_-2.763581118',
'Acidity_-2.765592868', 'Acidity_-2.777152433', 'Acidity_-2.77866477',
'Acidity_-2.789929031', 'Acidity_-2.793455657', 'Acidity_-2.793807727',
'Acidity_-2.796362372', 'Acidity_-2.797972751', 'Acidity_-2.799680074',
'Acidity_-2.801128268', 'Acidity_-2.802288688', 'Acidity_-2.80256109',
'Acidity_-2.803778412', 'Acidity_-2.810808169', 'Acidity_-2.812780317',
'Acidity_-2.813449028', 'Acidity_-2.813656094', 'Acidity_-2.814401245',
'Acidity_-2.814901901', 'Acidity_-2.824366834', 'Acidity_-2.827877708',
'Acidity_-2.830461841', 'Acidity_-2.830523857', 'Acidity_-2.830885051',
'Acidity_-2.831125855', 'Acidity_-2.835235275', 'Acidity_-2.83624902',
'Acidity_-2.839214332', 'Acidity_-2.84015253', 'Acidity_-2.84060724',
'Acidity_-2.851279554', 'Acidity_-2.851622849', 'Acidity_-2.856544619',
'Acidity_-2.856913601', 'Acidity_-2.85697803', 'Acidity_-2.858869532',
'Acidity_-2.870237493', 'Acidity_-2.871391746', 'Acidity_-2.872017555',
'Acidity_-2.876186916', 'Acidity_-2.877781254', 'Acidity_-2.878008873',
'Acidity_-2.893865646', 'Acidity_-2.894965081', 'Acidity_-2.900739788',
'Acidity_-2.910651105', 'Acidity_-2.913336836', 'Acidity_-2.915046676',
'Acidity_-2.917894697', 'Acidity_-2.919179265', 'Acidity_-2.920077461',
'Acidity_-2.920186182', 'Acidity_-2.924269341', 'Acidity_-2.924449787',
'Acidity_-2.926853781', 'Acidity_-2.92865794', 'Acidity_-2.930449982',
'Acidity_-2.931796158', 'Acidity_-2.93402889', 'Acidity_-2.94294254',
'Acidity_-2.943063246', 'Acidity_-2.947236366', 'Acidity_-2.94729487',
'Acidity_-2.948002977', 'Acidity_-2.948669595', 'Acidity_-2.949443677',
'Acidity_-2.955247077', 'Acidity_-2.957553958', 'Acidity_-2.960998466',
'Acidity_-2.967415983', 'Acidity_-2.976638655', 'Acidity_-2.981523169',
'Acidity_-2.983107289', 'Acidity_-2.995260179', 'Acidity_-2.995325003',
'Acidity_-3.000197815', 'Acidity_-3.000289432', 'Acidity_-3.004118614',
'Acidity_-3.005135514', 'Acidity_-3.014997295', 'Acidity_-3.016466776',
'Acidity_-3.021498163', 'Acidity_-3.022101786', 'Acidity_-3.023189457',
'Acidity_-3.024115524', 'Acidity_-3.029392365', 'Acidity_-3.032779136',
'Acidity_-3.03673955', 'Acidity_-3.036756189', 'Acidity_-3.036919711',
'Acidity_-3.04217039', 'Acidity_-3.045678368', 'Acidity_-3.048404145',
'Acidity_-3.0523752', 'Acidity_-3.05406544', 'Acidity_-3.056400752',
'Acidity_-3.062447573', 'Acidity_-3.066802416', 'Acidity_-3.070932217',
'Acidity_-3.072402945', 'Acidity_-3.077340152', 'Acidity_-3.077711231',
'Acidity_-3.081881098', 'Acidity_-3.088850587', 'Acidity_-3.090406634',
'Acidity_-3.093184992', 'Acidity_-3.095059758', 'Acidity_-3.099057262',
'Acidity_-3.101679757', 'Acidity_-3.102236247', 'Acidity_-3.116788599',
'Acidity_-3.121961293', 'Acidity_-3.122379218', 'Acidity_-3.125420729',
'Acidity_-3.128402267', 'Acidity_-3.128879868', 'Acidity_-3.13052801',
'Acidity_-3.132193701', 'Acidity_-3.133212644', 'Acidity_-3.135736492',
'Acidity_-3.135860673', 'Acidity_-3.142710335', 'Acidity_-3.156688048',
'Acidity_-3.15671247', 'Acidity_-3.167304356', 'Acidity_-3.168638448',
'Acidity_-3.171785929', 'Acidity_-3.172841066', 'Acidity_-3.176894759',
'Acidity_-3.178046326', 'Acidity_-3.178354998', 'Acidity_-3.180337542',

'Acidity_-3.184964955', 'Acidity_-3.185962846', 'Acidity_-3.191608959',
'Acidity_-3.201157829', 'Acidity_-3.201853102', 'Acidity_-3.202740023',
'Acidity_-3.212773437', 'Acidity_-3.233639308', 'Acidity_-3.234934565',
'Acidity_-3.235766411', 'Acidity_-3.239964661', 'Acidity_-3.253214826',
'Acidity_-3.255799747', 'Acidity_-3.257193758', 'Acidity_-3.261756459',
'Acidity_-3.274083513', 'Acidity_-3.277636934', 'Acidity_-3.280269971',
'Acidity_-3.295579966', 'Acidity_-3.298101639', 'Acidity_-3.309784564',
'Acidity_-3.315902733', 'Acidity_-3.317759208', 'Acidity_-3.320012571',
'Acidity_-3.322432942', 'Acidity_-3.329460085', 'Acidity_-3.343955801',
'Acidity_-3.344232923', 'Acidity_-3.349056395', 'Acidity_-3.351939221',
'Acidity_-3.354846721', 'Acidity_-3.365377449', 'Acidity_-3.376490049',
'Acidity_-3.384209522', 'Acidity_-3.391138415', 'Acidity_-3.391955806',
'Acidity_-3.394791568', 'Acidity_-3.408117425', 'Acidity_-3.416156974',
'Acidity_-3.425881972', 'Acidity_-3.427009421', 'Acidity_-3.432184357',
'Acidity_-3.436671787', 'Acidity_-3.452096304', 'Acidity_-3.453481778',
'Acidity_-3.460362588', 'Acidity_-3.46440438', 'Acidity_-3.47105338',
'Acidity_-3.473578108', 'Acidity_-3.480103771', 'Acidity_-3.481424234',
'Acidity_-3.484108935', 'Acidity_-3.488241819', 'Acidity_-3.488597892',
'Acidity_-3.492475258', 'Acidity_-3.496028713', 'Acidity_-3.504485228',
'Acidity_-3.508051832', 'Acidity_-3.513559603', 'Acidity_-3.518392042',
'Acidity_-3.524033097', 'Acidity_-3.52838956', 'Acidity_-3.532915159',
'Acidity_-3.534016691', 'Acidity_-3.534843901', 'Acidity_-3.543715634',
'Acidity_-3.545769631', 'Acidity_-3.547965513', 'Acidity_-3.552345851',
'Acidity_-3.556199706', 'Acidity_-3.557617574', 'Acidity_-3.566359317',
'Acidity_-3.580039861', 'Acidity_-3.584126728', 'Acidity_-3.609172995',
'Acidity_-3.626255141', 'Acidity_-3.635637004', 'Acidity_-3.646472989',
'Acidity_-3.649341717', 'Acidity_-3.65321852', 'Acidity_-3.670269251',
'Acidity_-3.671779429', 'Acidity_-3.675142735', 'Acidity_-3.684284125',
'Acidity_-3.692780634', 'Acidity_-3.715416136', 'Acidity_-3.7252244',
'Acidity_-3.726145619', 'Acidity_-3.755760233', 'Acidity_-3.759799863',
'Acidity_-3.762212148', 'Acidity_-3.769068269', 'Acidity_-3.776445756',
'Acidity_-3.780843258', 'Acidity_-3.786816268', 'Acidity_-3.788166932',
'Acidity_-3.799184056', 'Acidity_-3.801992201', 'Acidity_-3.806190157',
'Acidity_-3.807170335', 'Acidity_-3.84312533', 'Acidity_-3.846641823',
'Acidity_-3.847081054', 'Acidity_-3.861990488', 'Acidity_-3.873112715',
'Acidity_-3.886677917', 'Acidity_-3.909722031', 'Acidity_-3.922591293',
'Acidity_-3.933729069', 'Acidity_-3.937821417', 'Acidity_-3.940779763',
'Acidity_-3.960265632', 'Acidity_-3.969132032', 'Acidity_-3.971721858',
'Acidity_-3.976483633', 'Acidity_-3.978524859', 'Acidity_-3.997326959',
'Acidity_-3.998428933', 'Acidity_-3.999915065', 'Acidity_-4.007585958',
'Acidity_-4.011969793', 'Acidity_-4.037148536', 'Acidity_-4.041148175',
'Acidity_-4.061398882', 'Acidity_-4.068279734', 'Acidity_-4.085738692',
'Acidity_-4.107393341', 'Acidity_-4.108156551', 'Acidity_-4.108894568',
'Acidity_-4.110373172', 'Acidity_-4.11808396', 'Acidity_-4.120365395',
'Acidity_-4.125685106', 'Acidity_-4.18344198', 'Acidity_-4.188652551',
'Acidity_-4.198145677', 'Acidity_-4.199263205', 'Acidity_-4.208284752',
'Acidity_-4.224755889', 'Acidity_-4.232944485', 'Acidity_-4.260533274',
'Acidity_-4.29224041', 'Acidity_-4.302060555', 'Acidity_-4.311281608',

'Acidity_-4.320781616', 'Acidity_-4.36005947', 'Acidity_-4.368247677',
'Acidity_-4.369480739', 'Acidity_-4.37221972', 'Acidity_-4.382106445',
'Acidity_-4.384867847', 'Acidity_-4.412881167', 'Acidity_-4.42166643',
'Acidity_-4.423516212', 'Acidity_-4.431320563', 'Acidity_-4.43408316',
'Acidity_-4.434327674', 'Acidity_-4.436004418', 'Acidity_-4.438979897',
'Acidity_-4.445357585', 'Acidity_-4.448054211', 'Acidity_-4.454570173',
'Acidity_-4.45843063', 'Acidity_-4.467442104', 'Acidity_-4.469190139',
'Acidity_-4.47558768', 'Acidity_-4.488313518', 'Acidity_-4.492389752',
'Acidity_-4.496095477', 'Acidity_-4.522654682', 'Acidity_-4.524693907',
'Acidity_-4.525029897', 'Acidity_-4.534147649', 'Acidity_-4.534759594',
'Acidity_-4.547320493', 'Acidity_-4.559664683', 'Acidity_-4.560905342',
'Acidity_-4.575521131', 'Acidity_-4.586248088', 'Acidity_-4.617026424',
'Acidity_-4.643768843', 'Acidity_-4.653764605', 'Acidity_-4.654523919',
'Acidity_-4.663497109', 'Acidity_-4.720685297', 'Acidity_-4.768058804',
'Acidity_-4.781573815', 'Acidity_-4.794751933', 'Acidity_-4.797638853',
'Acidity_-4.798989984', 'Acidity_-4.809283356', 'Acidity_-4.813463009',
'Acidity_-4.856291001', 'Acidity_-4.865749521', 'Acidity_-4.868417376',
'Acidity_-4.871904758', 'Acidity_-4.904935908', 'Acidity_-4.92196266',
'Acidity_-4.926678843', 'Acidity_-4.926744501', 'Acidity_-4.950918747',
'Acidity_-4.969911363', 'Acidity_-5.000693112', 'Acidity_-5.015263697',
'Acidity_-5.049826951', 'Acidity_-5.056589969', 'Acidity_-5.10061664',
'Acidity_-5.103210963', 'Acidity_-5.236625293', 'Acidity_-5.256590346',
'Acidity_-5.319856723', 'Acidity_-5.376070651', 'Acidity_-5.384860338',
'Acidity_-5.387118149', 'Acidity_-5.537818992', 'Acidity_-5.634195153',
'Acidity_-5.795137698', 'Acidity_-5.9179002', 'Acidity_-6.46098926',
'Acidity_-6.547608222', 'Acidity_-6.739692961', 'Acidity_-6.955460367',
'Acidity_-7.010538475', 'Acidity_0.001521444', 'Acidity_0.003092451',
'Acidity_0.004235805', 'Acidity_0.00487338', 'Acidity_0.007160799',
'Acidity_0.008339593', 'Acidity_0.009209508', 'Acidity_0.011511544',
'Acidity_0.013338089', 'Acidity_0.013357278', 'Acidity_0.014034095',
'Acidity_0.014200275', 'Acidity_0.015523334', 'Acidity_0.016585265',
'Acidity_0.017095758', 'Acidity_0.01769468', 'Acidity_0.019317439',
'Acidity_0.019333986', 'Acidity_0.020273986', 'Acidity_0.021318706',
'Acidity_0.022230395', 'Acidity_0.022420828', 'Acidity_0.022797108',
'Acidity_0.022945313', 'Acidity_0.024892579', 'Acidity_0.026134195',
'Acidity_0.026171935', 'Acidity_0.026500413', 'Acidity_0.026872821',
'Acidity_0.032101352', 'Acidity_0.032870604', 'Acidity_0.033384684',
'Acidity_0.034565705', 'Acidity_0.038680032', 'Acidity_0.039580414',
'Acidity_0.044191872', 'Acidity_0.048978998', 'Acidity_0.050116799',
'Acidity_0.051273904', 'Acidity_0.051771594', 'Acidity_0.057094164',
'Acidity_0.058757464', 'Acidity_0.060613779', 'Acidity_0.060917574',
'Acidity_0.061930121', 'Acidity_0.062116068', 'Acidity_0.062215535',
'Acidity_0.064352175', 'Acidity_0.067609917', 'Acidity_0.06974271',
'Acidity_0.070887645', 'Acidity_0.071005711', 'Acidity_0.072530064',
'Acidity_0.07269825', 'Acidity_0.079276104', 'Acidity_0.085050081',
'Acidity_0.086659287', 'Acidity_0.087091587', 'Acidity_0.088930463',
'Acidity_0.089512941', 'Acidity_0.089953059', 'Acidity_0.090837087',
'Acidity_0.091921632', 'Acidity_0.094211038', 'Acidity_0.094647216',

'Acidity_0.096056144', 'Acidity_0.098645604', 'Acidity_0.099814677',
'Acidity_0.101005434', 'Acidity_0.105003839', 'Acidity_0.10671871',
'Acidity_0.108348642', 'Acidity_0.108746451', 'Acidity_0.109579238',
'Acidity_0.111191205', 'Acidity_0.112949559', 'Acidity_0.11606493',
'Acidity_0.11629875', 'Acidity_0.117583669', 'Acidity_0.119975723',
'Acidity_0.120172532', 'Acidity_0.120913067', 'Acidity_0.122828554',
'Acidity_0.123181228', 'Acidity_0.123584465', 'Acidity_0.124899208',
'Acidity_0.124914362', 'Acidity_0.125661579', 'Acidity_0.126464569',
'Acidity_0.127212642', 'Acidity_0.128325002', 'Acidity_0.136189304',
'Acidity_0.137784369', 'Acidity_0.138001968', 'Acidity_0.138371781',
'Acidity_0.140840408', 'Acidity_0.14140555', 'Acidity_0.142473791',
'Acidity_0.142606588', 'Acidity_0.147071257', 'Acidity_0.1481226',
'Acidity_0.149530447', 'Acidity_0.149826546', 'Acidity_0.150209878',
'Acidity_0.151744842', 'Acidity_0.156466706', 'Acidity_0.15706268',
'Acidity_0.157979193', 'Acidity_0.159467205', 'Acidity_0.159723075',
'Acidity_0.163437326', 'Acidity_0.167154758', 'Acidity_0.167576207',
'Acidity_0.168699111', 'Acidity_0.169730639', 'Acidity_0.170322177',
'Acidity_0.171314883', 'Acidity_0.171613195', 'Acidity_0.171703758',
'Acidity_0.17209792', 'Acidity_0.17363913', 'Acidity_0.173653987',
'Acidity_0.174434142', 'Acidity_0.17767679', 'Acidity_0.179404391',
'Acidity_0.180781197', 'Acidity_0.183194492', 'Acidity_0.184905607',
'Acidity_0.186521133', 'Acidity_0.187428908', 'Acidity_0.192862807',
'Acidity_0.194094541', 'Acidity_0.195606576', 'Acidity_0.196019372',
'Acidity_0.197143997', 'Acidity_0.198625883', 'Acidity_0.198688716',
'Acidity_0.200554236', 'Acidity_0.200985333', 'Acidity_0.201052033',
'Acidity_0.202817792', 'Acidity_0.203413025', 'Acidity_0.20355982',
'Acidity_0.204386751', 'Acidity_0.205756573', 'Acidity_0.206405898',
'Acidity_0.206975851', 'Acidity_0.210347278', 'Acidity_0.213071582',
'Acidity_0.215333082', 'Acidity_0.216299444', 'Acidity_0.216463295',
'Acidity_0.220198791', 'Acidity_0.22351331', 'Acidity_0.224019932',
'Acidity_0.227169191', 'Acidity_0.228479052', 'Acidity_0.232869083',
'Acidity_0.236001317', 'Acidity_0.240346626', 'Acidity_0.24132956',
'Acidity_0.242878626', 'Acidity_0.242942222', 'Acidity_0.243968297',
'Acidity_0.244161158', 'Acidity_0.244738583', 'Acidity_0.246129771',
'Acidity_0.2467183', 'Acidity_0.247923104', 'Acidity_0.248185788',
'Acidity_0.248189198', 'Acidity_0.248260945', 'Acidity_0.248881195',
'Acidity_0.249018548', 'Acidity_0.250770105', 'Acidity_0.251244793',
'Acidity_0.253207945', 'Acidity_0.253906147', 'Acidity_0.253966087',
'Acidity_0.254018717', 'Acidity_0.254269072', 'Acidity_0.254979585',
'Acidity_0.255152887', 'Acidity_0.255524047', 'Acidity_0.256349114',
'Acidity_0.257369095', 'Acidity_0.25769443', 'Acidity_0.258639507',
'Acidity_0.260141062', 'Acidity_0.260288653', 'Acidity_0.260775943',
'Acidity_0.26348289', 'Acidity_0.265070336', 'Acidity_0.266387675',
'Acidity_0.26666639', 'Acidity_0.267861555', 'Acidity_0.267883253',
'Acidity_0.268904126', 'Acidity_0.269081521', 'Acidity_0.269218955',
'Acidity_0.269221416', 'Acidity_0.270685503', 'Acidity_0.270741075',
'Acidity_0.270877363', 'Acidity_0.271799777', 'Acidity_0.273804412',
'Acidity_0.275865496', 'Acidity_0.276865133', 'Acidity_0.277447319',

'Acidity_0.28006913', 'Acidity_0.28020656', 'Acidity_0.280977383',
'Acidity_0.282464485', 'Acidity_0.2844448495', 'Acidity_0.28457265',
'Acidity_0.285889667', 'Acidity_0.286883321', 'Acidity_0.288334411',
'Acidity_0.291800325', 'Acidity_0.293289976', 'Acidity_0.293620924',
'Acidity_0.294390408', 'Acidity_0.296224193', 'Acidity_0.296232403',
'Acidity_0.298371281', 'Acidity_0.298523531', 'Acidity_0.300425348',
'Acidity_0.301496699', 'Acidity_0.301517071', 'Acidity_0.30185689',
'Acidity_0.3066305', 'Acidity_0.3071511', 'Acidity_0.307219577',
'Acidity_0.308139392', 'Acidity_0.308340666', 'Acidity_0.308678444',
'Acidity_0.313115727', 'Acidity_0.316418297', 'Acidity_0.316697285',
'Acidity_0.317187773', 'Acidity_0.317555935', 'Acidity_0.318494494',
'Acidity_0.322768516', 'Acidity_0.323823432', 'Acidity_0.327346075',
'Acidity_0.328405811', 'Acidity_0.329233019', 'Acidity_0.329818384',
'Acidity_0.335432297', 'Acidity_0.335632409', 'Acidity_0.338473295',
'Acidity_0.338913734', 'Acidity_0.339436235', 'Acidity_0.340237631',
'Acidity_0.340346714', 'Acidity_0.341751002', 'Acidity_0.341899461',
'Acidity_0.342091133', 'Acidity_0.348479388', 'Acidity_0.349169554',
'Acidity_0.35105039', 'Acidity_0.351966322', 'Acidity_0.352908697',
'Acidity_0.354489011', 'Acidity_0.355785802', 'Acidity_0.355960178',
'Acidity_0.356405327', 'Acidity_0.356695742', 'Acidity_0.358466427',
'Acidity_0.359640298', 'Acidity_0.362517495', 'Acidity_0.364630565',
'Acidity_0.3652211', 'Acidity_0.366164489', 'Acidity_0.367240863',
'Acidity_0.369160911', 'Acidity_0.369580215', 'Acidity_0.374344641',
'Acidity_0.375622231', 'Acidity_0.376595844', 'Acidity_0.376793906',
'Acidity_0.378997485', 'Acidity_0.382914269', 'Acidity_0.383299126',
'Acidity_0.383759484', 'Acidity_0.386518491', 'Acidity_0.387882819',
'Acidity_0.390464668', 'Acidity_0.391850889', 'Acidity_0.394444344',
'Acidity_0.395868142', 'Acidity_0.397002044', 'Acidity_0.398870457',
'Acidity_0.402124291', 'Acidity_0.403637638', 'Acidity_0.404912999',
'Acidity_0.405925967', 'Acidity_0.406387122', 'Acidity_0.408771462',
'Acidity_0.408958685', 'Acidity_0.409553081', 'Acidity_0.411447337',
'Acidity_0.416518576', 'Acidity_0.420270888', 'Acidity_0.420361836',
'Acidity_0.420810121', 'Acidity_0.421589696', 'Acidity_0.422928552',
'Acidity_0.423215962', 'Acidity_0.423361085', 'Acidity_0.424381497',
'Acidity_0.424573151', 'Acidity_0.426446217', 'Acidity_0.427387406',
'Acidity_0.427520425', 'Acidity_0.428501793', 'Acidity_0.430263765',
'Acidity_0.430274164', 'Acidity_0.432000061', 'Acidity_0.432627179',
'Acidity_0.436686274', 'Acidity_0.436921461', 'Acidity_0.437045362',
'Acidity_0.437557417', 'Acidity_0.438022588', 'Acidity_0.440505842',
'Acidity_0.440630298', 'Acidity_0.442710961', 'Acidity_0.444069046',
'Acidity_0.445759947', 'Acidity_0.445840404', 'Acidity_0.44678879',
'Acidity_0.448603514', 'Acidity_0.449868274', 'Acidity_0.450070766',
'Acidity_0.450130636', 'Acidity_0.456268981', 'Acidity_0.458761382',
'Acidity_0.458892829', 'Acidity_0.459723265', 'Acidity_0.460380026',
'Acidity_0.461086978', 'Acidity_0.461313968', 'Acidity_0.461474433',
'Acidity_0.467697195', 'Acidity_0.468330323', 'Acidity_0.469696107',
'Acidity_0.472938272', 'Acidity_0.473000429', 'Acidity_0.473929765',
'Acidity_0.474794991', 'Acidity_0.475477722', 'Acidity_0.478269528',

'Acidity_0.480489556', 'Acidity_0.483467424', 'Acidity_0.483902441',
'Acidity_0.48470493', 'Acidity_0.485986304', 'Acidity_0.486558229',
'Acidity_0.489432337', 'Acidity_0.489466669', 'Acidity_0.490235188',
'Acidity_0.495203413', 'Acidity_0.495656913', 'Acidity_0.496347095',
'Acidity_0.500029929', 'Acidity_0.501984036', 'Acidity_0.502034477',
'Acidity_0.502430498', 'Acidity_0.503799062', 'Acidity_0.503952801',
'Acidity_0.508298972', 'Acidity_0.512910617', 'Acidity_0.517261001',
'Acidity_0.518192204', 'Acidity_0.518813987', 'Acidity_0.519551095',
'Acidity_0.52098068', 'Acidity_0.521519891', 'Acidity_0.521665548',
'Acidity_0.523310477', 'Acidity_0.523557588', 'Acidity_0.524794375',
'Acidity_0.526873773', 'Acidity_0.526956474', 'Acidity_0.52763269',
'Acidity_0.528698798', 'Acidity_0.53068575', 'Acidity_0.531038738',
'Acidity_0.532010254', 'Acidity_0.536212238', 'Acidity_0.537010434',
'Acidity_0.538838538', 'Acidity_0.541694462', 'Acidity_0.541780444',
'Acidity_0.54510856', 'Acidity_0.545749303', 'Acidity_0.549905438',
'Acidity_0.550081687', 'Acidity_0.55266805', 'Acidity_0.553472889',
'Acidity_0.553623544', 'Acidity_0.554639352', 'Acidity_0.555497079',
'Acidity_0.555714418', 'Acidity_0.555947812', 'Acidity_0.556336179',
'Acidity_0.557724553', 'Acidity_0.56143631', 'Acidity_0.568775009',
'Acidity_0.568969749', 'Acidity_0.569352532', 'Acidity_0.570639948',
'Acidity_0.572564128', 'Acidity_0.575495381', 'Acidity_0.578838057',
'Acidity_0.579767371', 'Acidity_0.580057429', 'Acidity_0.581234485',
'Acidity_0.58178077', 'Acidity_0.581808577', 'Acidity_0.582127057',
'Acidity_0.583067518', 'Acidity_0.58325181', 'Acidity_0.584263593',
'Acidity_0.585740646', 'Acidity_0.586654871', 'Acidity_0.586785096',
'Acidity_0.592237542', 'Acidity_0.592650517', 'Acidity_0.594901098',
'Acidity_0.595125499', 'Acidity_0.596716142', 'Acidity_0.597076592',
'Acidity_0.598162333', 'Acidity_0.598524359', 'Acidity_0.599425465',
'Acidity_0.601349722', 'Acidity_0.601484011', 'Acidity_0.602466039',
'Acidity_0.603642425', 'Acidity_0.60485971', 'Acidity_0.608727066',
'Acidity_0.609528381', 'Acidity_0.612547794', 'Acidity_0.614775962',
'Acidity_0.6169814', 'Acidity_0.617345483', 'Acidity_0.618410208',
'Acidity_0.623696496', 'Acidity_0.623971295', 'Acidity_0.624139036',
'Acidity_0.624239782', 'Acidity_0.625345629', 'Acidity_0.625448453',
'Acidity_0.627116568', 'Acidity_0.62809646', 'Acidity_0.629141468',
'Acidity_0.629891589', 'Acidity_0.629952465', 'Acidity_0.630023525',
'Acidity_0.630104364', 'Acidity_0.630116237', 'Acidity_0.633750281',
'Acidity_0.634562579', 'Acidity_0.635916325', 'Acidity_0.637151688',
'Acidity_0.637302588', 'Acidity_0.638381721', 'Acidity_0.638395235',
'Acidity_0.638418811', 'Acidity_0.638823121', 'Acidity_0.639425812',
'Acidity_0.640408505', 'Acidity_0.642705013', 'Acidity_0.643928312',
'Acidity_0.643951904', 'Acidity_0.644180673', 'Acidity_0.648231211',
'Acidity_0.649804223', 'Acidity_0.650677868', 'Acidity_0.653144112',
'Acidity_0.657650379', 'Acidity_0.658072598', 'Acidity_0.659567289',
'Acidity_0.660725219', 'Acidity_0.660854694', 'Acidity_0.661329719',
'Acidity_0.665209153', 'Acidity_0.666779313', 'Acidity_0.667613531',
'Acidity_0.668996327', 'Acidity_0.671129906', 'Acidity_0.671572499',
'Acidity_0.671943146', 'Acidity_0.673504733', 'Acidity_0.673782716',

'Acidity_0.673818582', 'Acidity_0.675495193', 'Acidity_0.675817641',
'Acidity_0.676821939', 'Acidity_0.679080972', 'Acidity_0.679908751',
'Acidity_0.680343871', 'Acidity_0.681981804', 'Acidity_0.683851588',
'Acidity_0.685408528', 'Acidity_0.688424659', 'Acidity_0.689321251',
'Acidity_0.69013069', 'Acidity_0.691372124', 'Acidity_0.692202456',
'Acidity_0.693524526', 'Acidity_0.695032573', 'Acidity_0.699535471',
'Acidity_0.699819954', 'Acidity_0.700071292', 'Acidity_0.701310229',
'Acidity_0.701403599', 'Acidity_0.701928115', 'Acidity_0.703618681',
'Acidity_0.703823703', 'Acidity_0.706485347', 'Acidity_0.706917641',
'Acidity_0.710305734', 'Acidity_0.710723883', 'Acidity_0.716829312',
'Acidity_0.719461552', 'Acidity_0.71993501', 'Acidity_0.72019566',
'Acidity_0.7209638', 'Acidity_0.721337439', 'Acidity_0.722045686',
'Acidity_0.722138309', 'Acidity_0.723795542', 'Acidity_0.7241907',
'Acidity_0.724561237', 'Acidity_0.725999977', 'Acidity_0.726775672',
'Acidity_0.727058624', 'Acidity_0.73058333', 'Acidity_0.733549657',
'Acidity_0.734982747', 'Acidity_0.735253371', 'Acidity_0.735685801',
'Acidity_0.73875602', 'Acidity_0.743703336', 'Acidity_0.744692034',
'Acidity_0.749383473', 'Acidity_0.750552752', 'Acidity_0.752009811',
'Acidity_0.753302007', 'Acidity_0.753544133', 'Acidity_0.754841662',
'Acidity_0.75567379', 'Acidity_0.758104622', 'Acidity_0.76256805',
'Acidity_0.764295402', 'Acidity_0.766026809', 'Acidity_0.768755986',
'Acidity_0.772937754', 'Acidity_0.773249664', 'Acidity_0.774225621',
'Acidity_0.775272528', 'Acidity_0.775481436', 'Acidity_0.776321633',
'Acidity_0.777577489', 'Acidity_0.777769952', 'Acidity_0.78028109',
'Acidity_0.780419902', 'Acidity_0.784539205', 'Acidity_0.784607915',
'Acidity_0.790723217', 'Acidity_0.791113178', 'Acidity_0.794783487',
'Acidity_0.795889952', 'Acidity_0.796064138', 'Acidity_0.797920023',
'Acidity_0.801162074', 'Acidity_0.802316898', 'Acidity_0.803017634',
'Acidity_0.803956698', 'Acidity_0.806262665', 'Acidity_0.807576524',
'Acidity_0.807895795', 'Acidity_0.809907288', 'Acidity_0.810122508',
'Acidity_0.810334873', 'Acidity_0.811045605', 'Acidity_0.812995828',
'Acidity_0.813678164', 'Acidity_0.814293361', 'Acidity_0.81596028',
'Acidity_0.816618795', 'Acidity_0.816681247', 'Acidity_0.818821014',
'Acidity_0.819827005', 'Acidity_0.820800826', 'Acidity_0.821488579',
'Acidity_0.822411546', 'Acidity_0.823026283', 'Acidity_0.825066953',
'Acidity_0.826550768', 'Acidity_0.836379512', 'Acidity_0.837749293',
'Acidity_0.837869179', 'Acidity_0.837999604', 'Acidity_0.838015685',
'Acidity_0.839021075', 'Acidity_0.841770053', 'Acidity_0.842211258',
'Acidity_0.843975672', 'Acidity_0.848923139', 'Acidity_0.851873006',
'Acidity_0.855149248', 'Acidity_0.85622891', 'Acidity_0.856356498',
'Acidity_0.859575031', 'Acidity_0.859773406', 'Acidity_0.863598197',
'Acidity_0.86478663', 'Acidity_0.86587971', 'Acidity_0.866186822',
'Acidity_0.866285324', 'Acidity_0.869982944', 'Acidity_0.871449566',
'Acidity_0.872470725', 'Acidity_0.873307948', 'Acidity_0.874231935',
'Acidity_0.876718842', 'Acidity_0.8772043', 'Acidity_0.879334374',
'Acidity_0.880198889', 'Acidity_0.882688273', 'Acidity_0.884102443',
'Acidity_0.889659108', 'Acidity_0.892245948', 'Acidity_0.893563954',
'Acidity_0.894076504', 'Acidity_0.894756027', 'Acidity_0.895274255',

'Acidity_0.896418974', 'Acidity_0.896653238', 'Acidity_0.897683852',
'Acidity_0.898164308', 'Acidity_0.903033551', 'Acidity_0.914096944',
'Acidity_0.914403502', 'Acidity_0.916157533', 'Acidity_0.918075613',
'Acidity_0.91807892', 'Acidity_0.919506782', 'Acidity_0.919588001',
'Acidity_0.920605642', 'Acidity_0.922071266', 'Acidity_0.922163803',
'Acidity_0.923862967', 'Acidity_0.923973334', 'Acidity_0.924515772',
'Acidity_0.924712224', 'Acidity_0.925927314', 'Acidity_0.926895465',
'Acidity_0.931078465', 'Acidity_0.933022857', 'Acidity_0.933636263',
'Acidity_0.936264265', 'Acidity_0.9389107', 'Acidity_0.939595556',
'Acidity_0.939702545', 'Acidity_0.942478981', 'Acidity_0.943887284',
'Acidity_0.944422302', 'Acidity_0.947553035', 'Acidity_0.94783296',
'Acidity_0.947932207', 'Acidity_0.950782318', 'Acidity_0.953241072',
'Acidity_0.953487839', 'Acidity_0.955717019', 'Acidity_0.956300718',
'Acidity_0.956782203', 'Acidity_0.957153269', 'Acidity_0.957374782',
'Acidity_0.958543825', 'Acidity_0.960135336', 'Acidity_0.960661464',
'Acidity_0.963957113', 'Acidity_0.964165879', 'Acidity_0.96430594',
'Acidity_0.967041295', 'Acidity_0.971095716', 'Acidity_0.972018806',
'Acidity_0.97284771', 'Acidity_0.97422529', 'Acidity_0.977101501',
'Acidity_0.977638764', 'Acidity_0.978183746', 'Acidity_0.985013262',
'Acidity_0.988540998', 'Acidity_0.990331149', 'Acidity_0.991549395',
'Acidity_0.994854424', 'Acidity_0.995985405', 'Acidity_0.99610046',
'Acidity_0.999308201', 'Acidity_1.001952064', 'Acidity_1.002259234',
'Acidity_1.002717725', 'Acidity_1.003508224', 'Acidity_1.003754094',
'Acidity_1.004462732', 'Acidity_1.004476849', 'Acidity_1.006506949',
'Acidity_1.006877454', 'Acidity_1.009155619', 'Acidity_1.010299062',
'Acidity_1.010451335', 'Acidity_1.01084709', 'Acidity_1.014805472',
'Acidity_1.01775056', 'Acidity_1.018572989', 'Acidity_1.019526009',
'Acidity_1.020470369', 'Acidity_1.021798877', 'Acidity_1.024242635',
'Acidity_1.025434143', 'Acidity_1.030098094', 'Acidity_1.03430939',
'Acidity_1.035643365', 'Acidity_1.03812053', 'Acidity_1.040265446',
'Acidity_1.041804277', 'Acidity_1.045148744', 'Acidity_1.04606777',
'Acidity_1.047021307', 'Acidity_1.048440252', 'Acidity_1.049428799',
'Acidity_1.05090811', 'Acidity_1.052510895', 'Acidity_1.053746966',
'Acidity_1.054380314', 'Acidity_1.054633563', 'Acidity_1.054950604',
'Acidity_1.059464845', 'Acidity_1.059900355', 'Acidity_1.062466224',
'Acidity_1.062597044', 'Acidity_1.063990358', 'Acidity_1.070209221',
'Acidity_1.071129708', 'Acidity_1.072321024', 'Acidity_1.073826134',
'Acidity_1.078184946', 'Acidity_1.079333971', 'Acidity_1.079932807',
'Acidity_1.083694885', 'Acidity_1.08475409', 'Acidity_1.085271327',
'Acidity_1.086971353', 'Acidity_1.088504595', 'Acidity_1.090284676',
'Acidity_1.094332865', 'Acidity_1.095010268', 'Acidity_1.097634922',
'Acidity_1.101818513', 'Acidity_1.102208093', 'Acidity_1.105284862',
'Acidity_1.105737675', 'Acidity_1.105971772', 'Acidity_1.108448274',
'Acidity_1.117163222', 'Acidity_1.12172416', 'Acidity_1.122215319',
'Acidity_1.122494601', 'Acidity_1.123206738', 'Acidity_1.124419217',
'Acidity_1.124935316', 'Acidity_1.126991099', 'Acidity_1.128191131',
'Acidity_1.129927802', 'Acidity_1.132168505', 'Acidity_1.133950788',
'Acidity_1.13433461', 'Acidity_1.136907353', 'Acidity_1.136970464',

'Acidity_1.136985378', 'Acidity_1.137425853', 'Acidity_1.139624355',
'Acidity_1.142108458', 'Acidity_1.148905922', 'Acidity_1.151235848',
'Acidity_1.152768549', 'Acidity_1.153000012', 'Acidity_1.155649163',
'Acidity_1.155864135', 'Acidity_1.155911804', 'Acidity_1.161389507',
'Acidity_1.1627936', 'Acidity_1.163699508', 'Acidity_1.165776955',
'Acidity_1.16616104', 'Acidity_1.166970737', 'Acidity_1.168432716',
'Acidity_1.168838186', 'Acidity_1.168981716', 'Acidity_1.175072561',
'Acidity_1.176172575', 'Acidity_1.176424009', 'Acidity_1.177378852',
'Acidity_1.182446876', 'Acidity_1.18419642', 'Acidity_1.185050162',
'Acidity_1.186177549', 'Acidity_1.186414598', 'Acidity_1.189698829',
'Acidity_1.191130833', 'Acidity_1.192569843', 'Acidity_1.193021804',
'Acidity_1.193854061', 'Acidity_1.193891254', 'Acidity_1.194249236',
'Acidity_1.195273442', 'Acidity_1.210290501', 'Acidity_1.21299242',
'Acidity_1.21543583', 'Acidity_1.215772084', 'Acidity_1.216429866',
'Acidity_1.217177815', 'Acidity_1.21731347', 'Acidity_1.220319515',
'Acidity_1.220969825', 'Acidity_1.221682298', 'Acidity_1.221697782',
'Acidity_1.222003358', 'Acidity_1.223084441', 'Acidity_1.224430811',
'Acidity_1.224928763', 'Acidity_1.225941103', 'Acidity_1.225988563',
'Acidity_1.226940054', 'Acidity_1.227386779', 'Acidity_1.22898763',
'Acidity_1.229222876', 'Acidity_1.230691463', 'Acidity_1.23370899',
'Acidity_1.234749952', 'Acidity_1.236271681', 'Acidity_1.239641077',
'Acidity_1.241980192', 'Acidity_1.243595847', 'Acidity_1.245359039',
'Acidity_1.248791791', 'Acidity_1.250970347', 'Acidity_1.260253613',
'Acidity_1.262024005', 'Acidity_1.264206323', 'Acidity_1.264944552',
'Acidity_1.2649463', 'Acidity_1.265160783', 'Acidity_1.265621547',
'Acidity_1.266060162', 'Acidity_1.268758457', 'Acidity_1.271455342',
'Acidity_1.271605588', 'Acidity_1.271769835', 'Acidity_1.274318228',
'Acidity_1.278969028', 'Acidity_1.279871941', 'Acidity_1.280264687',
'Acidity_1.281925544', 'Acidity_1.282263396', 'Acidity_1.28361462',
'Acidity_1.283893863', 'Acidity_1.284231392', 'Acidity_1.284336116',
'Acidity_1.285039755', 'Acidity_1.285942944', 'Acidity_1.28669118',
'Acidity_1.291181186', 'Acidity_1.292195002', 'Acidity_1.293012809',
'Acidity_1.293193656', 'Acidity_1.293471827', 'Acidity_1.29348935',
'Acidity_1.294323927', 'Acidity_1.296747816', 'Acidity_1.2971345',
'Acidity_1.30054503', 'Acidity_1.300693775', 'Acidity_1.303473702',
'Acidity_1.304226459', 'Acidity_1.305533314', 'Acidity_1.307264909',
'Acidity_1.307555892', 'Acidity_1.307998921', 'Acidity_1.3090311',
'Acidity_1.312900519', 'Acidity_1.313167949', 'Acidity_1.313860721',
'Acidity_1.317743743', 'Acidity_1.322156035', 'Acidity_1.325830189',
'Acidity_1.32628185', 'Acidity_1.32712058', 'Acidity_1.327763059',
'Acidity_1.328699376', 'Acidity_1.330072744', 'Acidity_1.333438049',
'Acidity_1.334702168', 'Acidity_1.334893586', 'Acidity_1.338008142',
'Acidity_1.338036233', 'Acidity_1.339130788', 'Acidity_1.339616741',
'Acidity_1.340208338', 'Acidity_1.341249631', 'Acidity_1.342735852',
'Acidity_1.346230253', 'Acidity_1.346573723', 'Acidity_1.348302458',
'Acidity_1.34871204', 'Acidity_1.349920757', 'Acidity_1.350938849',
'Acidity_1.353161003', 'Acidity_1.355485212', 'Acidity_1.358347765',
'Acidity_1.360220777', 'Acidity_1.365203893', 'Acidity_1.366933888',

'Acidity_1.367064815', 'Acidity_1.371001437', 'Acidity_1.371130948',
'Acidity_1.372600604', 'Acidity_1.376426937', 'Acidity_1.378138082',
'Acidity_1.379010378', 'Acidity_1.379090343', 'Acidity_1.382718983',
'Acidity_1.383166033', 'Acidity_1.384035334', 'Acidity_1.384495608',
'Acidity_1.384627576', 'Acidity_1.385557299', 'Acidity_1.385611637',
'Acidity_1.386487028', 'Acidity_1.387407917', 'Acidity_1.389061921',
'Acidity_1.389285206', 'Acidity_1.393033847', 'Acidity_1.397096248',
'Acidity_1.39885364', 'Acidity_1.399388786', 'Acidity_1.400482969',
'Acidity_1.401459762', 'Acidity_1.402366123', 'Acidity_1.402970488',
'Acidity_1.403469653', 'Acidity_1.403521232', 'Acidity_1.408120843',
'Acidity_1.410038052', 'Acidity_1.412873536', 'Acidity_1.41309275',
'Acidity_1.414178188', 'Acidity_1.416983091', 'Acidity_1.41772588',
'Acidity_1.421059511', 'Acidity_1.422806645', 'Acidity_1.426287521',
'Acidity_1.42771444', 'Acidity_1.428455306', 'Acidity_1.430354006',
'Acidity_1.433817427', 'Acidity_1.434992327', 'Acidity_1.436332986',
'Acidity_1.436344794', 'Acidity_1.436373326', 'Acidity_1.436965362',
'Acidity_1.438698948', 'Acidity_1.441385597', 'Acidity_1.444897577',
'Acidity_1.445026966', 'Acidity_1.445360694', 'Acidity_1.44882124',
'Acidity_1.449094973', 'Acidity_1.451621714', 'Acidity_1.453685894',
'Acidity_1.454577903', 'Acidity_1.454755859', 'Acidity_1.454817252',
'Acidity_1.455562203', 'Acidity_1.458007057', 'Acidity_1.460762294',
'Acidity_1.461085428', 'Acidity_1.461894077', 'Acidity_1.466043609',
'Acidity_1.466224085', 'Acidity_1.471594734', 'Acidity_1.472263329',
'Acidity_1.472535448', 'Acidity_1.475863572', 'Acidity_1.482428335',
'Acidity_1.487473202', 'Acidity_1.488269518', 'Acidity_1.489581235',
'Acidity_1.490174669', 'Acidity_1.491628066', 'Acidity_1.49337749',
'Acidity_1.493954536', 'Acidity_1.495648024', 'Acidity_1.496261501',
'Acidity_1.499011058', 'Acidity_1.50001457', 'Acidity_1.500926927',
'Acidity_1.501072134', 'Acidity_1.501562875', 'Acidity_1.501762219',
'Acidity_1.503667484', 'Acidity_1.505616743', 'Acidity_1.508189676',
'Acidity_1.508887162', 'Acidity_1.50903555', 'Acidity_1.510439023',
'Acidity_1.510653955', 'Acidity_1.511514415', 'Acidity_1.512497334',
'Acidity_1.514154771', 'Acidity_1.516106884', 'Acidity_1.516530547',
'Acidity_1.518602253', 'Acidity_1.525039867', 'Acidity_1.525044452',
'Acidity_1.526001912', 'Acidity_1.527393697', 'Acidity_1.529106684',
'Acidity_1.529469089', 'Acidity_1.533792693', 'Acidity_1.539828557',
'Acidity_1.543986894', 'Acidity_1.550666826', 'Acidity_1.551755314',
'Acidity_1.552371873', 'Acidity_1.554838145', 'Acidity_1.555914074',
'Acidity_1.556972107', 'Acidity_1.557792118', 'Acidity_1.560880955',
'Acidity_1.561226504', 'Acidity_1.561895451', 'Acidity_1.562067587',
'Acidity_1.565061386', 'Acidity_1.565237962', 'Acidity_1.566993752',
'Acidity_1.570413149', 'Acidity_1.57326933', 'Acidity_1.575293784',
'Acidity_1.581261549', 'Acidity_1.58151545', 'Acidity_1.582143197',
'Acidity_1.584665032', 'Acidity_1.58489876', 'Acidity_1.585767282',
'Acidity_1.594064952', 'Acidity_1.599195218', 'Acidity_1.599796456',
'Acidity_1.599882026', 'Acidity_1.599886607', 'Acidity_1.60008799',
'Acidity_1.601038247', 'Acidity_1.602278558', 'Acidity_1.602770371',
'Acidity_1.603692081', 'Acidity_1.607589568', 'Acidity_1.608708742',

'Acidity_1.610284105', 'Acidity_1.61098811', 'Acidity_1.611813638',
'Acidity_1.612088232', 'Acidity_1.613529813', 'Acidity_1.615739883',
'Acidity_1.617416928', 'Acidity_1.617889109', 'Acidity_1.618756068',
'Acidity_1.619183695', 'Acidity_1.622219956', 'Acidity_1.622376046',
'Acidity_1.622793192', 'Acidity_1.625841828', 'Acidity_1.629186243',
'Acidity_1.630534548', 'Acidity_1.631091306', 'Acidity_1.631611692',
'Acidity_1.632220274', 'Acidity_1.632592779', 'Acidity_1.634416382',
'Acidity_1.638728705', 'Acidity_1.639280607', 'Acidity_1.640197921',
'Acidity_1.643451555', 'Acidity_1.64595436', 'Acidity_1.649339187',
'Acidity_1.65215817', 'Acidity_1.652870764', 'Acidity_1.653082221',
'Acidity_1.656620737', 'Acidity_1.656877646', 'Acidity_1.657770128',
'Acidity_1.658262189', 'Acidity_1.659750865', 'Acidity_1.66131914',
'Acidity_1.663726188', 'Acidity_1.665924398', 'Acidity_1.667069825',
'Acidity_1.667884513', 'Acidity_1.66902099', 'Acidity_1.67188245',
'Acidity_1.68390841', 'Acidity_1.686512224', 'Acidity_1.689841773',
'Acidity_1.689852489', 'Acidity_1.691025405', 'Acidity_1.691561916',
'Acidity_1.692455508', 'Acidity_1.692950967', 'Acidity_1.69937263',
'Acidity_1.700165743', 'Acidity_1.702742816', 'Acidity_1.70291443',
'Acidity_1.704576907', 'Acidity_1.709708209', 'Acidity_1.712699274',
'Acidity_1.716681323', 'Acidity_1.721389057', 'Acidity_1.723107676',
'Acidity_1.723307547', 'Acidity_1.723762318', 'Acidity_1.723936784',
'Acidity_1.724026084', 'Acidity_1.724251569', 'Acidity_1.725500851',
'Acidity_1.7260921', 'Acidity_1.732524419', 'Acidity_1.735372229',
'Acidity_1.746986998', 'Acidity_1.750426491', 'Acidity_1.752883205',
'Acidity_1.75325013', 'Acidity_1.753576087', 'Acidity_1.754105271',
'Acidity_1.756848405', 'Acidity_1.760895731', 'Acidity_1.762176077',
'Acidity_1.76244588', 'Acidity_1.765241847', 'Acidity_1.767633005',
'Acidity_1.769225354', 'Acidity_1.770603947', 'Acidity_1.775343683',
'Acidity_1.775743836', 'Acidity_1.776869606', 'Acidity_1.777255205',
'Acidity_1.780316712', 'Acidity_1.782646005', 'Acidity_1.783110374',
'Acidity_1.784271472', 'Acidity_1.786843109', 'Acidity_1.787328054',
'Acidity_1.787465613', 'Acidity_1.788154413', 'Acidity_1.789026195',
'Acidity_1.789687083', 'Acidity_1.791805414', 'Acidity_1.795992671',
'Acidity_1.798356068', 'Acidity_1.798605677', 'Acidity_1.799675359',
'Acidity_1.8014555', 'Acidity_1.802374182', 'Acidity_1.807043143',
'Acidity_1.810950768', 'Acidity_1.811327489', 'Acidity_1.811772403',
'Acidity_1.815367793', 'Acidity_1.815548893', 'Acidity_1.817069571',
'Acidity_1.818460298', 'Acidity_1.818489534', 'Acidity_1.820526057',
'Acidity_1.821120048', 'Acidity_1.822181262', 'Acidity_1.827255633',
'Acidity_1.830054885', 'Acidity_1.833452686', 'Acidity_1.83351112',
'Acidity_1.837355596', 'Acidity_1.83775147', 'Acidity_1.838720084',
'Acidity_1.840285348', 'Acidity_1.841722975', 'Acidity_1.842190395',
'Acidity_1.854235285', 'Acidity_1.86746951', 'Acidity_1.869629941',
'Acidity_1.870309153', 'Acidity_1.871943764', 'Acidity_1.874067405',
'Acidity_1.875565732', 'Acidity_1.876060595', 'Acidity_1.877042092',
'Acidity_1.880348648', 'Acidity_1.881426498', 'Acidity_1.882161474',
'Acidity_1.885015984', 'Acidity_1.885183745', 'Acidity_1.886580978',
'Acidity_1.892157515', 'Acidity_1.895399271', 'Acidity_1.897369292',

'Acidity_1.899782249', 'Acidity_1.899972028', 'Acidity_1.901277095',
'Acidity_1.904027416', 'Acidity_1.904849585', 'Acidity_1.906740297',
'Acidity_1.913664613', 'Acidity_1.914618382', 'Acidity_1.920543098',
'Acidity_1.921861905', 'Acidity_1.92667469', 'Acidity_1.929992575',
'Acidity_1.931514995', 'Acidity_1.933060621', 'Acidity_1.934600389',
'Acidity_1.935006729', 'Acidity_1.937289864', 'Acidity_1.937378487',
'Acidity_1.93905777', 'Acidity_1.943418859', 'Acidity_1.945986711',
'Acidity_1.949540556', 'Acidity_1.950120377', 'Acidity_1.951705686',
'Acidity_1.952776768', 'Acidity_1.95327206', 'Acidity_1.954562057',
'Acidity_1.954753513', 'Acidity_1.95499173', 'Acidity_1.956843866',
'Acidity_1.96329495', 'Acidity_1.965934989', 'Acidity_1.966674682',
'Acidity_1.970783741', 'Acidity_1.975611851', 'Acidity_1.975668692',
'Acidity_1.976318514', 'Acidity_1.979674831', 'Acidity_1.981723613',
'Acidity_1.983392167', 'Acidity_1.983451961', 'Acidity_1.985320996',
'Acidity_1.98565023', 'Acidity_1.986156356', 'Acidity_1.986412486',
'Acidity_1.987429612', 'Acidity_1.99553046', 'Acidity_1.996529898',
'Acidity_1.999641554', 'Acidity_2.000125146', 'Acidity_2.004537615',
'Acidity_2.004807236', 'Acidity_2.005504657', 'Acidity_2.00555776',
'Acidity_2.006451575', 'Acidity_2.008429932', 'Acidity_2.008481011',
'Acidity_2.009993218', 'Acidity_2.011494167', 'Acidity_2.012270168',
'Acidity_2.012687026', 'Acidity_2.01698413', 'Acidity_2.01900265',
'Acidity_2.019215518', 'Acidity_2.020624473', 'Acidity_2.023841607',
'Acidity_2.024089693', 'Acidity_2.0247306', 'Acidity_2.025756513',
'Acidity_2.030695991', 'Acidity_2.035405642', 'Acidity_2.039177066',
'Acidity_2.040200065', 'Acidity_2.040601557', 'Acidity_2.046075689',
'Acidity_2.047649446', 'Acidity_2.049558231', 'Acidity_2.050011062',
'Acidity_2.052889264', 'Acidity_2.056639697', 'Acidity_2.058232952',
'Acidity_2.058357127', 'Acidity_2.064066964', 'Acidity_2.064118217',
'Acidity_2.065728297', 'Acidity_2.066437685', 'Acidity_2.068649561',
'Acidity_2.069446272', 'Acidity_2.069509514', 'Acidity_2.070395901',
'Acidity_2.070556012', 'Acidity_2.071983608', 'Acidity_2.073017847',
'Acidity_2.07799313', 'Acidity_2.078826028', 'Acidity_2.079393199',
'Acidity_2.081537202', 'Acidity_2.086618541', 'Acidity_2.094503274',
'Acidity_2.095870617', 'Acidity_2.097802087', 'Acidity_2.099729971',
'Acidity_2.102015829', 'Acidity_2.102061885', 'Acidity_2.105816187',
'Acidity_2.106155005', 'Acidity_2.10991205', 'Acidity_2.114409958',
'Acidity_2.119538103', 'Acidity_2.120352636', 'Acidity_2.120970261',
'Acidity_2.124362402', 'Acidity_2.124385261', 'Acidity_2.127518998',
'Acidity_2.129436957', 'Acidity_2.131648699', 'Acidity_2.133817463',
'Acidity_2.135494154', 'Acidity_2.138542689', 'Acidity_2.141838373',
'Acidity_2.145083279', 'Acidity_2.148164161', 'Acidity_2.148967097',
'Acidity_2.150572298', 'Acidity_2.153440221', 'Acidity_2.157878307',
'Acidity_2.157909715', 'Acidity_2.158032334', 'Acidity_2.158860894',
'Acidity_2.165079371', 'Acidity_2.165801374', 'Acidity_2.168927943',
'Acidity_2.16902306', 'Acidity_2.171090444', 'Acidity_2.177282174',
'Acidity_2.181118542', 'Acidity_2.185607723', 'Acidity_2.189273559',
'Acidity_2.190118648', 'Acidity_2.190636353', 'Acidity_2.191127139',
'Acidity_2.191252624', 'Acidity_2.191434769', 'Acidity_2.191859787',

'Acidity_2.193147335', 'Acidity_2.193171589', 'Acidity_2.193523816',
'Acidity_2.196099992', 'Acidity_2.199468715', 'Acidity_2.199487687',
'Acidity_2.200526984', 'Acidity_2.201416622', 'Acidity_2.203022165',
'Acidity_2.204141635', 'Acidity_2.205699038', 'Acidity_2.211755911',
'Acidity_2.215031084', 'Acidity_2.215688603', 'Acidity_2.219890486',
'Acidity_2.221258172', 'Acidity_2.221617546', 'Acidity_2.229527803',
'Acidity_2.232521943', 'Acidity_2.233682316', 'Acidity_2.23487766',
'Acidity_2.236754113', 'Acidity_2.245048782', 'Acidity_2.252121481',
'Acidity_2.256195514', 'Acidity_2.257634168', 'Acidity_2.258237957',
'Acidity_2.263811944', 'Acidity_2.264292465', 'Acidity_2.266989042',
'Acidity_2.269546816', 'Acidity_2.274141292', 'Acidity_2.275525222',
'Acidity_2.277992284', 'Acidity_2.279462306', 'Acidity_2.280094899',
'Acidity_2.287287185', 'Acidity_2.287350346', 'Acidity_2.288403252',
'Acidity_2.292332884', 'Acidity_2.294602509', 'Acidity_2.295017632',
'Acidity_2.297794779', 'Acidity_2.300330525', 'Acidity_2.302842585',
'Acidity_2.30860314', 'Acidity_2.308864383', 'Acidity_2.309331461',
'Acidity_2.309399752', 'Acidity_2.311174821', 'Acidity_2.311521591',
'Acidity_2.316583272', 'Acidity_2.319098048', 'Acidity_2.323921689',
'Acidity_2.325145985', 'Acidity_2.329274555', 'Acidity_2.330347175',
'Acidity_2.331284997', 'Acidity_2.338540166', 'Acidity_2.342807242',
'Acidity_2.343417978', 'Acidity_2.344657884', 'Acidity_2.345164631',
'Acidity_2.34552157', 'Acidity_2.347861337', 'Acidity_2.35380814',
'Acidity_2.355625894', 'Acidity_2.358023613', 'Acidity_2.359771783',
'Acidity_2.360765322', 'Acidity_2.36743413', 'Acidity_2.377949333',
'Acidity_2.380855802', 'Acidity_2.38179469', 'Acidity_2.383936244',
'Acidity_2.386965287', 'Acidity_2.388514589', 'Acidity_2.388586111',
'Acidity_2.391349211', 'Acidity_2.392763422', 'Acidity_2.392864652',
'Acidity_2.39350287', 'Acidity_2.396013951', 'Acidity_2.397487419',
'Acidity_2.399052542', 'Acidity_2.400152227', 'Acidity_2.400968257',
'Acidity_2.405654839', 'Acidity_2.405837627', 'Acidity_2.40789327',
'Acidity_2.411086303', 'Acidity_2.414170509', 'Acidity_2.416317749',
'Acidity_2.419515928', 'Acidity_2.42129939', 'Acidity_2.422487722',
'Acidity_2.422747057', 'Acidity_2.423539068', 'Acidity_2.423928679',
'Acidity_2.424332415', 'Acidity_2.430187757', 'Acidity_2.432501809',
'Acidity_2.43431229', 'Acidity_2.434754044', 'Acidity_2.434947598',
'Acidity_2.442705012', 'Acidity_2.445013853', 'Acidity_2.446554704',
'Acidity_2.448169699', 'Acidity_2.450725045', 'Acidity_2.453387601',
'Acidity_2.453666286', 'Acidity_2.454228211', 'Acidity_2.458897674',
'Acidity_2.465236699', 'Acidity_2.465401734', 'Acidity_2.466289385',
'Acidity_2.469651486', 'Acidity_2.473983711', 'Acidity_2.474673276',
'Acidity_2.476016393', 'Acidity_2.476398328', 'Acidity_2.476740123',
'Acidity_2.477579568', 'Acidity_2.48045173', 'Acidity_2.48128233',
'Acidity_2.481557725', 'Acidity_2.482959627', 'Acidity_2.484374946',
'Acidity_2.492781622', 'Acidity_2.493781985', 'Acidity_2.501694047',
'Acidity_2.502066301', 'Acidity_2.503739294', 'Acidity_2.504311868',
'Acidity_2.50518817', 'Acidity_2.505367723', 'Acidity_2.5054737',
'Acidity_2.506834119', 'Acidity_2.508858741', 'Acidity_2.518020811',
'Acidity_2.518374081', 'Acidity_2.518539233', 'Acidity_2.519346925',

'Acidity_2.520626892', 'Acidity_2.520905121', 'Acidity_2.523712283',
'Acidity_2.523858095', 'Acidity_2.524172585', 'Acidity_2.524304064',
'Acidity_2.527526345', 'Acidity_2.530517323', 'Acidity_2.533952804',
'Acidity_2.536835582', 'Acidity_2.541203984', 'Acidity_2.544447652',
'Acidity_2.545395225', 'Acidity_2.545422919', 'Acidity_2.548896236',
'Acidity_2.551831691', 'Acidity_2.552587448', 'Acidity_2.553833014',
'Acidity_2.557250685', 'Acidity_2.560803351', 'Acidity_2.563835795',
'Acidity_2.564238209', 'Acidity_2.564829402', 'Acidity_2.565322523',
'Acidity_2.568845781', 'Acidity_2.569365201', 'Acidity_2.57033771',
'Acidity_2.571582061', 'Acidity_2.573083876', 'Acidity_2.573280752',
'Acidity_2.575010153', 'Acidity_2.575213796', 'Acidity_2.576581178',
'Acidity_2.576949552', 'Acidity_2.577473097', 'Acidity_2.579043452',
'Acidity_2.586432022', 'Acidity_2.589012926', 'Acidity_2.589351111',
'Acidity_2.589818171', 'Acidity_2.59718064', 'Acidity_2.597690447',
'Acidity_2.598926778', 'Acidity_2.599186237', 'Acidity_2.59971145',
'Acidity_2.599989695', 'Acidity_2.600239701', 'Acidity_2.600716106',
'Acidity_2.603010577', 'Acidity_2.604484205', 'Acidity_2.60786687',
'Acidity_2.608624768', 'Acidity_2.608796602', 'Acidity_2.613614988',
'Acidity_2.614692534', 'Acidity_2.617780266', 'Acidity_2.618615143',
'Acidity_2.620061624', 'Acidity_2.620943417', 'Acidity_2.621552305',
'Acidity_2.621636473', 'Acidity_2.624366428', 'Acidity_2.626433539',
'Acidity_2.626749321', 'Acidity_2.627274158', 'Acidity_2.635430475',
'Acidity_2.642948241', 'Acidity_2.647722423', 'Acidity_2.648944119',
'Acidity_2.649874004', 'Acidity_2.650961932', 'Acidity_2.651101705',
'Acidity_2.652943776', 'Acidity_2.653468431', 'Acidity_2.657543409',
'Acidity_2.66212605', 'Acidity_2.662200873', 'Acidity_2.662547829',
'Acidity_2.663416258', 'Acidity_2.665086812', 'Acidity_2.666099628',
'Acidity_2.667098506', 'Acidity_2.669102823', 'Acidity_2.67598861',
'Acidity_2.683269381', 'Acidity_2.684720448', 'Acidity_2.68483651',
'Acidity_2.686067904', 'Acidity_2.687006687', 'Acidity_2.691332311',
'Acidity_2.693643818', 'Acidity_2.696619742', 'Acidity_2.697240797',
'Acidity_2.697917877', 'Acidity_2.700550217', 'Acidity_2.701821479',
'Acidity_2.702748283', 'Acidity_2.706358361', 'Acidity_2.708657416',
'Acidity_2.7095919', 'Acidity_2.709944697', 'Acidity_2.71103408',
'Acidity_2.714357454', 'Acidity_2.718979289', 'Acidity_2.719665829',
'Acidity_2.720059239', 'Acidity_2.720284244', 'Acidity_2.721538302',
'Acidity_2.722973293', 'Acidity_2.723642804', 'Acidity_2.724329759',
'Acidity_2.724627734', 'Acidity_2.728708138', 'Acidity_2.733986236',
'Acidity_2.740924761', 'Acidity_2.74473663', 'Acidity_2.747653602',
'Acidity_2.753851267', 'Acidity_2.755812939', 'Acidity_2.759441226',
'Acidity_2.766830845', 'Acidity_2.767157405', 'Acidity_2.769458608',
'Acidity_2.771449533', 'Acidity_2.77301531', 'Acidity_2.776502937',
'Acidity_2.779827015', 'Acidity_2.786759187', 'Acidity_2.788116753',
'Acidity_2.790841777', 'Acidity_2.790905995', 'Acidity_2.792589273',
'Acidity_2.801796005', 'Acidity_2.802812312', 'Acidity_2.803937963',
'Acidity_2.810348673', 'Acidity_2.810378257', 'Acidity_2.814021899',
'Acidity_2.821766372', 'Acidity_2.823337043', 'Acidity_2.825652933',
'Acidity_2.829489418', 'Acidity_2.831482849', 'Acidity_2.834503938',

'Acidity_2.836815744', 'Acidity_2.840613192', 'Acidity_2.843064411',
'Acidity_2.860697945', 'Acidity_2.862160014', 'Acidity_2.865048371',
'Acidity_2.87016191', 'Acidity_2.871475348', 'Acidity_2.872205132',
'Acidity_2.87351138', 'Acidity_2.874555906', 'Acidity_2.878142344',
'Acidity_2.887083647', 'Acidity_2.892003722', 'Acidity_2.892828747',
'Acidity_2.90375397', 'Acidity_2.904401259', 'Acidity_2.90534156',
'Acidity_2.909939244', 'Acidity_2.914469166', 'Acidity_2.918977767',
'Acidity_2.926372989', 'Acidity_2.92642631', 'Acidity_2.927230832',
'Acidity_2.928774852', 'Acidity_2.932793736', 'Acidity_2.936344233',
'Acidity_2.936987174', 'Acidity_2.943281752', 'Acidity_2.943658081',
'Acidity_2.943828562', 'Acidity_2.948829885', 'Acidity_2.949225886',
'Acidity_2.954526914', 'Acidity_2.96054524', 'Acidity_2.9637063',
'Acidity_2.965505402', 'Acidity_2.966694832', 'Acidity_2.973010155',
'Acidity_2.975223485', 'Acidity_2.97738182', 'Acidity_2.977411637',
'Acidity_2.979749725', 'Acidity_2.981116267', 'Acidity_2.98479691',
'Acidity_2.990700053', 'Acidity_3.002468885', 'Acidity_3.004852758',
'Acidity_3.007054198', 'Acidity_3.007831395', 'Acidity_3.02180759',
'Acidity_3.02839618', 'Acidity_3.030761684', 'Acidity_3.03179765',
'Acidity_3.040761752', 'Acidity_3.04163101', 'Acidity_3.048116271',
'Acidity_3.050600945', 'Acidity_3.052069553', 'Acidity_3.062536423',
'Acidity_3.065090038', 'Acidity_3.067087102', 'Acidity_3.068997143',
'Acidity_3.079908093', 'Acidity_3.080107647', 'Acidity_3.086566434',
'Acidity_3.091904815', 'Acidity_3.096682929', 'Acidity_3.096691118',
'Acidity_3.097818375', 'Acidity_3.09905486', 'Acidity_3.103715262',
'Acidity_3.104203842', 'Acidity_3.104922831', 'Acidity_3.129403535',
'Acidity_3.133728152', 'Acidity_3.139484639', 'Acidity_3.145872884',
'Acidity_3.152707213', 'Acidity_3.159536667', 'Acidity_3.160949687',
'Acidity_3.170053076', 'Acidity_3.174687485', 'Acidity_3.184188187',
'Acidity_3.188345866', 'Acidity_3.188874035', 'Acidity_3.189154084',
'Acidity_3.200821467', 'Acidity_3.201419042', 'Acidity_3.20408054',
'Acidity_3.206656298', 'Acidity_3.207720704', 'Acidity_3.216363849',
'Acidity_3.220223691', 'Acidity_3.220311509', 'Acidity_3.220818231',
'Acidity_3.225935051', 'Acidity_3.230441357', 'Acidity_3.232687294',
'Acidity_3.246392767', 'Acidity_3.247621524', 'Acidity_3.251512146',
'Acidity_3.253430006', 'Acidity_3.256333414', 'Acidity_3.259328603',
'Acidity_3.267287974', 'Acidity_3.270969072', 'Acidity_3.276022921',
'Acidity_3.283154894', 'Acidity_3.285412981', 'Acidity_3.291172928',
'Acidity_3.292110029', 'Acidity_3.296287937', 'Acidity_3.301476164',
'Acidity_3.306494887', 'Acidity_3.311386373', 'Acidity_3.316119737',
'Acidity_3.319835117', 'Acidity_3.321828024', 'Acidity_3.32511205',
'Acidity_3.336713101', 'Acidity_3.34199466', 'Acidity_3.342109929',
'Acidity_3.347671368', 'Acidity_3.350155927', 'Acidity_3.35747973',
'Acidity_3.364612329', 'Acidity_3.368594087', 'Acidity_3.368661424',
'Acidity_3.374035449', 'Acidity_3.378856539', 'Acidity_3.380683335',
'Acidity_3.383837679', 'Acidity_3.3848004', 'Acidity_3.387447604',
'Acidity_3.38751734', 'Acidity_3.389386459', 'Acidity_3.399375591',
'Acidity_3.401455383', 'Acidity_3.404747277', 'Acidity_3.405436263',
'Acidity_3.411549677', 'Acidity_3.416639346', 'Acidity_3.418052336',

'Acidity_3.419852669', 'Acidity_3.422270784', 'Acidity_3.428367426',
'Acidity_3.436560049', 'Acidity_3.43973372', 'Acidity_3.441841889',
'Acidity_3.447199193', 'Acidity_3.451955025', 'Acidity_3.453014147',
'Acidity_3.460221928', 'Acidity_3.467810108', 'Acidity_3.47299406',
'Acidity_3.488602631', 'Acidity_3.489358464', 'Acidity_3.496538098',
'Acidity_3.496943154', 'Acidity_3.499264098', 'Acidity_3.501481092',
'Acidity_3.502273108', 'Acidity_3.506464979', 'Acidity_3.509665067',
'Acidity_3.510518945', 'Acidity_3.518451596', 'Acidity_3.527774311',
'Acidity_3.532238446', 'Acidity_3.537846194', 'Acidity_3.538732353',
'Acidity_3.540891827', 'Acidity_3.543470082', 'Acidity_3.551641608',
'Acidity_3.554015134', 'Acidity_3.555318358', 'Acidity_3.557674731',
'Acidity_3.559569799', 'Acidity_3.56533263', 'Acidity_3.565493262',
'Acidity_3.569300942', 'Acidity_3.582814236', 'Acidity_3.59055577',
'Acidity_3.591669472', 'Acidity_3.592090472', 'Acidity_3.597187215',
'Acidity_3.598619133', 'Acidity_3.599024519', 'Acidity_3.600796684',
'Acidity_3.604772068', 'Acidity_3.604999027', 'Acidity_3.607232346',
'Acidity_3.612062408', 'Acidity_3.612383361', 'Acidity_3.615340239',
'Acidity_3.616898168', 'Acidity_3.617288034', 'Acidity_3.618673557',
'Acidity_3.620053885', 'Acidity_3.62855493', 'Acidity_3.637884115',
'Acidity_3.654805327', 'Acidity_3.658487446', 'Acidity_3.669770294',
'Acidity_3.670181522', 'Acidity_3.674093248', 'Acidity_3.67749718',
'Acidity_3.683016111', 'Acidity_3.689580857', 'Acidity_3.696714537',
'Acidity_3.701673772', 'Acidity_3.725119774', 'Acidity_3.725729501',
'Acidity_3.738833794', 'Acidity_3.739759196', 'Acidity_3.744711358',
'Acidity_3.752627485', 'Acidity_3.758296168', 'Acidity_3.760518321',
'Acidity_3.761634732', 'Acidity_3.764854713', 'Acidity_3.766012647',
'Acidity_3.767958209', 'Acidity_3.768027336', 'Acidity_3.778604046',
'Acidity_3.782451601', 'Acidity_3.793323716', 'Acidity_3.794659404',
'Acidity_3.812018328', 'Acidity_3.816880808', 'Acidity_3.825229936',
'Acidity_3.827240359', 'Acidity_3.831942983', 'Acidity_3.844658129',
'Acidity_3.84744379', 'Acidity_3.856590968', 'Acidity_3.86888573',
'Acidity_3.889340641', 'Acidity_3.905349775', 'Acidity_3.923279611',
'Acidity_3.954487792', 'Acidity_3.979854814', 'Acidity_3.991479474',
'Acidity_3.991795286', 'Acidity_4.020885915', 'Acidity_4.022184389',
'Acidity_4.024592092', 'Acidity_4.034392859', 'Acidity_4.036879974',
'Acidity_4.037146399', 'Acidity_4.04329901', 'Acidity_4.046948428',
'Acidity_4.04877488', 'Acidity_4.072019984', 'Acidity_4.076830586',
'Acidity_4.077163435', 'Acidity_4.082158867', 'Acidity_4.093808854',
'Acidity_4.09531232', 'Acidity_4.110698064', 'Acidity_4.125106377',
'Acidity_4.125265455', 'Acidity_4.127360306', 'Acidity_4.13039773',
'Acidity_4.147140619', 'Acidity_4.147865892', 'Acidity_4.157028537',
'Acidity_4.158394682', 'Acidity_4.169748166', 'Acidity_4.173553001',
'Acidity_4.17939151', 'Acidity_4.207055592', 'Acidity_4.210413891',
'Acidity_4.21395771', 'Acidity_4.263594155', 'Acidity_4.264650581',
'Acidity_4.266416653', 'Acidity_4.280580332', 'Acidity_4.288667532',
'Acidity_4.300782725', 'Acidity_4.306460128', 'Acidity_4.306908269',
'Acidity_4.308434418', 'Acidity_4.312841326', 'Acidity_4.324596042',
'Acidity_4.325308624', 'Acidity_4.329863961', 'Acidity_4.334399653',

```
'Acidity_4.348131862', 'Acidity_4.371277287', 'Acidity_4.392352372',
'Acidity_4.393658725', 'Acidity_4.405949342', 'Acidity_4.430772373',
'Acidity_4.434521041', 'Acidity_4.43608798', 'Acidity_4.472115939',
'Acidity_4.514503907', 'Acidity_4.595794222', 'Acidity_4.59635612',
'Acidity_4.619550751', 'Acidity_4.622510262', 'Acidity_4.623162668',
'Acidity_4.659482955', 'Acidity_4.67363368', 'Acidity_4.687954168',
'Acidity_4.689126107', 'Acidity_4.705961188', 'Acidity_4.738312808',
'Acidity_4.74391499', 'Acidity_4.787568824', 'Acidity_4.80783425',
'Acidity_4.815610945', 'Acidity_4.820600657', 'Acidity_4.85770709',
'Acidity_4.892835064', 'Acidity_4.902216626', 'Acidity_4.91079485',
'Acidity_4.915941101', 'Acidity_4.940053725', 'Acidity_4.96733684',
'Acidity_4.989297317', 'Acidity_4.999895803', 'Acidity_5.000494671',
'Acidity_5.011310465', 'Acidity_5.05127048', 'Acidity_5.087458065',
'Acidity_5.098353797', 'Acidity_5.123757212', 'Acidity_5.125138503',
'Acidity_5.131967121', 'Acidity_5.136138788', 'Acidity_5.170171939',
'Acidity_5.189715685', 'Acidity_5.201887028', 'Acidity_5.206389947',
'Acidity_5.240468622', 'Acidity_5.26838182', 'Acidity_5.303691147',
'Acidity_5.305217658', 'Acidity_5.361157242', 'Acidity_5.373434788',
'Acidity_5.381199793', 'Acidity_5.389839871', 'Acidity_5.416040003',
'Acidity_5.458589887', 'Acidity_5.465399138', 'Acidity_5.478025057',
'Acidity_5.529057165', 'Acidity_5.529861296', 'Acidity_5.536747898',
'Acidity_5.538526181', 'Acidity_5.552320288', 'Acidity_5.560108693',
'Acidity_5.568768151', 'Acidity_5.588124235', 'Acidity_5.614975313',
'Acidity_5.651337095', 'Acidity_5.685252925', 'Acidity_5.746699131',
'Acidity_5.890655101', 'Acidity_5.91888783', 'Acidity_6.004566164',
'Acidity_6.008854208', 'Acidity_6.13106252', 'Acidity_6.13896523',
'Acidity_6.17198647', 'Acidity_6.184145401', 'Acidity_6.267182876',
'Acidity_6.348869952', 'Acidity_6.70139469', 'Acidity_7.193374375',
'Acidity_7.404736238']
```

Dimensiones de X: (4000, 4006)

Dimensiones de y codificado: (4000,)

Primeros 5 valores codificados de y: [1 1 0 1 1]

Etiquetas originales de y: ['bad' 'good']

Dimensiones de X_train: (2800, 4006)

Dimensiones de X_test: (1200, 4006)

Dimensiones de y_train: (2800,)

Dimensiones de y_test: (1200,)

```
[17]: from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix

resultados2 = []
matrices_confusion_train2 = {}
matrices_confusion_test2 = {}

print("Iniciando entrenamiento de modelos (calidad de manzana)...")
```

```

for nombre, modelo in clasificadores:
    print(f"\nEntrenando {nombre}...")

    # Entrenamiento
    modelo.fit(X_train, y_train)

    # Predicciones
    y_train_pred = modelo.predict(X_train)
    y_test_pred = modelo.predict(X_test)

    # Métricas
    acc_train = accuracy_score(y_train, y_train_pred)
    acc_test = accuracy_score(y_test, y_test_pred)
    prec = precision_score(y_test, y_test_pred, average='weighted', ↵
↵zero_division=0)
    rec = recall_score(y_test, y_test_pred, average='weighted')
    f1 = f1_score(y_test, y_test_pred, average='weighted')

    # Matrices de confusión
    cm_train = confusion_matrix(y_train, y_train_pred)
    cm_test = confusion_matrix(y_test, y_test_pred)
    matrices_confusion_train2[nombre] = cm_train
    matrices_confusion_test2[nombre] = cm_test

    # Resultados
    resultados2.append({
        'Modelo': nombre,
        'Accuracy Train': acc_train,
        'Accuracy Test': acc_test,
        'Precision': prec,
        'Recall': rec,
        'F1 Score': f1
    })

    print(f" {nombre} completado. Accuracy Test: {acc_test:.4f}")

df_resultados2 = pd.DataFrame(resultados2).sort_values(by='Accuracy Test', ↵
↵ascending=False)

```

Iniciando entrenamiento de modelos (calidad de manzana)...

Entrenando Regresión Logística...

Regresión Logística completado. Accuracy Test: 0.7408

Entrenando Random Forest...

Random Forest completado. Accuracy Test: 0.8483

Entrenando Árbol de Decisión...

Árbol de Decisión completado. Accuracy Test: 0.7875

```
[18]: df_resultados2
```

```
[18]:
```

	Modelo	Accuracy Train	Accuracy Test	Precision	Recall	\
1	Random Forest	1.000000	0.848333	0.848401	0.848333	
2	Árbol de Decisión	1.000000	0.787500	0.787520	0.787500	
0	Regresión Logística	0.727143	0.740833	0.741012	0.740833	

	F1 Score
1	0.848308
2	0.787505
0	0.740836

```
[19]: print("Reporte de clasificación para cada modelo:\n")

for nombre, modelo in clasificadores:
    y_pred = modelo.predict(X_test)

    print("=" * 50)
    print(f" Modelo: {nombre}")
    print(classification_report(y_test, y_pred, target_names=le.classes_))
```

Reporte de clasificación para cada modelo:

```
=====
Modelo: Regresión Logística
      precision    recall  f1-score   support

   bad         0.73       0.75       0.74         593
   good         0.75       0.73       0.74         607

 accuracy                   0.74         1200
 macro avg         0.74       0.74       0.74         1200
weighted avg         0.74       0.74       0.74         1200

=====
```

```
Modelo: Random Forest
      precision    recall  f1-score   support

   bad         0.85       0.84       0.85         593
   good         0.84       0.86       0.85         607

 accuracy                   0.85         1200
 macro avg         0.85       0.85       0.85         1200
weighted avg         0.85       0.85       0.85         1200

=====
```

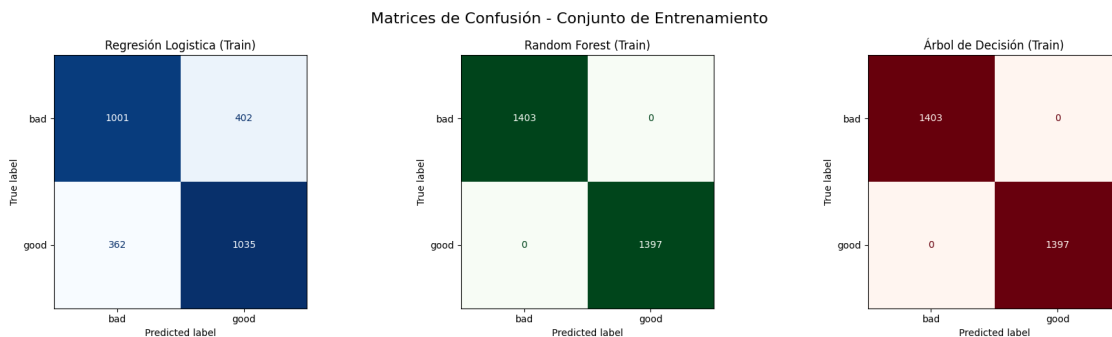
Modelo: Árbol de Decisión

	precision	recall	f1-score	support
bad	0.78	0.79	0.79	593
good	0.79	0.79	0.79	607
accuracy			0.79	1200
macro avg	0.79	0.79	0.79	1200
weighted avg	0.79	0.79	0.79	1200

```
[20]: #Matrices de Confusión para conjunto de entrenamiento
fig, axes = plt.subplots(1, 3, figsize=(18, 5))
etiquetas = le.classes_ # Ya solo serán ['bad', 'good']

for i, (nombre, _) in enumerate(clasificadores):
    ConfusionMatrixDisplay(
        confusion_matrix=matrices_confusion_train2[nombre],
        display_labels=etiquetas
    ).plot(cmap=["Blues", "Greens", "Reds"][i], ax=axes[i], colorbar=False)
    axes[i].set_title(f"{nombre} (Train)")

fig.suptitle("Matrices de Confusión - Conjunto de Entrenamiento", fontsize=16)
plt.tight_layout()
plt.show()
```



```
[21]: #Matrices de Confusión para conjunto de prueba
fig, axes = plt.subplots(1, 3, figsize=(18, 5))
etiquetas = le.classes_

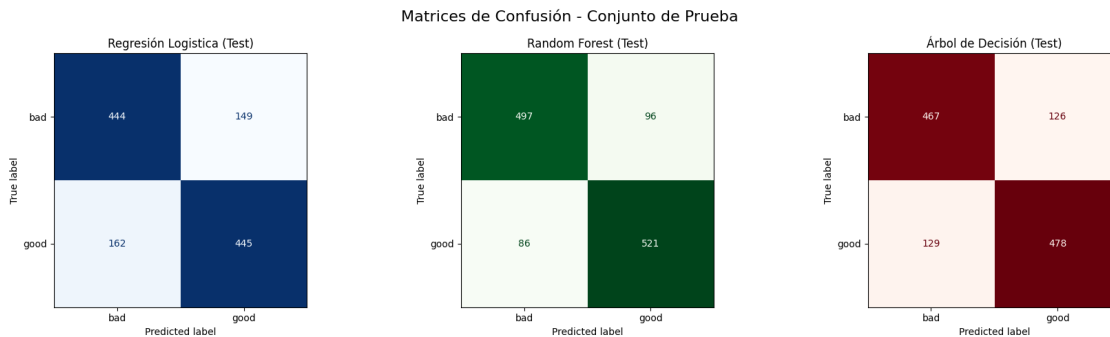
for i, (nombre, _) in enumerate(clasificadores):
    ConfusionMatrixDisplay(
        confusion_matrix=matrices_confusion_test2[nombre],
        display_labels=etiquetas
    ).plot(cmap=["Blues", "Greens", "Reds"][i], ax=axes[i], colorbar=False)
```

```

axes[i].set_title(f"{nombre} (Test)")

fig.suptitle("Matrices de Confusión - Conjunto de Prueba", fontsize=16)
plt.tight_layout()
plt.show()

```



```

[22]: #Curvas Rog

y_test_bin = label_binarize(y_test, classes=[0, 1]).ravel() # ravel() para que
↳ sea vector plano
etiquetas = le.classes_

# Crear figura
fig, axes = plt.subplots(1, 3, figsize=(18, 5))

# Tabla para resumen AUC
auc_resumen = []

for i, (nombre, modelo) in enumerate(clasificadores):
    # Obtener probabilidades de clase positiva
    y_score = modelo.predict_proba(X_test)[:, 1]

    # Calcular curva ROC
    fpr, tpr, _ = roc_curve(y_test_bin, y_score)
    roc_auc = auc(fpr, tpr)

    # Graficar
    axes[i].plot(fpr, tpr, lw=2, label=f'AUC = {roc_auc:.2f}',
    ↳ color='darkorange')
    axes[i].plot([0, 1], [0, 1], 'k--', lw=1)
    axes[i].set_xlim([0.0, 1.0])
    axes[i].set_ylim([0.0, 1.05])
    axes[i].set_xlabel('False Positive Rate')
    axes[i].set_ylabel('True Positive Rate')

```

```

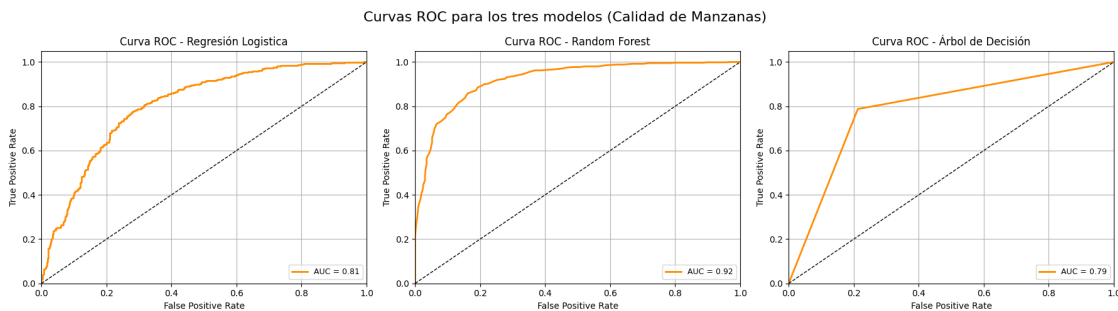
axes[i].set_title(f'Curva ROC - {nombre}')
axes[i].legend(loc="lower right", fontsize=9)
axes[i].grid(True)

# Guardar AUC para la tabla
auc_resumen.append({'Modelo': nombre, 'AUC': roc_auc})

# Título general
fig.suptitle("Curvas ROC para los tres modelos (Calidad de Manzanas)",
             ↳ fontsize=16)
plt.tight_layout()
plt.show()

# Tabla resumen AUC
df_auc = pd.DataFrame(auc_resumen).sort_values(by='AUC', ascending=False)
display(df_auc)

```



	Modelo	AUC
1	Random Forest	0.921509
0	Regresión Logística	0.806143
2	Árbol de Decisión	0.787500

```

[23]: # Unir las métricas con el AUC
df_resumen_problema2 = pd.merge(df_resultados2, df_auc, on='Modelo')

# Agregar número de problema
df_resumen_problema2.insert(0, 'Problema', 2)

# Reordenar columnas
columnas_ordenadas = [
    'Problema', 'Modelo', 'Accuracy Test', 'Precision', 'Recall',
    'F1 Score', 'AUC Promedio (macro)'
]

# Señalar el mejor modelo (según Accuracy Test)

```

```

mejor_modelo = df_resumen_problema2.sort_values(by='Accuracy Test',
↪ascending=False).iloc[0]['Modelo']
df_resumen_problema2['Mejor Modelo'] = df_resumen_problema2['Modelo'].
↪apply(lambda x: ' ' if x == mejor_modelo else '')

# Mostrar
import pandas as pd
import numpy as np
import IPython.display as dsp
dsp.display(df_resumen_problema2.round(3))

```

	Problema	Modelo	Accuracy Train	Accuracy Test	Precision \
0	2	Random Forest	1.000	0.848	0.848
1	2	Árbol de Decisión	1.000	0.788	0.788
2	2	Regresión Logística	0.727	0.741	0.741

	Recall	F1 Score	AUC Mejor Modelo
0	0.848	0.848	0.922
1	0.788	0.788	0.788
2	0.741	0.741	0.806

0.6 PROBLEMA N.3 (APRENDIZAJE AUTOMATICO)

Predicción de la jugosidad de una manzana a partir de sus características

Dataset:<https://www.kaggle.com/datasets/nelgiryewithana/apple-quality>

```

[24]: # --- Separar el DataFrame en X y Y ---
X3 = df_apple_limpio.drop(columns=['Juiciness']) # Quitamos la columna objetivo
y3 = df_apple_limpio['Juiciness']               # Variable objetivo continua

# --- Codificar variables categóricas (como 'Color') ---
X3 = pd.get_dummies(X3, drop_first=True)

# --- Verificación ---
print("Columnas de X codificado:", X3.columns.tolist())
print("Dimensiones de X:", X3.shape)
print("Dimensiones de y (objetivo):", y3.shape)
print("Primeros 5 valores de y:", y3.head())

# --- Dividir datos en entrenamiento y prueba ---
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler

X3_train, X3_test, y3_train, y3_test = train_test_split(X3, y3, test_size=0.3,
↪random_state=42)

# --- Escalado ---

```

```

scaler = StandardScaler()
X3_train = scaler.fit_transform(X3_train)
X3_test = scaler.transform(X3_test)

# --- Verificación de dimensiones ---
print("Dimensiones de X_train:", X3_train.shape)
print("Dimensiones de X_test:", X3_test.shape)
print("Dimensiones de y_train:", y3_train.shape)
print("Dimensiones de y_test:", y3_test.shape)

```

Columnas de X codificado: ['A_id', 'Size', 'Weight', 'Sweetness', 'Crunchiness', 'Ripeness', 'Acidity_-0.001593958', 'Acidity_-0.003109107', 'Acidity_-0.008136378', 'Acidity_-0.009153027', 'Acidity_-0.011438035', 'Acidity_-0.011582814', 'Acidity_-0.012061768', 'Acidity_-0.012433307', 'Acidity_-0.012611428', 'Acidity_-0.014252196', 'Acidity_-0.014548296', 'Acidity_-0.01630256', 'Acidity_-0.017094245', 'Acidity_-0.021751811', 'Acidity_-0.021881716', 'Acidity_-0.022774534', 'Acidity_-0.024607366', 'Acidity_-0.024782906', 'Acidity_-0.025322858', 'Acidity_-0.026114955', 'Acidity_-0.026177532', 'Acidity_-0.0287965', 'Acidity_-0.029111848', 'Acidity_-0.030533085', 'Acidity_-0.030536884', 'Acidity_-0.031126053', 'Acidity_-0.032305611', 'Acidity_-0.033737529', 'Acidity_-0.035106956', 'Acidity_-0.035775461', 'Acidity_-0.037423169', 'Acidity_-0.037817127', 'Acidity_-0.03893581', 'Acidity_-0.040585042', 'Acidity_-0.041491395', 'Acidity_-0.04287989', 'Acidity_-0.043227512', 'Acidity_-0.043436179', 'Acidity_-0.045183862', 'Acidity_-0.045203447', 'Acidity_-0.045751867', 'Acidity_-0.046495034', 'Acidity_-0.049403327', 'Acidity_-0.049725888', 'Acidity_-0.050037559', 'Acidity_-0.052342248', 'Acidity_-0.052965085', 'Acidity_-0.055333999', 'Acidity_-0.058448189', 'Acidity_-0.058599695', 'Acidity_-0.059952688', 'Acidity_-0.060036533', 'Acidity_-0.060371554', 'Acidity_-0.062892903', 'Acidity_-0.064020014', 'Acidity_-0.064257729', 'Acidity_-0.064418364', 'Acidity_-0.064779143', 'Acidity_-0.067216749', 'Acidity_-0.067312574', 'Acidity_-0.06847672', 'Acidity_-0.068995237', 'Acidity_-0.069598119', 'Acidity_-0.069879417', 'Acidity_-0.07028261', 'Acidity_-0.071538203', 'Acidity_-0.072155984', 'Acidity_-0.079761693', 'Acidity_-0.083171176', 'Acidity_-0.083337968', 'Acidity_-0.08337454', 'Acidity_-0.086582903', 'Acidity_-0.087134055', 'Acidity_-0.088663441', 'Acidity_-0.08899782', 'Acidity_-0.089084964', 'Acidity_-0.089930972', 'Acidity_-0.090021116', 'Acidity_-0.092992357', 'Acidity_-0.093251563', 'Acidity_-0.095012373', 'Acidity_-0.100716598', 'Acidity_-0.101481348', 'Acidity_-0.101619167', 'Acidity_-0.101724645', 'Acidity_-0.103006945', 'Acidity_-0.104389292', 'Acidity_-0.105291052', 'Acidity_-0.105424932', 'Acidity_-0.112472887', 'Acidity_-0.113157751', 'Acidity_-0.114319001', 'Acidity_-0.114346995', 'Acidity_-0.116073579', 'Acidity_-0.116938612', 'Acidity_-0.117891307', 'Acidity_-0.12163975', 'Acidity_-0.121784757', 'Acidity_-0.122705371', 'Acidity_-0.123379089', 'Acidity_-0.125013797', 'Acidity_-0.127366597', 'Acidity_-0.127804206', 'Acidity_-0.129357025', 'Acidity_-0.129697828', 'Acidity_-0.131763548', 'Acidity_-0.13201002', 'Acidity_-0.132407603', 'Acidity_-0.135212578', 'Acidity_-0.138584021',

'Acidity_-0.139888201', 'Acidity_-0.140260908', 'Acidity_-0.142374841',
'Acidity_-0.142418513', 'Acidity_-0.145661877', 'Acidity_-0.147493032',
'Acidity_-0.148094755', 'Acidity_-0.150866596', 'Acidity_-0.153170021',
'Acidity_-0.153359887', 'Acidity_-0.154144723', 'Acidity_-0.154609697',
'Acidity_-0.155022519', 'Acidity_-0.155481559', 'Acidity_-0.155530675',
'Acidity_-0.155858708', 'Acidity_-0.156731288', 'Acidity_-0.157130678',
'Acidity_-0.157924585', 'Acidity_-0.15793634', 'Acidity_-0.158018044',
'Acidity_-0.159626345', 'Acidity_-0.159879504', 'Acidity_-0.160666067',
'Acidity_-0.160762434', 'Acidity_-0.162040748', 'Acidity_-0.163210965',
'Acidity_-0.1640507', 'Acidity_-0.165532307', 'Acidity_-0.166238213',
'Acidity_-0.166840905', 'Acidity_-0.166934434', 'Acidity_-0.171433286',
'Acidity_-0.171514808', 'Acidity_-0.171976702', 'Acidity_-0.172241138',
'Acidity_-0.175329442', 'Acidity_-0.176108441', 'Acidity_-0.180186783',
'Acidity_-0.180916277', 'Acidity_-0.181076729', 'Acidity_-0.181237683',
'Acidity_-0.184644788', 'Acidity_-0.185962292', 'Acidity_-0.187720712',
'Acidity_-0.190202595', 'Acidity_-0.19350131', 'Acidity_-0.19466949',
'Acidity_-0.195057181', 'Acidity_-0.195111846', 'Acidity_-0.19729751',
'Acidity_-0.198068641', 'Acidity_-0.199364539', 'Acidity_-0.20004532',
'Acidity_-0.201099027', 'Acidity_-0.201583219', 'Acidity_-0.20164097',
'Acidity_-0.205165577', 'Acidity_-0.206759919', 'Acidity_-0.207245857',
'Acidity_-0.207891707', 'Acidity_-0.208976341', 'Acidity_-0.209055894',
'Acidity_-0.209677379', 'Acidity_-0.209986622', 'Acidity_-0.211490845',
'Acidity_-0.212057285', 'Acidity_-0.212711899', 'Acidity_-0.213484699',
'Acidity_-0.214724499', 'Acidity_-0.218830741', 'Acidity_-0.219795307',
'Acidity_-0.221104798', 'Acidity_-0.221227947', 'Acidity_-0.222391791',
'Acidity_-0.22261528', 'Acidity_-0.222751026', 'Acidity_-0.223255333',
'Acidity_-0.225686776', 'Acidity_-0.226509407', 'Acidity_-0.228236467',
'Acidity_-0.229714061', 'Acidity_-0.232190647', 'Acidity_-0.23537231',
'Acidity_-0.236998031', 'Acidity_-0.237104575', 'Acidity_-0.237263801',
'Acidity_-0.240021926', 'Acidity_-0.240177877', 'Acidity_-0.24299231',
'Acidity_-0.24524675', 'Acidity_-0.246022141', 'Acidity_-0.247001025',
'Acidity_-0.247436221', 'Acidity_-0.247542181', 'Acidity_-0.248249837',
'Acidity_-0.250708498', 'Acidity_-0.251871449', 'Acidity_-0.253866598',
'Acidity_-0.2553206', 'Acidity_-0.259443433', 'Acidity_-0.264234402',
'Acidity_-0.264526021', 'Acidity_-0.26541206', 'Acidity_-0.266609261',
'Acidity_-0.266775155', 'Acidity_-0.268075678', 'Acidity_-0.268519733',
'Acidity_-0.268954307', 'Acidity_-0.269680302', 'Acidity_-0.270118466',
'Acidity_-0.270345315', 'Acidity_-0.272164508', 'Acidity_-0.274575749',
'Acidity_-0.275670961', 'Acidity_-0.280116277', 'Acidity_-0.280325343',
'Acidity_-0.281977942', 'Acidity_-0.282558364', 'Acidity_-0.2828032',
'Acidity_-0.286911456', 'Acidity_-0.287477036', 'Acidity_-0.289741446',
'Acidity_-0.292091057', 'Acidity_-0.293212613', 'Acidity_-0.293752288',
'Acidity_-0.294918041', 'Acidity_-0.297218327', 'Acidity_-0.297336319',
'Acidity_-0.297613936', 'Acidity_-0.299100961', 'Acidity_-0.299899373',
'Acidity_-0.304185954', 'Acidity_-0.304780024', 'Acidity_-0.306520094',
'Acidity_-0.308598616', 'Acidity_-0.3088289', 'Acidity_-0.311928118',
'Acidity_-0.312796419', 'Acidity_-0.313392864', 'Acidity_-0.315721218',
'Acidity_-0.318278176', 'Acidity_-0.319050723', 'Acidity_-0.319752434',

'Acidity_-0.320548874', 'Acidity_-0.320573507', 'Acidity_-0.321599953',
'Acidity_-0.325436857', 'Acidity_-0.328378522', 'Acidity_-0.331566813',
'Acidity_-0.332070551', 'Acidity_-0.33283833', 'Acidity_-0.337194942',
'Acidity_-0.338260538', 'Acidity_-0.342965528', 'Acidity_-0.347664165',
'Acidity_-0.348891561', 'Acidity_-0.352363349', 'Acidity_-0.352533686',
'Acidity_-0.3529432', 'Acidity_-0.353434952', 'Acidity_-0.354309056',
'Acidity_-0.356564039', 'Acidity_-0.358597278', 'Acidity_-0.359520606',
'Acidity_-0.360762862', 'Acidity_-0.361346892', 'Acidity_-0.362249992',
'Acidity_-0.362616748', 'Acidity_-0.364658365', 'Acidity_-0.364772303',
'Acidity_-0.365323639', 'Acidity_-0.366087423', 'Acidity_-0.369305737',
'Acidity_-0.369886702', 'Acidity_-0.37030521', 'Acidity_-0.370717416',
'Acidity_-0.37089119', 'Acidity_-0.372651142', 'Acidity_-0.373300429',
'Acidity_-0.37351141', 'Acidity_-0.376803568', 'Acidity_-0.378882061',
'Acidity_-0.380388345', 'Acidity_-0.3815496', 'Acidity_-0.382318078',
'Acidity_-0.384522554', 'Acidity_-0.387311965', 'Acidity_-0.388277768',
'Acidity_-0.388747934', 'Acidity_-0.393146676', 'Acidity_-0.39362185',
'Acidity_-0.393669424', 'Acidity_-0.395249528', 'Acidity_-0.395376725',
'Acidity_-0.396177027', 'Acidity_-0.396285908', 'Acidity_-0.398543188',
'Acidity_-0.398598247', 'Acidity_-0.400220952', 'Acidity_-0.401394668',
'Acidity_-0.401986967', 'Acidity_-0.402378588', 'Acidity_-0.402743578',
'Acidity_-0.402743899', 'Acidity_-0.404406676', 'Acidity_-0.404411056',
'Acidity_-0.405650725', 'Acidity_-0.409655793', 'Acidity_-0.409698609',
'Acidity_-0.410368282', 'Acidity_-0.414499767', 'Acidity_-0.415019589',
'Acidity_-0.417714457', 'Acidity_-0.417913889', 'Acidity_-0.419030643',
'Acidity_-0.419815008', 'Acidity_-0.420776079', 'Acidity_-0.423856214',
'Acidity_-0.424229645', 'Acidity_-0.426531147', 'Acidity_-0.426703685',
'Acidity_-0.427016765', 'Acidity_-0.429252652', 'Acidity_-0.429658576',
'Acidity_-0.43079891', 'Acidity_-0.431719785', 'Acidity_-0.433008056',
'Acidity_-0.434602915', 'Acidity_-0.435061046', 'Acidity_-0.436040062',
'Acidity_-0.43826909', 'Acidity_-0.439551693', 'Acidity_-0.441318604',
'Acidity_-0.442167341', 'Acidity_-0.442221981', 'Acidity_-0.445254562',
'Acidity_-0.445385345', 'Acidity_-0.445502635', 'Acidity_-0.446923846',
'Acidity_-0.448345002', 'Acidity_-0.449605316', 'Acidity_-0.450351301',
'Acidity_-0.452403545', 'Acidity_-0.452462829', 'Acidity_-0.453097422',
'Acidity_-0.453107702', 'Acidity_-0.454867529', 'Acidity_-0.456343829',
'Acidity_-0.458133124', 'Acidity_-0.458505316', 'Acidity_-0.459299267',
'Acidity_-0.461544176', 'Acidity_-0.463927147', 'Acidity_-0.464272899',
'Acidity_-0.46500337', 'Acidity_-0.465744571', 'Acidity_-0.466357237',
'Acidity_-0.467195847', 'Acidity_-0.467479407', 'Acidity_-0.468873071',
'Acidity_-0.471432166', 'Acidity_-0.472352512', 'Acidity_-0.474934654',
'Acidity_-0.475460518', 'Acidity_-0.475792246', 'Acidity_-0.476322949',
'Acidity_-0.476339027', 'Acidity_-0.476545377', 'Acidity_-0.481364103',
'Acidity_-0.481429777', 'Acidity_-0.482243679', 'Acidity_-0.483888959',
'Acidity_-0.484022389', 'Acidity_-0.485425281', 'Acidity_-0.485887104',
'Acidity_-0.486259057', 'Acidity_-0.486725293', 'Acidity_-0.487158383',
'Acidity_-0.487297287', 'Acidity_-0.488345281', 'Acidity_-0.490572827',
'Acidity_-0.490589561', 'Acidity_-0.491173801', 'Acidity_-0.491266303',
'Acidity_-0.491447074', 'Acidity_-0.491590483', 'Acidity_-0.491652551',

'Acidity_-0.493836065', 'Acidity_-0.493978613', 'Acidity_-0.494913274',
'Acidity_-0.495153874', 'Acidity_-0.498427512', 'Acidity_-0.500546815',
'Acidity_-0.500785638', 'Acidity_-0.502763647', 'Acidity_-0.505211353',
'Acidity_-0.506908778', 'Acidity_-0.508210454', 'Acidity_-0.509261855',
'Acidity_-0.510457242', 'Acidity_-0.512978748', 'Acidity_-0.51325681',
'Acidity_-0.514661791', 'Acidity_-0.515157585', 'Acidity_-0.518724707',
'Acidity_-0.518849651', 'Acidity_-0.520586153', 'Acidity_-0.521118184',
'Acidity_-0.522776192', 'Acidity_-0.523976498', 'Acidity_-0.524903868',
'Acidity_-0.525431727', 'Acidity_-0.52823467', 'Acidity_-0.52902919',
'Acidity_-0.530663222', 'Acidity_-0.531192355', 'Acidity_-0.533024496',
'Acidity_-0.533379941', 'Acidity_-0.533808885', 'Acidity_-0.534094288',
'Acidity_-0.534298775', 'Acidity_-0.539101247', 'Acidity_-0.53944205',
'Acidity_-0.540070346', 'Acidity_-0.541750458', 'Acidity_-0.542510772',
'Acidity_-0.544761148', 'Acidity_-0.544826103', 'Acidity_-0.549522887',
'Acidity_-0.549825346', 'Acidity_-0.550468315', 'Acidity_-0.550514699',
'Acidity_-0.551683935', 'Acidity_-0.553338298', 'Acidity_-0.556703085',
'Acidity_-0.556968634', 'Acidity_-0.558208683', 'Acidity_-0.55847561',
'Acidity_-0.559362496', 'Acidity_-0.559688927', 'Acidity_-0.56257843',
'Acidity_-0.562910005', 'Acidity_-0.566140943', 'Acidity_-0.568033409',
'Acidity_-0.571770884', 'Acidity_-0.572295971', 'Acidity_-0.574108525',
'Acidity_-0.575085932', 'Acidity_-0.575898292', 'Acidity_-0.575944026',
'Acidity_-0.576675064', 'Acidity_-0.577515827', 'Acidity_-0.580636807',
'Acidity_-0.584857573', 'Acidity_-0.586266336', 'Acidity_-0.58628671',
'Acidity_-0.586411241', 'Acidity_-0.587674412', 'Acidity_-0.587753816',
'Acidity_-0.588996732', 'Acidity_-0.590615714', 'Acidity_-0.591156761',
'Acidity_-0.593803367', 'Acidity_-0.594522307', 'Acidity_-0.594941438',
'Acidity_-0.595644653', 'Acidity_-0.598258687', 'Acidity_-0.600034154',
'Acidity_-0.600271979', 'Acidity_-0.600943284', 'Acidity_-0.603270824',
'Acidity_-0.603548753', 'Acidity_-0.607660179', 'Acidity_-0.609772001',
'Acidity_-0.613702772', 'Acidity_-0.615545776', 'Acidity_-0.616023504',
'Acidity_-0.618401567', 'Acidity_-0.621715231', 'Acidity_-0.622331787',
'Acidity_-0.62391155', 'Acidity_-0.624850579', 'Acidity_-0.625379668',
'Acidity_-0.625875999', 'Acidity_-0.627642994', 'Acidity_-0.630160574',
'Acidity_-0.632589366', 'Acidity_-0.633685208', 'Acidity_-0.635232848',
'Acidity_-0.636625891', 'Acidity_-0.641906912', 'Acidity_-0.642410731',
'Acidity_-0.64743073', 'Acidity_-0.649064514', 'Acidity_-0.651472669',
'Acidity_-0.651763831', 'Acidity_-0.651893154', 'Acidity_-0.657783225',
'Acidity_-0.662106626', 'Acidity_-0.662878148', 'Acidity_-0.666486737',
'Acidity_-0.66938657', 'Acidity_-0.671464525', 'Acidity_-0.675343239',
'Acidity_-0.676107581', 'Acidity_-0.679285685', 'Acidity_-0.679388519',
'Acidity_-0.680335038', 'Acidity_-0.681570939', 'Acidity_-0.683793916',
'Acidity_-0.683917462', 'Acidity_-0.684437591', 'Acidity_-0.686163646',
'Acidity_-0.687521898', 'Acidity_-0.689292785', 'Acidity_-0.693294222',
'Acidity_-0.693438851', 'Acidity_-0.693510247', 'Acidity_-0.69651361',
'Acidity_-0.698871555', 'Acidity_-0.701531939', 'Acidity_-0.703213729',
'Acidity_-0.70466805', 'Acidity_-0.70515812', 'Acidity_-0.70532865',
'Acidity_-0.705385436', 'Acidity_-0.70578237', 'Acidity_-0.708988229',
'Acidity_-0.709214531', 'Acidity_-0.709236896', 'Acidity_-0.710313296',

'Acidity_-0.711558086', 'Acidity_-0.712190722', 'Acidity_-0.714199104',
'Acidity_-0.720917908', 'Acidity_-0.721453515', 'Acidity_-0.721606341',
'Acidity_-0.721931929', 'Acidity_-0.722809367', 'Acidity_-0.72650885',
'Acidity_-0.727764951', 'Acidity_-0.728190556', 'Acidity_-0.728537862',
'Acidity_-0.731351697', 'Acidity_-0.733235908', 'Acidity_-0.739283923',
'Acidity_-0.740705926', 'Acidity_-0.7445219', 'Acidity_-0.7459267',
'Acidity_-0.746742282', 'Acidity_-0.747510868', 'Acidity_-0.74790279',
'Acidity_-0.747989889', 'Acidity_-0.748039619', 'Acidity_-0.751640827',
'Acidity_-0.751744832', 'Acidity_-0.754772933', 'Acidity_-0.756159031',
'Acidity_-0.756864314', 'Acidity_-0.757241868', 'Acidity_-0.758083109',
'Acidity_-0.758572586', 'Acidity_-0.760862459', 'Acidity_-0.761850508',
'Acidity_-0.762112528', 'Acidity_-0.76275429', 'Acidity_-0.765000312',
'Acidity_-0.765057007', 'Acidity_-0.76858734', 'Acidity_-0.771035039',
'Acidity_-0.771607308', 'Acidity_-0.771769254', 'Acidity_-0.772829229',
'Acidity_-0.773422808', 'Acidity_-0.777125843', 'Acidity_-0.777963277',
'Acidity_-0.778000656', 'Acidity_-0.779829007', 'Acidity_-0.779940614',
'Acidity_-0.780995024', 'Acidity_-0.782277871', 'Acidity_-0.782556409',
'Acidity_-0.783602296', 'Acidity_-0.786841505', 'Acidity_-0.791890878',
'Acidity_-0.791927318', 'Acidity_-0.792172479', 'Acidity_-0.794370301',
'Acidity_-0.7949044', 'Acidity_-0.796702202', 'Acidity_-0.796702882',
'Acidity_-0.799352658', 'Acidity_-0.801235143', 'Acidity_-0.801434151',
'Acidity_-0.803958746', 'Acidity_-0.805294862', 'Acidity_-0.810135014',
'Acidity_-0.811324293', 'Acidity_-0.812285956', 'Acidity_-0.81231003',
'Acidity_-0.813438826', 'Acidity_-0.813557818', 'Acidity_-0.81558716',
'Acidity_-0.815654524', 'Acidity_-0.815660285', 'Acidity_-0.816365227',
'Acidity_-0.818700955', 'Acidity_-0.819232392', 'Acidity_-0.82028043',
'Acidity_-0.820290944', 'Acidity_-0.821002238', 'Acidity_-0.822828237',
'Acidity_-0.824822105', 'Acidity_-0.826248186', 'Acidity_-0.826906012',
'Acidity_-0.82719456', 'Acidity_-0.827880576', 'Acidity_-0.831360337',
'Acidity_-0.831599748', 'Acidity_-0.831623942', 'Acidity_-0.832732459',
'Acidity_-0.833616032', 'Acidity_-0.835054852', 'Acidity_-0.836107034',
'Acidity_-0.836166022', 'Acidity_-0.836539152', 'Acidity_-0.837065778',
'Acidity_-0.838856348', 'Acidity_-0.839104478', 'Acidity_-0.840986776',
'Acidity_-0.841695386', 'Acidity_-0.841906665', 'Acidity_-0.842503239',
'Acidity_-0.844435863', 'Acidity_-0.844719722', 'Acidity_-0.846369849',
'Acidity_-0.851295192', 'Acidity_-0.852910474', 'Acidity_-0.853948036',
'Acidity_-0.856481232', 'Acidity_-0.856561122', 'Acidity_-0.858438387',
'Acidity_-0.859936938', 'Acidity_-0.865797956', 'Acidity_-0.866138499',
'Acidity_-0.868245492', 'Acidity_-0.873064683', 'Acidity_-0.876620761',
'Acidity_-0.87745592', 'Acidity_-0.882947341', 'Acidity_-0.884502772',
'Acidity_-0.88488274', 'Acidity_-0.885985558', 'Acidity_-0.887194383',
'Acidity_-0.88752163', 'Acidity_-0.894186563', 'Acidity_-0.896947428',
'Acidity_-0.899930932', 'Acidity_-0.900825856', 'Acidity_-0.900962827',
'Acidity_-0.905208948', 'Acidity_-0.905345771', 'Acidity_-0.908360248',
'Acidity_-0.909613055', 'Acidity_-0.911224331', 'Acidity_-0.912395857',
'Acidity_-0.912977459', 'Acidity_-0.916131', 'Acidity_-0.917775403',
'Acidity_-0.918587296', 'Acidity_-0.920848181', 'Acidity_-0.921203548',
'Acidity_-0.921238606', 'Acidity_-0.921359724', 'Acidity_-0.923307315',

'Acidity_-0.924374191', 'Acidity_-0.925759589', 'Acidity_-0.928323609',
'Acidity_-0.930151642', 'Acidity_-0.930807428', 'Acidity_-0.931903755',
'Acidity_-0.932228278', 'Acidity_-0.932557413', 'Acidity_-0.936970586',
'Acidity_-0.93849036', 'Acidity_-0.938837813', 'Acidity_-0.941217156',
'Acidity_-0.944009775', 'Acidity_-0.944209504', 'Acidity_-0.94467615',
'Acidity_-0.945080106', 'Acidity_-0.946008716', 'Acidity_-0.947002551',
'Acidity_-0.94853192', 'Acidity_-0.950800307', 'Acidity_-0.95186741',
'Acidity_-0.953286976', 'Acidity_-0.953665479', 'Acidity_-0.953914561',
'Acidity_-0.955725798', 'Acidity_-0.960916549', 'Acidity_-0.961003564',
'Acidity_-0.961164357', 'Acidity_-0.961324304', 'Acidity_-0.964795146',
'Acidity_-0.964945495', 'Acidity_-0.965657546', 'Acidity_-0.969689707',
'Acidity_-0.970235117', 'Acidity_-0.970844205', 'Acidity_-0.973028819',
'Acidity_-0.977348263', 'Acidity_-0.97791175', 'Acidity_-0.980073421',
'Acidity_-0.98138767', 'Acidity_-0.981738246', 'Acidity_-0.985096387',
'Acidity_-0.987967575', 'Acidity_-0.987979264', 'Acidity_-0.990261265',
'Acidity_-0.990545561', 'Acidity_-0.99116221', 'Acidity_-0.99235719',
'Acidity_-0.993894782', 'Acidity_-0.994363844', 'Acidity_-0.995586036',
'Acidity_-0.998086414', 'Acidity_-1.0020498', 'Acidity_-1.003866289',
'Acidity_-1.005574147', 'Acidity_-1.007957945', 'Acidity_-1.008545765',
'Acidity_-1.010206942', 'Acidity_-1.012158006', 'Acidity_-1.013110289',
'Acidity_-1.01323595', 'Acidity_-1.014262058', 'Acidity_-1.015782155',
'Acidity_-1.016481028', 'Acidity_-1.016744147', 'Acidity_-1.016751894',
'Acidity_-1.016811874', 'Acidity_-1.01691619', 'Acidity_-1.018861092',
'Acidity_-1.021048144', 'Acidity_-1.021940944', 'Acidity_-1.022076896',
'Acidity_-1.022113594', 'Acidity_-1.022736521', 'Acidity_-1.02428096',
'Acidity_-1.02746287', 'Acidity_-1.03071463', 'Acidity_-1.031509395',
'Acidity_-1.032193774', 'Acidity_-1.033433159', 'Acidity_-1.037023221',
'Acidity_-1.037591443', 'Acidity_-1.037979931', 'Acidity_-1.03820733',
'Acidity_-1.038278443', 'Acidity_-1.038366412', 'Acidity_-1.041618262',
'Acidity_-1.044119', 'Acidity_-1.045022463', 'Acidity_-1.046069507',
'Acidity_-1.047266468', 'Acidity_-1.049762868', 'Acidity_-1.052173301',
'Acidity_-1.056070673', 'Acidity_-1.057525635', 'Acidity_-1.059747757',
'Acidity_-1.065906691', 'Acidity_-1.071621924', 'Acidity_-1.072149163',
'Acidity_-1.072446111', 'Acidity_-1.073124668', 'Acidity_-1.073303814',
'Acidity_-1.074466736', 'Acidity_-1.074677266', 'Acidity_-1.074680749',
'Acidity_-1.075780377', 'Acidity_-1.075812207', 'Acidity_-1.075872105',
'Acidity_-1.078644834', 'Acidity_-1.080151306', 'Acidity_-1.082842655',
'Acidity_-1.083532988', 'Acidity_-1.083620788', 'Acidity_-1.085596232',
'Acidity_-1.089252346', 'Acidity_-1.094247351', 'Acidity_-1.094367441',
'Acidity_-1.094727349', 'Acidity_-1.0954011', 'Acidity_-1.097949458',
'Acidity_-1.098018395', 'Acidity_-1.098326042', 'Acidity_-1.098696642',
'Acidity_-1.101446241', 'Acidity_-1.101755862', 'Acidity_-1.102217986',
'Acidity_-1.103758111', 'Acidity_-1.104954734', 'Acidity_-1.10912618',
'Acidity_-1.109341247', 'Acidity_-1.109603654', 'Acidity_-1.11395109',
'Acidity_-1.115162513', 'Acidity_-1.115966245', 'Acidity_-1.116251429',
'Acidity_-1.117317375', 'Acidity_-1.117440894', 'Acidity_-1.119954024',
'Acidity_-1.120162817', 'Acidity_-1.12185085', 'Acidity_-1.122796031',
'Acidity_-1.126932496', 'Acidity_-1.129854827', 'Acidity_-1.13105906',

'Acidity_-1.131353718', 'Acidity_-1.131703903', 'Acidity_-1.13294028',
'Acidity_-1.134481826', 'Acidity_-1.135254622', 'Acidity_-1.136878191',
'Acidity_-1.138202266', 'Acidity_-1.139213205', 'Acidity_-1.141635635',
'Acidity_-1.146541689', 'Acidity_-1.149860234', 'Acidity_-1.151269301',
'Acidity_-1.15329372', 'Acidity_-1.153843133', 'Acidity_-1.15563525',
'Acidity_-1.158128067', 'Acidity_-1.160508623', 'Acidity_-1.161427669',
'Acidity_-1.162362718', 'Acidity_-1.164808614', 'Acidity_-1.165522925',
'Acidity_-1.168716844', 'Acidity_-1.169836168', 'Acidity_-1.170213868',
'Acidity_-1.170504546', 'Acidity_-1.17091649', 'Acidity_-1.171343556',
'Acidity_-1.171349328', 'Acidity_-1.17180874', 'Acidity_-1.172440423',
'Acidity_-1.174097332', 'Acidity_-1.175107477', 'Acidity_-1.176531722',
'Acidity_-1.182859869', 'Acidity_-1.187467937', 'Acidity_-1.187544333',
'Acidity_-1.188430018', 'Acidity_-1.188675877', 'Acidity_-1.189820366',
'Acidity_-1.190605373', 'Acidity_-1.19106958', 'Acidity_-1.191132861',
'Acidity_-1.192430581', 'Acidity_-1.192975776', 'Acidity_-1.198656978',
'Acidity_-1.198752546', 'Acidity_-1.200659973', 'Acidity_-1.203748849',
'Acidity_-1.204729283', 'Acidity_-1.205361339', 'Acidity_-1.207574424',
'Acidity_-1.209371265', 'Acidity_-1.217526316', 'Acidity_-1.218056239',
'Acidity_-1.219137533', 'Acidity_-1.219637157', 'Acidity_-1.22320905',
'Acidity_-1.223954372', 'Acidity_-1.227993857', 'Acidity_-1.228239389',
'Acidity_-1.228662319', 'Acidity_-1.229254586', 'Acidity_-1.230442485',
'Acidity_-1.231201967', 'Acidity_-1.231269108', 'Acidity_-1.231954325',
'Acidity_-1.233923989', 'Acidity_-1.236918712', 'Acidity_-1.237117724',
'Acidity_-1.238271661', 'Acidity_-1.242029527', 'Acidity_-1.243639196',
'Acidity_-1.244090836', 'Acidity_-1.244207232', 'Acidity_-1.244418116',
'Acidity_-1.245114712', 'Acidity_-1.247215776', 'Acidity_-1.248234595',
'Acidity_-1.25036695', 'Acidity_-1.256130956', 'Acidity_-1.260379857',
'Acidity_-1.263063979', 'Acidity_-1.263137235', 'Acidity_-1.266261118',
'Acidity_-1.26652009', 'Acidity_-1.267032978', 'Acidity_-1.270915474',
'Acidity_-1.272654789', 'Acidity_-1.276436424', 'Acidity_-1.277183124',
'Acidity_-1.278020409', 'Acidity_-1.283199906', 'Acidity_-1.284494762',
'Acidity_-1.288854244', 'Acidity_-1.290563234', 'Acidity_-1.29240429',
'Acidity_-1.294135499', 'Acidity_-1.29448487', 'Acidity_-1.299867748',
'Acidity_-1.310354517', 'Acidity_-1.310787649', 'Acidity_-1.312242503',
'Acidity_-1.316498558', 'Acidity_-1.316709464', 'Acidity_-1.317115885',
'Acidity_-1.31740779', 'Acidity_-1.319501638', 'Acidity_-1.326927462',
'Acidity_-1.331010488', 'Acidity_-1.331629395', 'Acidity_-1.333122234',
'Acidity_-1.3334791', 'Acidity_-1.334611391', 'Acidity_-1.334654393',
'Acidity_-1.335152047', 'Acidity_-1.336415136', 'Acidity_-1.336576589',
'Acidity_-1.33782954', 'Acidity_-1.339717006', 'Acidity_-1.341074605',
'Acidity_-1.341537581', 'Acidity_-1.341609287', 'Acidity_-1.344693541',
'Acidity_-1.345222378', 'Acidity_-1.346727343', 'Acidity_-1.347701929',
'Acidity_-1.353458176', 'Acidity_-1.353715891', 'Acidity_-1.354379192',
'Acidity_-1.356287356', 'Acidity_-1.356739922', 'Acidity_-1.356950956',
'Acidity_-1.361078055', 'Acidity_-1.361351188', 'Acidity_-1.365127445',
'Acidity_-1.365244029', 'Acidity_-1.365828711', 'Acidity_-1.369954154',
'Acidity_-1.370209837', 'Acidity_-1.370836529', 'Acidity_-1.37216003',
'Acidity_-1.373321887', 'Acidity_-1.373330522', 'Acidity_-1.375301757',

'Acidity_-1.37665721', 'Acidity_-1.37682618', 'Acidity_-1.37733815',
'Acidity_-1.377681864', 'Acidity_-1.379642791', 'Acidity_-1.381367881',
'Acidity_-1.382419645', 'Acidity_-1.382849117', 'Acidity_-1.383503368',
'Acidity_-1.384707721', 'Acidity_-1.385460542', 'Acidity_-1.38729856',
'Acidity_-1.392445032', 'Acidity_-1.393716037', 'Acidity_-1.394008361',
'Acidity_-1.394149587', 'Acidity_-1.394184455', 'Acidity_-1.394846266',
'Acidity_-1.394863422', 'Acidity_-1.396166003', 'Acidity_-1.39693378',
'Acidity_-1.400045838', 'Acidity_-1.403613427', 'Acidity_-1.407064656',
'Acidity_-1.409884405', 'Acidity_-1.410296641', 'Acidity_-1.413254569',
'Acidity_-1.413630612', 'Acidity_-1.414392056', 'Acidity_-1.414626558',
'Acidity_-1.416347007', 'Acidity_-1.416918958', 'Acidity_-1.419024768',
'Acidity_-1.420395519', 'Acidity_-1.422775542', 'Acidity_-1.424672113',
'Acidity_-1.42480894', 'Acidity_-1.424985366', 'Acidity_-1.425231325',
'Acidity_-1.426638729', 'Acidity_-1.428508854', 'Acidity_-1.428807471',
'Acidity_-1.429723526', 'Acidity_-1.430272117', 'Acidity_-1.430429857',
'Acidity_-1.432245547', 'Acidity_-1.433368628', 'Acidity_-1.437493738',
'Acidity_-1.437745983', 'Acidity_-1.43801903', 'Acidity_-1.44427643',
'Acidity_-1.444479812', 'Acidity_-1.445193398', 'Acidity_-1.446176434',
'Acidity_-1.447407664', 'Acidity_-1.447751284', 'Acidity_-1.448802504',
'Acidity_-1.449308157', 'Acidity_-1.451499763', 'Acidity_-1.453396762',
'Acidity_-1.453878333', 'Acidity_-1.454219836', 'Acidity_-1.455314217',
'Acidity_-1.455839994', 'Acidity_-1.456133779', 'Acidity_-1.457355855',
'Acidity_-1.460898327', 'Acidity_-1.465539339', 'Acidity_-1.466012486',
'Acidity_-1.470125066', 'Acidity_-1.473537531', 'Acidity_-1.474773962',
'Acidity_-1.474869921', 'Acidity_-1.47788311', 'Acidity_-1.478188555',
'Acidity_-1.479707559', 'Acidity_-1.483232895', 'Acidity_-1.484347485',
'Acidity_-1.485660777', 'Acidity_-1.486048914', 'Acidity_-1.487431453',
'Acidity_-1.487521965', 'Acidity_-1.488721191', 'Acidity_-1.490858227',
'Acidity_-1.492676524', 'Acidity_-1.494699742', 'Acidity_-1.494874657',
'Acidity_-1.495112616', 'Acidity_-1.498635305', 'Acidity_-1.498656037',
'Acidity_-1.499622518', 'Acidity_-1.499881687', 'Acidity_-1.501630364',
'Acidity_-1.504922768', 'Acidity_-1.506333071', 'Acidity_-1.507584962',
'Acidity_-1.50774414', 'Acidity_-1.507770861', 'Acidity_-1.50782307',
'Acidity_-1.509871219', 'Acidity_-1.514089626', 'Acidity_-1.517382368',
'Acidity_-1.519371671', 'Acidity_-1.519654387', 'Acidity_-1.521261721',
'Acidity_-1.525738047', 'Acidity_-1.526119857', 'Acidity_-1.527393023',
'Acidity_-1.528270534', 'Acidity_-1.529713032', 'Acidity_-1.532051498',
'Acidity_-1.539788142', 'Acidity_-1.540711874', 'Acidity_-1.552642907',
'Acidity_-1.55746322', 'Acidity_-1.559156989', 'Acidity_-1.559336557',
'Acidity_-1.562123182', 'Acidity_-1.563236348', 'Acidity_-1.564030154',
'Acidity_-1.568007387', 'Acidity_-1.569037068', 'Acidity_-1.570153891',
'Acidity_-1.570350881', 'Acidity_-1.573617152', 'Acidity_-1.576527775',
'Acidity_-1.576681863', 'Acidity_-1.587952145', 'Acidity_-1.58956899',
'Acidity_-1.590177926', 'Acidity_-1.590347457', 'Acidity_-1.590747921',
'Acidity_-1.597359527', 'Acidity_-1.604760616', 'Acidity_-1.606343106',
'Acidity_-1.609770097', 'Acidity_-1.611315674', 'Acidity_-1.611571284',
'Acidity_-1.611753292', 'Acidity_-1.612598392', 'Acidity_-1.614529778',
'Acidity_-1.614855762', 'Acidity_-1.615105438', 'Acidity_-1.618615272',

'Acidity_-1.618798405', 'Acidity_-1.62268429', 'Acidity_-1.626572021',
'Acidity_-1.626797333', 'Acidity_-1.629769541', 'Acidity_-1.632354203',
'Acidity_-1.633272132', 'Acidity_-1.633641993', 'Acidity_-1.634403901',
'Acidity_-1.635295535', 'Acidity_-1.635404402', 'Acidity_-1.636458548',
'Acidity_-1.636582685', 'Acidity_-1.6375486', 'Acidity_-1.638679394',
'Acidity_-1.642436844', 'Acidity_-1.645758888', 'Acidity_-1.652114056',
'Acidity_-1.652992023', 'Acidity_-1.654340482', 'Acidity_-1.655330392',
'Acidity_-1.658382639', 'Acidity_-1.660211588', 'Acidity_-1.660639485',
'Acidity_-1.661294173', 'Acidity_-1.662029824', 'Acidity_-1.664081084',
'Acidity_-1.667016198', 'Acidity_-1.667203637', 'Acidity_-1.668711571',
'Acidity_-1.673578429', 'Acidity_-1.674314414', 'Acidity_-1.675279484',
'Acidity_-1.677969421', 'Acidity_-1.679271349', 'Acidity_-1.679607938',
'Acidity_-1.680924092', 'Acidity_-1.680970102', 'Acidity_-1.684387471',
'Acidity_-1.684659207', 'Acidity_-1.685764024', 'Acidity_-1.692936537',
'Acidity_-1.695979688', 'Acidity_-1.698730403', 'Acidity_-1.70027429',
'Acidity_-1.700396069', 'Acidity_-1.70344056', 'Acidity_-1.705311656',
'Acidity_-1.710943166', 'Acidity_-1.711394876', 'Acidity_-1.712375191',
'Acidity_-1.712621136', 'Acidity_-1.714085315', 'Acidity_-1.714875597',
'Acidity_-1.716680472', 'Acidity_-1.717266777', 'Acidity_-1.718581873',
'Acidity_-1.71883793', 'Acidity_-1.720987553', 'Acidity_-1.721947865',
'Acidity_-1.721968946', 'Acidity_-1.722186761', 'Acidity_-1.722948342',
'Acidity_-1.724640045', 'Acidity_-1.725885201', 'Acidity_-1.72694203',
'Acidity_-1.72733069', 'Acidity_-1.732498176', 'Acidity_-1.73329254',
'Acidity_-1.733447098', 'Acidity_-1.73387327', 'Acidity_-1.735117708',
'Acidity_-1.736012279', 'Acidity_-1.7377166', 'Acidity_-1.737783398',
'Acidity_-1.739287372', 'Acidity_-1.743420492', 'Acidity_-1.745919587',
'Acidity_-1.746685633', 'Acidity_-1.747239147', 'Acidity_-1.750078184',
'Acidity_-1.750282866', 'Acidity_-1.750481108', 'Acidity_-1.751339472',
'Acidity_-1.752809114', 'Acidity_-1.755744072', 'Acidity_-1.756110692',
'Acidity_-1.758251832', 'Acidity_-1.759214369', 'Acidity_-1.76715476',
'Acidity_-1.770887232', 'Acidity_-1.774588694', 'Acidity_-1.778796745',
'Acidity_-1.78125695', 'Acidity_-1.781651819', 'Acidity_-1.785736934',
'Acidity_-1.786390953', 'Acidity_-1.78744711', 'Acidity_-1.788594744',
'Acidity_-1.788673364', 'Acidity_-1.789660235', 'Acidity_-1.791648302',
'Acidity_-1.793667469', 'Acidity_-1.795486331', 'Acidity_-1.79884063',
'Acidity_-1.800760146', 'Acidity_-1.800893018', 'Acidity_-1.805347812',
'Acidity_-1.808142083', 'Acidity_-1.812256803', 'Acidity_-1.814628148',
'Acidity_-1.815198368', 'Acidity_-1.818450848', 'Acidity_-1.81845168',
'Acidity_-1.819622356', 'Acidity_-1.820405061', 'Acidity_-1.822560505',
'Acidity_-1.824904108', 'Acidity_-1.826704357', 'Acidity_-1.833064431',
'Acidity_-1.838594058', 'Acidity_-1.838806737', 'Acidity_-1.839627396',
'Acidity_-1.839709536', 'Acidity_-1.844098803', 'Acidity_-1.845646416',
'Acidity_-1.849898792', 'Acidity_-1.851003324', 'Acidity_-1.852173203',
'Acidity_-1.853269386', 'Acidity_-1.854692443', 'Acidity_-1.865114573',
'Acidity_-1.865832708', 'Acidity_-1.870967196', 'Acidity_-1.873596372',
'Acidity_-1.874856057', 'Acidity_-1.876145015', 'Acidity_-1.877867469',
'Acidity_-1.8810387', 'Acidity_-1.88350261', 'Acidity_-1.885500472',
'Acidity_-1.886004821', 'Acidity_-1.888234231', 'Acidity_-1.888768607',

'Acidity_-1.894868531', 'Acidity_-1.900758276', 'Acidity_-1.904348537',
'Acidity_-1.906380646', 'Acidity_-1.906439223', 'Acidity_-1.911790438',
'Acidity_-1.911851627', 'Acidity_-1.916665389', 'Acidity_-1.916873036',
'Acidity_-1.917976581', 'Acidity_-1.918349804', 'Acidity_-1.919457867',
'Acidity_-1.922671396', 'Acidity_-1.92648196', 'Acidity_-1.926771608',
'Acidity_-1.927133746', 'Acidity_-1.930633745', 'Acidity_-1.931833592',
'Acidity_-1.932152263', 'Acidity_-1.932296411', 'Acidity_-1.933512989',
'Acidity_-1.93413049', 'Acidity_-1.935700362', 'Acidity_-1.936085259',
'Acidity_-1.937411735', 'Acidity_-1.94031386', 'Acidity_-1.941251654',
'Acidity_-1.944981661', 'Acidity_-1.946933753', 'Acidity_-1.947408878',
'Acidity_-1.950320823', 'Acidity_-1.952773954', 'Acidity_-1.953020778',
'Acidity_-1.955656366', 'Acidity_-1.956538847', 'Acidity_-1.957389142',
'Acidity_-1.962664226', 'Acidity_-1.963420629', 'Acidity_-1.964058807',
'Acidity_-1.964758344', 'Acidity_-1.96567694', 'Acidity_-1.966063033',
'Acidity_-1.968351619', 'Acidity_-1.977000824', 'Acidity_-1.979824612',
'Acidity_-1.981574246', 'Acidity_-1.98172907', 'Acidity_-1.982356',
'Acidity_-1.98381094', 'Acidity_-1.990831514', 'Acidity_-1.990957758',
'Acidity_-1.992564683', 'Acidity_-1.998524116', 'Acidity_-1.998824673',
'Acidity_-2.001538354', 'Acidity_-2.005624759', 'Acidity_-2.008544885',
'Acidity_-2.011518699', 'Acidity_-2.018944333', 'Acidity_-2.020660357',
'Acidity_-2.022186257', 'Acidity_-2.03105815', 'Acidity_-2.031178367',
'Acidity_-2.032169189', 'Acidity_-2.033170149', 'Acidity_-2.036698853',
'Acidity_-2.037169723', 'Acidity_-2.044768947', 'Acidity_-2.045652882',
'Acidity_-2.045779422', 'Acidity_-2.045905812', 'Acidity_-2.046503511',
'Acidity_-2.046627469', 'Acidity_-2.047689391', 'Acidity_-2.052738211',
'Acidity_-2.053694418', 'Acidity_-2.05390054', 'Acidity_-2.054184632',
'Acidity_-2.057901543', 'Acidity_-2.058734686', 'Acidity_-2.061053621',
'Acidity_-2.068531974', 'Acidity_-2.069189399', 'Acidity_-2.06921183',
'Acidity_-2.072047579', 'Acidity_-2.072508474', 'Acidity_-2.073924429',
'Acidity_-2.076113997', 'Acidity_-2.077222982', 'Acidity_-2.081906248',
'Acidity_-2.085341847', 'Acidity_-2.087742829', 'Acidity_-2.088865252',
'Acidity_-2.090361332', 'Acidity_-2.090557189', 'Acidity_-2.092763864',
'Acidity_-2.094162271', 'Acidity_-2.101646699', 'Acidity_-2.106325457',
'Acidity_-2.108192127', 'Acidity_-2.108683493', 'Acidity_-2.109832124',
'Acidity_-2.109986332', 'Acidity_-2.114689564', 'Acidity_-2.120654024',
'Acidity_-2.121538832', 'Acidity_-2.124795261', 'Acidity_-2.125177292',
'Acidity_-2.130460727', 'Acidity_-2.13497313', 'Acidity_-2.135251693',
'Acidity_-2.137039909', 'Acidity_-2.13744482', 'Acidity_-2.139487225',
'Acidity_-2.141371139', 'Acidity_-2.141922762', 'Acidity_-2.143204755',
'Acidity_-2.144244362', 'Acidity_-2.146023387', 'Acidity_-2.146420065',
'Acidity_-2.14777319', 'Acidity_-2.148650397', 'Acidity_-2.149219277',
'Acidity_-2.150778123', 'Acidity_-2.152558033', 'Acidity_-2.15334928',
'Acidity_-2.154356678', 'Acidity_-2.160378945', 'Acidity_-2.161802976',
'Acidity_-2.163384024', 'Acidity_-2.170958563', 'Acidity_-2.171343633',
'Acidity_-2.171938158', 'Acidity_-2.17447647', 'Acidity_-2.177388359',
'Acidity_-2.178295845', 'Acidity_-2.17857139', 'Acidity_-2.178990218',
'Acidity_-2.179352823', 'Acidity_-2.179682618', 'Acidity_-2.18279681',
'Acidity_-2.185649097', 'Acidity_-2.186644764', 'Acidity_-2.187043062',

'Acidity_-2.189896681', 'Acidity_-2.190126509', 'Acidity_-2.191083585',
'Acidity_-2.192343114', 'Acidity_-2.195098992', 'Acidity_-2.195781505',
'Acidity_-2.197877521', 'Acidity_-2.200125883', 'Acidity_-2.201604888',
'Acidity_-2.202142041', 'Acidity_-2.202971097', 'Acidity_-2.204610725',
'Acidity_-2.204790514', 'Acidity_-2.206017085', 'Acidity_-2.208685041',
'Acidity_-2.211441171', 'Acidity_-2.212114432', 'Acidity_-2.212947993',
'Acidity_-2.214664806', 'Acidity_-2.218992645', 'Acidity_-2.225723904',
'Acidity_-2.229719806', 'Acidity_-2.230315931', 'Acidity_-2.235372635',
'Acidity_-2.236208646', 'Acidity_-2.246384251', 'Acidity_-2.24664311',
'Acidity_-2.249965831', 'Acidity_-2.251067315', 'Acidity_-2.261259327',
'Acidity_-2.268126637', 'Acidity_-2.269809075', 'Acidity_-2.271361874',
'Acidity_-2.273601407', 'Acidity_-2.273704682', 'Acidity_-2.280808773',
'Acidity_-2.281440707', 'Acidity_-2.281646448', 'Acidity_-2.283013329',
'Acidity_-2.284637715', 'Acidity_-2.290337606', 'Acidity_-2.291247659',
'Acidity_-2.292075129', 'Acidity_-2.292964433', 'Acidity_-2.298875523',
'Acidity_-2.301153993', 'Acidity_-2.304147763', 'Acidity_-2.305923979',
'Acidity_-2.306351404', 'Acidity_-2.309132459', 'Acidity_-2.312181684',
'Acidity_-2.312430431', 'Acidity_-2.314749819', 'Acidity_-2.31541651',
'Acidity_-2.315433582', 'Acidity_-2.317160544', 'Acidity_-2.318115994',
'Acidity_-2.321158436', 'Acidity_-2.327119827', 'Acidity_-2.334165601',
'Acidity_-2.334245356', 'Acidity_-2.334378234', 'Acidity_-2.336331708',
'Acidity_-2.337145932', 'Acidity_-2.339589704', 'Acidity_-2.343132224',
'Acidity_-2.343748011', 'Acidity_-2.348485773', 'Acidity_-2.349616349',
'Acidity_-2.349972115', 'Acidity_-2.350263746', 'Acidity_-2.35095113',
'Acidity_-2.352559669', 'Acidity_-2.362080615', 'Acidity_-2.365989395',
'Acidity_-2.36761053', 'Acidity_-2.368449883', 'Acidity_-2.371781666',
'Acidity_-2.372509423', 'Acidity_-2.37639469', 'Acidity_-2.378220329',
'Acidity_-2.380826862', 'Acidity_-2.383259187', 'Acidity_-2.384086925',
'Acidity_-2.386929328', 'Acidity_-2.392702312', 'Acidity_-2.394496757',
'Acidity_-2.395380818', 'Acidity_-2.397691796', 'Acidity_-2.398270661',
'Acidity_-2.403035562', 'Acidity_-2.403243223', 'Acidity_-2.403308571',
'Acidity_-2.403407092', 'Acidity_-2.406163774', 'Acidity_-2.41369341',
'Acidity_-2.420080801', 'Acidity_-2.423093249', 'Acidity_-2.428275981',
'Acidity_-2.429393469', 'Acidity_-2.436285918', 'Acidity_-2.43979642',
'Acidity_-2.445712666', 'Acidity_-2.448352787', 'Acidity_-2.449484525',
'Acidity_-2.449861733', 'Acidity_-2.450416593', 'Acidity_-2.450763672',
'Acidity_-2.454533933', 'Acidity_-2.461445782', 'Acidity_-2.463749104',
'Acidity_-2.469547062', 'Acidity_-2.47129927', 'Acidity_-2.47195567',
'Acidity_-2.475505407', 'Acidity_-2.478055932', 'Acidity_-2.484300312',
'Acidity_-2.486120112', 'Acidity_-2.491870668', 'Acidity_-2.492708194',
'Acidity_-2.49304192', 'Acidity_-2.496322081', 'Acidity_-2.501304538',
'Acidity_-2.506381031', 'Acidity_-2.509839932', 'Acidity_-2.51282819',
'Acidity_-2.516542927', 'Acidity_-2.517100408', 'Acidity_-2.520334223',
'Acidity_-2.525250744', 'Acidity_-2.526343018', 'Acidity_-2.528922726',
'Acidity_-2.531913018', 'Acidity_-2.538324231', 'Acidity_-2.545404117',
'Acidity_-2.546855975', 'Acidity_-2.549854264', 'Acidity_-2.550249431',
'Acidity_-2.553685122', 'Acidity_-2.554458565', 'Acidity_-2.556006369',
'Acidity_-2.556007083', 'Acidity_-2.556911326', 'Acidity_-2.558510083',

'Acidity_-2.561564247', 'Acidity_-2.568301692', 'Acidity_-2.569348843',
'Acidity_-2.570587079', 'Acidity_-2.570864991', 'Acidity_-2.572776035',
'Acidity_-2.5762885', 'Acidity_-2.577715569', 'Acidity_-2.58188348',
'Acidity_-2.583858134', 'Acidity_-2.585610903', 'Acidity_-2.586663686',
'Acidity_-2.587893347', 'Acidity_-2.589079481', 'Acidity_-2.589271476',
'Acidity_-2.589555547', 'Acidity_-2.589597715', 'Acidity_-2.597220268',
'Acidity_-2.599374036', 'Acidity_-2.600424018', 'Acidity_-2.600627211',
'Acidity_-2.602720262', 'Acidity_-2.60312352', 'Acidity_-2.609107132',
'Acidity_-2.612310691', 'Acidity_-2.615350549', 'Acidity_-2.620271545',
'Acidity_-2.62072577', 'Acidity_-2.621325047', 'Acidity_-2.628356827',
'Acidity_-2.635915732', 'Acidity_-2.636844815', 'Acidity_-2.639847185',
'Acidity_-2.639978091', 'Acidity_-2.643474086', 'Acidity_-2.645657128',
'Acidity_-2.647164684', 'Acidity_-2.650827913', 'Acidity_-2.657511668',
'Acidity_-2.661384616', 'Acidity_-2.661679446', 'Acidity_-2.662369178',
'Acidity_-2.674506672', 'Acidity_-2.678681961', 'Acidity_-2.680302067',
'Acidity_-2.686256143', 'Acidity_-2.686719062', 'Acidity_-2.693037463',
'Acidity_-2.694542386', 'Acidity_-2.694676285', 'Acidity_-2.698721567',
'Acidity_-2.701406904', 'Acidity_-2.702976078', 'Acidity_-2.704740981',
'Acidity_-2.711856524', 'Acidity_-2.715597414', 'Acidity_-2.720479949',
'Acidity_-2.720651525', 'Acidity_-2.727464441', 'Acidity_-2.727666723',
'Acidity_-2.730679347', 'Acidity_-2.734030154', 'Acidity_-2.736862892',
'Acidity_-2.738833565', 'Acidity_-2.742458438', 'Acidity_-2.746453526',
'Acidity_-2.748016953', 'Acidity_-2.749218073', 'Acidity_-2.757038944',
'Acidity_-2.75899695', 'Acidity_-2.760396429', 'Acidity_-2.763581118',
'Acidity_-2.765592868', 'Acidity_-2.777152433', 'Acidity_-2.77866477',
'Acidity_-2.789929031', 'Acidity_-2.793455657', 'Acidity_-2.793807727',
'Acidity_-2.796362372', 'Acidity_-2.797972751', 'Acidity_-2.799680074',
'Acidity_-2.801128268', 'Acidity_-2.802288688', 'Acidity_-2.80256109',
'Acidity_-2.803778412', 'Acidity_-2.810808169', 'Acidity_-2.812780317',
'Acidity_-2.813449028', 'Acidity_-2.813656094', 'Acidity_-2.814401245',
'Acidity_-2.814901901', 'Acidity_-2.824366834', 'Acidity_-2.827877708',
'Acidity_-2.830461841', 'Acidity_-2.830523857', 'Acidity_-2.830885051',
'Acidity_-2.831125855', 'Acidity_-2.835235275', 'Acidity_-2.83624902',
'Acidity_-2.839214332', 'Acidity_-2.84015253', 'Acidity_-2.84060724',
'Acidity_-2.851279554', 'Acidity_-2.851622849', 'Acidity_-2.856544619',
'Acidity_-2.856913601', 'Acidity_-2.85697803', 'Acidity_-2.858869532',
'Acidity_-2.870237493', 'Acidity_-2.871391746', 'Acidity_-2.872017555',
'Acidity_-2.876186916', 'Acidity_-2.877781254', 'Acidity_-2.878008873',
'Acidity_-2.893865646', 'Acidity_-2.894965081', 'Acidity_-2.900739788',
'Acidity_-2.910651105', 'Acidity_-2.913336836', 'Acidity_-2.915046676',
'Acidity_-2.917894697', 'Acidity_-2.919179265', 'Acidity_-2.920077461',
'Acidity_-2.920186182', 'Acidity_-2.924269341', 'Acidity_-2.924449787',
'Acidity_-2.926853781', 'Acidity_-2.92865794', 'Acidity_-2.930449982',
'Acidity_-2.931796158', 'Acidity_-2.93402889', 'Acidity_-2.94294254',
'Acidity_-2.943063246', 'Acidity_-2.947236366', 'Acidity_-2.94729487',
'Acidity_-2.948002977', 'Acidity_-2.948669595', 'Acidity_-2.949443677',
'Acidity_-2.955247077', 'Acidity_-2.957553958', 'Acidity_-2.960998466',
'Acidity_-2.967415983', 'Acidity_-2.976638655', 'Acidity_-2.981523169',

'Acidity_-2.983107289', 'Acidity_-2.995260179', 'Acidity_-2.995325003',
'Acidity_-3.000197815', 'Acidity_-3.000289432', 'Acidity_-3.004118614',
'Acidity_-3.005135514', 'Acidity_-3.014997295', 'Acidity_-3.016466776',
'Acidity_-3.021498163', 'Acidity_-3.022101786', 'Acidity_-3.023189457',
'Acidity_-3.024115524', 'Acidity_-3.029392365', 'Acidity_-3.032779136',
'Acidity_-3.03673955', 'Acidity_-3.036756189', 'Acidity_-3.036919711',
'Acidity_-3.04217039', 'Acidity_-3.045678368', 'Acidity_-3.048404145',
'Acidity_-3.0523752', 'Acidity_-3.05406544', 'Acidity_-3.056400752',
'Acidity_-3.062447573', 'Acidity_-3.066802416', 'Acidity_-3.070932217',
'Acidity_-3.072402945', 'Acidity_-3.077340152', 'Acidity_-3.077711231',
'Acidity_-3.081881098', 'Acidity_-3.088850587', 'Acidity_-3.090406634',
'Acidity_-3.093184992', 'Acidity_-3.095059758', 'Acidity_-3.099057262',
'Acidity_-3.101679757', 'Acidity_-3.102236247', 'Acidity_-3.116788599',
'Acidity_-3.121961293', 'Acidity_-3.122379218', 'Acidity_-3.125420729',
'Acidity_-3.128402267', 'Acidity_-3.128879868', 'Acidity_-3.13052801',
'Acidity_-3.132193701', 'Acidity_-3.133212644', 'Acidity_-3.135736492',
'Acidity_-3.135860673', 'Acidity_-3.142710335', 'Acidity_-3.156688048',
'Acidity_-3.15671247', 'Acidity_-3.167304356', 'Acidity_-3.168638448',
'Acidity_-3.171785929', 'Acidity_-3.172841066', 'Acidity_-3.176894759',
'Acidity_-3.178046326', 'Acidity_-3.178354998', 'Acidity_-3.180337542',
'Acidity_-3.184964955', 'Acidity_-3.185962846', 'Acidity_-3.191608959',
'Acidity_-3.201157829', 'Acidity_-3.201853102', 'Acidity_-3.202740023',
'Acidity_-3.212773437', 'Acidity_-3.233639308', 'Acidity_-3.234934565',
'Acidity_-3.235766411', 'Acidity_-3.239964661', 'Acidity_-3.253214826',
'Acidity_-3.255799747', 'Acidity_-3.257193758', 'Acidity_-3.261756459',
'Acidity_-3.274083513', 'Acidity_-3.277636934', 'Acidity_-3.280269971',
'Acidity_-3.295579966', 'Acidity_-3.298101639', 'Acidity_-3.309784564',
'Acidity_-3.315902733', 'Acidity_-3.317759208', 'Acidity_-3.320012571',
'Acidity_-3.322432942', 'Acidity_-3.329460085', 'Acidity_-3.343955801',
'Acidity_-3.344232923', 'Acidity_-3.349056395', 'Acidity_-3.351939221',
'Acidity_-3.354846721', 'Acidity_-3.365377449', 'Acidity_-3.376490049',
'Acidity_-3.384209522', 'Acidity_-3.391138415', 'Acidity_-3.391955806',
'Acidity_-3.394791568', 'Acidity_-3.408117425', 'Acidity_-3.416156974',
'Acidity_-3.425881972', 'Acidity_-3.427009421', 'Acidity_-3.432184357',
'Acidity_-3.436671787', 'Acidity_-3.452096304', 'Acidity_-3.453481778',
'Acidity_-3.460362588', 'Acidity_-3.46440438', 'Acidity_-3.47105338',
'Acidity_-3.473578108', 'Acidity_-3.480103771', 'Acidity_-3.481424234',
'Acidity_-3.484108935', 'Acidity_-3.488241819', 'Acidity_-3.488597892',
'Acidity_-3.492475258', 'Acidity_-3.496028713', 'Acidity_-3.504485228',
'Acidity_-3.508051832', 'Acidity_-3.513559603', 'Acidity_-3.518392042',
'Acidity_-3.524033097', 'Acidity_-3.52838956', 'Acidity_-3.532915159',
'Acidity_-3.534016691', 'Acidity_-3.534843901', 'Acidity_-3.543715634',
'Acidity_-3.545769631', 'Acidity_-3.547965513', 'Acidity_-3.552345851',
'Acidity_-3.556199706', 'Acidity_-3.557617574', 'Acidity_-3.566359317',
'Acidity_-3.580039861', 'Acidity_-3.584126728', 'Acidity_-3.609172995',
'Acidity_-3.626255141', 'Acidity_-3.635637004', 'Acidity_-3.646472989',
'Acidity_-3.649341717', 'Acidity_-3.65321852', 'Acidity_-3.670269251',
'Acidity_-3.671779429', 'Acidity_-3.675142735', 'Acidity_-3.684284125',

'Acidity_-3.692780634', 'Acidity_-3.715416136', 'Acidity_-3.7252244',
'Acidity_-3.726145619', 'Acidity_-3.755760233', 'Acidity_-3.759799863',
'Acidity_-3.762212148', 'Acidity_-3.769068269', 'Acidity_-3.776445756',
'Acidity_-3.780843258', 'Acidity_-3.786816268', 'Acidity_-3.788166932',
'Acidity_-3.799184056', 'Acidity_-3.801992201', 'Acidity_-3.806190157',
'Acidity_-3.807170335', 'Acidity_-3.84312533', 'Acidity_-3.846641823',
'Acidity_-3.847081054', 'Acidity_-3.861990488', 'Acidity_-3.873112715',
'Acidity_-3.886677917', 'Acidity_-3.909722031', 'Acidity_-3.922591293',
'Acidity_-3.933729069', 'Acidity_-3.937821417', 'Acidity_-3.940779763',
'Acidity_-3.960265632', 'Acidity_-3.969132032', 'Acidity_-3.971721858',
'Acidity_-3.976483633', 'Acidity_-3.978524859', 'Acidity_-3.997326959',
'Acidity_-3.998428933', 'Acidity_-3.999915065', 'Acidity_-4.007585958',
'Acidity_-4.011969793', 'Acidity_-4.037148536', 'Acidity_-4.041148175',
'Acidity_-4.061398882', 'Acidity_-4.068279734', 'Acidity_-4.085738692',
'Acidity_-4.107393341', 'Acidity_-4.108156551', 'Acidity_-4.108894568',
'Acidity_-4.110373172', 'Acidity_-4.11808396', 'Acidity_-4.120365395',
'Acidity_-4.125685106', 'Acidity_-4.18344198', 'Acidity_-4.188652551',
'Acidity_-4.198145677', 'Acidity_-4.199263205', 'Acidity_-4.208284752',
'Acidity_-4.224755889', 'Acidity_-4.232944485', 'Acidity_-4.260533274',
'Acidity_-4.29224041', 'Acidity_-4.302060555', 'Acidity_-4.311281608',
'Acidity_-4.320781616', 'Acidity_-4.36005947', 'Acidity_-4.368247677',
'Acidity_-4.369480739', 'Acidity_-4.37221972', 'Acidity_-4.382106445',
'Acidity_-4.384867847', 'Acidity_-4.412881167', 'Acidity_-4.42166643',
'Acidity_-4.423516212', 'Acidity_-4.431320563', 'Acidity_-4.43408316',
'Acidity_-4.434327674', 'Acidity_-4.436004418', 'Acidity_-4.438979897',
'Acidity_-4.445357585', 'Acidity_-4.448054211', 'Acidity_-4.454570173',
'Acidity_-4.45843063', 'Acidity_-4.467442104', 'Acidity_-4.469190139',
'Acidity_-4.47558768', 'Acidity_-4.488313518', 'Acidity_-4.492389752',
'Acidity_-4.496095477', 'Acidity_-4.522654682', 'Acidity_-4.524693907',
'Acidity_-4.525029897', 'Acidity_-4.534147649', 'Acidity_-4.534759594',
'Acidity_-4.547320493', 'Acidity_-4.559664683', 'Acidity_-4.560905342',
'Acidity_-4.575521131', 'Acidity_-4.586248088', 'Acidity_-4.617026424',
'Acidity_-4.643768843', 'Acidity_-4.653764605', 'Acidity_-4.654523919',
'Acidity_-4.663497109', 'Acidity_-4.720685297', 'Acidity_-4.768058804',
'Acidity_-4.781573815', 'Acidity_-4.794751933', 'Acidity_-4.797638853',
'Acidity_-4.798989984', 'Acidity_-4.809283356', 'Acidity_-4.813463009',
'Acidity_-4.856291001', 'Acidity_-4.865749521', 'Acidity_-4.868417376',
'Acidity_-4.871904758', 'Acidity_-4.904935908', 'Acidity_-4.92196266',
'Acidity_-4.926678843', 'Acidity_-4.926744501', 'Acidity_-4.950918747',
'Acidity_-4.969911363', 'Acidity_-5.000693112', 'Acidity_-5.015263697',
'Acidity_-5.049826951', 'Acidity_-5.056589969', 'Acidity_-5.10061664',
'Acidity_-5.103210963', 'Acidity_-5.236625293', 'Acidity_-5.256590346',
'Acidity_-5.319856723', 'Acidity_-5.376070651', 'Acidity_-5.384860338',
'Acidity_-5.387118149', 'Acidity_-5.537818992', 'Acidity_-5.634195153',
'Acidity_-5.795137698', 'Acidity_-5.9179002', 'Acidity_-6.46098926',
'Acidity_-6.547608222', 'Acidity_-6.739692961', 'Acidity_-6.955460367',
'Acidity_-7.010538475', 'Acidity_0.001521444', 'Acidity_0.003092451',
'Acidity_0.004235805', 'Acidity_0.00487338', 'Acidity_0.007160799',

'Acidity_0.008339593', 'Acidity_0.009209508', 'Acidity_0.011511544',
'Acidity_0.013338089', 'Acidity_0.013357278', 'Acidity_0.014034095',
'Acidity_0.014200275', 'Acidity_0.015523334', 'Acidity_0.016585265',
'Acidity_0.017095758', 'Acidity_0.01769468', 'Acidity_0.019317439',
'Acidity_0.019333986', 'Acidity_0.020273986', 'Acidity_0.021318706',
'Acidity_0.022230395', 'Acidity_0.022420828', 'Acidity_0.022797108',
'Acidity_0.022945313', 'Acidity_0.024892579', 'Acidity_0.026134195',
'Acidity_0.026171935', 'Acidity_0.026500413', 'Acidity_0.026872821',
'Acidity_0.032101352', 'Acidity_0.032870604', 'Acidity_0.033384684',
'Acidity_0.034565705', 'Acidity_0.038680032', 'Acidity_0.039580414',
'Acidity_0.044191872', 'Acidity_0.048978998', 'Acidity_0.050116799',
'Acidity_0.051273904', 'Acidity_0.051771594', 'Acidity_0.057094164',
'Acidity_0.058757464', 'Acidity_0.060613779', 'Acidity_0.060917574',
'Acidity_0.061930121', 'Acidity_0.062116068', 'Acidity_0.062215535',
'Acidity_0.064352175', 'Acidity_0.067609917', 'Acidity_0.06974271',
'Acidity_0.070887645', 'Acidity_0.071005711', 'Acidity_0.072530064',
'Acidity_0.07269825', 'Acidity_0.079276104', 'Acidity_0.085050081',
'Acidity_0.086659287', 'Acidity_0.087091587', 'Acidity_0.088930463',
'Acidity_0.089512941', 'Acidity_0.089953059', 'Acidity_0.090837087',
'Acidity_0.091921632', 'Acidity_0.094211038', 'Acidity_0.094647216',
'Acidity_0.096056144', 'Acidity_0.098645604', 'Acidity_0.099814677',
'Acidity_0.101005434', 'Acidity_0.105003839', 'Acidity_0.10671871',
'Acidity_0.108348642', 'Acidity_0.108746451', 'Acidity_0.109579238',
'Acidity_0.111191205', 'Acidity_0.112949559', 'Acidity_0.11606493',
'Acidity_0.11629875', 'Acidity_0.117583669', 'Acidity_0.119975723',
'Acidity_0.120172532', 'Acidity_0.120913067', 'Acidity_0.122828554',
'Acidity_0.123181228', 'Acidity_0.123584465', 'Acidity_0.124899208',
'Acidity_0.124914362', 'Acidity_0.125661579', 'Acidity_0.126464569',
'Acidity_0.127212642', 'Acidity_0.128325002', 'Acidity_0.136189304',
'Acidity_0.137784369', 'Acidity_0.138001968', 'Acidity_0.138371781',
'Acidity_0.140840408', 'Acidity_0.14140555', 'Acidity_0.142473791',
'Acidity_0.142606588', 'Acidity_0.147071257', 'Acidity_0.1481226',
'Acidity_0.149530447', 'Acidity_0.149826546', 'Acidity_0.150209878',
'Acidity_0.151744842', 'Acidity_0.156466706', 'Acidity_0.15706268',
'Acidity_0.157979193', 'Acidity_0.159467205', 'Acidity_0.159723075',
'Acidity_0.163437326', 'Acidity_0.167154758', 'Acidity_0.167576207',
'Acidity_0.168699111', 'Acidity_0.169730639', 'Acidity_0.170322177',
'Acidity_0.171314883', 'Acidity_0.171613195', 'Acidity_0.171703758',
'Acidity_0.17209792', 'Acidity_0.17363913', 'Acidity_0.173653987',
'Acidity_0.174434142', 'Acidity_0.17767679', 'Acidity_0.179404391',
'Acidity_0.180781197', 'Acidity_0.183194492', 'Acidity_0.184905607',
'Acidity_0.186521133', 'Acidity_0.187428908', 'Acidity_0.192862807',
'Acidity_0.194094541', 'Acidity_0.195606576', 'Acidity_0.196019372',
'Acidity_0.197143997', 'Acidity_0.198625883', 'Acidity_0.198688716',
'Acidity_0.200554236', 'Acidity_0.200985333', 'Acidity_0.201052033',
'Acidity_0.202817792', 'Acidity_0.203413025', 'Acidity_0.20355982',
'Acidity_0.204386751', 'Acidity_0.205756573', 'Acidity_0.206405898',
'Acidity_0.206975851', 'Acidity_0.210347278', 'Acidity_0.213071582',

'Acidity_0.215333082', 'Acidity_0.216299444', 'Acidity_0.216463295',
'Acidity_0.220198791', 'Acidity_0.22351331', 'Acidity_0.224019932',
'Acidity_0.227169191', 'Acidity_0.228479052', 'Acidity_0.232869083',
'Acidity_0.236001317', 'Acidity_0.240346626', 'Acidity_0.24132956',
'Acidity_0.242878626', 'Acidity_0.242942222', 'Acidity_0.243968297',
'Acidity_0.244161158', 'Acidity_0.244738583', 'Acidity_0.246129771',
'Acidity_0.2467183', 'Acidity_0.247923104', 'Acidity_0.248185788',
'Acidity_0.248189198', 'Acidity_0.248260945', 'Acidity_0.248881195',
'Acidity_0.249018548', 'Acidity_0.250770105', 'Acidity_0.251244793',
'Acidity_0.253207945', 'Acidity_0.253906147', 'Acidity_0.253966087',
'Acidity_0.254018717', 'Acidity_0.254269072', 'Acidity_0.254979585',
'Acidity_0.255152887', 'Acidity_0.255524047', 'Acidity_0.256349114',
'Acidity_0.257369095', 'Acidity_0.25769443', 'Acidity_0.258639507',
'Acidity_0.260141062', 'Acidity_0.260288653', 'Acidity_0.260775943',
'Acidity_0.26348289', 'Acidity_0.265070336', 'Acidity_0.266387675',
'Acidity_0.26666639', 'Acidity_0.267861555', 'Acidity_0.267883253',
'Acidity_0.268904126', 'Acidity_0.269081521', 'Acidity_0.269218955',
'Acidity_0.269221416', 'Acidity_0.270685503', 'Acidity_0.270741075',
'Acidity_0.270877363', 'Acidity_0.271799777', 'Acidity_0.273804412',
'Acidity_0.275865496', 'Acidity_0.276865133', 'Acidity_0.277447319',
'Acidity_0.28006913', 'Acidity_0.28020656', 'Acidity_0.280977383',
'Acidity_0.282464485', 'Acidity_0.284448495', 'Acidity_0.28457265',
'Acidity_0.285889667', 'Acidity_0.286883321', 'Acidity_0.288334411',
'Acidity_0.291800325', 'Acidity_0.293289976', 'Acidity_0.293620924',
'Acidity_0.294390408', 'Acidity_0.296224193', 'Acidity_0.296232403',
'Acidity_0.298371281', 'Acidity_0.298523531', 'Acidity_0.300425348',
'Acidity_0.301496699', 'Acidity_0.301517071', 'Acidity_0.30185689',
'Acidity_0.3066305', 'Acidity_0.3071511', 'Acidity_0.307219577',
'Acidity_0.308139392', 'Acidity_0.308340666', 'Acidity_0.308678444',
'Acidity_0.313115727', 'Acidity_0.316418297', 'Acidity_0.316697285',
'Acidity_0.317187773', 'Acidity_0.317555935', 'Acidity_0.318494494',
'Acidity_0.322768516', 'Acidity_0.323823432', 'Acidity_0.327346075',
'Acidity_0.328405811', 'Acidity_0.329233019', 'Acidity_0.329818384',
'Acidity_0.335432297', 'Acidity_0.335632409', 'Acidity_0.338473295',
'Acidity_0.338913734', 'Acidity_0.339436235', 'Acidity_0.340237631',
'Acidity_0.340346714', 'Acidity_0.341751002', 'Acidity_0.341899461',
'Acidity_0.342091133', 'Acidity_0.348479388', 'Acidity_0.349169554',
'Acidity_0.35105039', 'Acidity_0.351966322', 'Acidity_0.352908697',
'Acidity_0.354489011', 'Acidity_0.355785802', 'Acidity_0.355960178',
'Acidity_0.356405327', 'Acidity_0.356695742', 'Acidity_0.358466427',
'Acidity_0.359640298', 'Acidity_0.362517495', 'Acidity_0.364630565',
'Acidity_0.3652211', 'Acidity_0.366164489', 'Acidity_0.367240863',
'Acidity_0.369160911', 'Acidity_0.369580215', 'Acidity_0.374344641',
'Acidity_0.375622231', 'Acidity_0.376595844', 'Acidity_0.376793906',
'Acidity_0.378997485', 'Acidity_0.382914269', 'Acidity_0.383299126',
'Acidity_0.383759484', 'Acidity_0.386518491', 'Acidity_0.387882819',
'Acidity_0.390464668', 'Acidity_0.391850889', 'Acidity_0.394444344',
'Acidity_0.395868142', 'Acidity_0.397002044', 'Acidity_0.398870457',

'Acidity_0.402124291', 'Acidity_0.403637638', 'Acidity_0.404912999',
'Acidity_0.405925967', 'Acidity_0.406387122', 'Acidity_0.408771462',
'Acidity_0.408958685', 'Acidity_0.409553081', 'Acidity_0.411447337',
'Acidity_0.416518576', 'Acidity_0.420270888', 'Acidity_0.420361836',
'Acidity_0.420810121', 'Acidity_0.421589696', 'Acidity_0.422928552',
'Acidity_0.423215962', 'Acidity_0.423361085', 'Acidity_0.424381497',
'Acidity_0.424573151', 'Acidity_0.426446217', 'Acidity_0.427387406',
'Acidity_0.427520425', 'Acidity_0.428501793', 'Acidity_0.430263765',
'Acidity_0.430274164', 'Acidity_0.432000061', 'Acidity_0.432627179',
'Acidity_0.436686274', 'Acidity_0.436921461', 'Acidity_0.437045362',
'Acidity_0.437557417', 'Acidity_0.438022588', 'Acidity_0.440505842',
'Acidity_0.440630298', 'Acidity_0.442710961', 'Acidity_0.444069046',
'Acidity_0.445759947', 'Acidity_0.445840404', 'Acidity_0.44678879',
'Acidity_0.448603514', 'Acidity_0.449868274', 'Acidity_0.450070766',
'Acidity_0.450130636', 'Acidity_0.456268981', 'Acidity_0.458761382',
'Acidity_0.458892829', 'Acidity_0.459723265', 'Acidity_0.460380026',
'Acidity_0.461086978', 'Acidity_0.461313968', 'Acidity_0.461474433',
'Acidity_0.467697195', 'Acidity_0.468330323', 'Acidity_0.469696107',
'Acidity_0.472938272', 'Acidity_0.473000429', 'Acidity_0.473929765',
'Acidity_0.474794991', 'Acidity_0.475477722', 'Acidity_0.478269528',
'Acidity_0.480489556', 'Acidity_0.483467424', 'Acidity_0.483902441',
'Acidity_0.48470493', 'Acidity_0.485986304', 'Acidity_0.486558229',
'Acidity_0.489432337', 'Acidity_0.489466669', 'Acidity_0.490235188',
'Acidity_0.495203413', 'Acidity_0.495656913', 'Acidity_0.496347095',
'Acidity_0.500029929', 'Acidity_0.501984036', 'Acidity_0.502034477',
'Acidity_0.502430498', 'Acidity_0.503799062', 'Acidity_0.503952801',
'Acidity_0.508298972', 'Acidity_0.512910617', 'Acidity_0.517261001',
'Acidity_0.518192204', 'Acidity_0.518813987', 'Acidity_0.519551095',
'Acidity_0.52098068', 'Acidity_0.521519891', 'Acidity_0.521665548',
'Acidity_0.523310477', 'Acidity_0.523557588', 'Acidity_0.524794375',
'Acidity_0.526873773', 'Acidity_0.526956474', 'Acidity_0.52763269',
'Acidity_0.528698798', 'Acidity_0.53068575', 'Acidity_0.531038738',
'Acidity_0.532010254', 'Acidity_0.536212238', 'Acidity_0.537010434',
'Acidity_0.538838538', 'Acidity_0.541694462', 'Acidity_0.541780444',
'Acidity_0.54510856', 'Acidity_0.545749303', 'Acidity_0.549905438',
'Acidity_0.550081687', 'Acidity_0.55266805', 'Acidity_0.553472889',
'Acidity_0.553623544', 'Acidity_0.554639352', 'Acidity_0.555497079',
'Acidity_0.555714418', 'Acidity_0.555947812', 'Acidity_0.556336179',
'Acidity_0.557724553', 'Acidity_0.56143631', 'Acidity_0.568775009',
'Acidity_0.568969749', 'Acidity_0.569352532', 'Acidity_0.570639948',
'Acidity_0.572564128', 'Acidity_0.575495381', 'Acidity_0.578838057',
'Acidity_0.579767371', 'Acidity_0.580057429', 'Acidity_0.581234485',
'Acidity_0.58178077', 'Acidity_0.581808577', 'Acidity_0.582127057',
'Acidity_0.583067518', 'Acidity_0.58325181', 'Acidity_0.584263593',
'Acidity_0.585740646', 'Acidity_0.586654871', 'Acidity_0.586785096',
'Acidity_0.592237542', 'Acidity_0.592650517', 'Acidity_0.594901098',
'Acidity_0.595125499', 'Acidity_0.596716142', 'Acidity_0.597076592',
'Acidity_0.598162333', 'Acidity_0.598524359', 'Acidity_0.599425465',

'Acidity_0.601349722', 'Acidity_0.601484011', 'Acidity_0.602466039',
'Acidity_0.603642425', 'Acidity_0.60485971', 'Acidity_0.608727066',
'Acidity_0.609528381', 'Acidity_0.612547794', 'Acidity_0.614775962',
'Acidity_0.6169814', 'Acidity_0.617345483', 'Acidity_0.618410208',
'Acidity_0.623696496', 'Acidity_0.623971295', 'Acidity_0.624139036',
'Acidity_0.624239782', 'Acidity_0.625345629', 'Acidity_0.625448453',
'Acidity_0.627116568', 'Acidity_0.62809646', 'Acidity_0.629141468',
'Acidity_0.629891589', 'Acidity_0.629952465', 'Acidity_0.630023525',
'Acidity_0.630104364', 'Acidity_0.630116237', 'Acidity_0.633750281',
'Acidity_0.634562579', 'Acidity_0.635916325', 'Acidity_0.637151688',
'Acidity_0.637302588', 'Acidity_0.638381721', 'Acidity_0.638395235',
'Acidity_0.638418811', 'Acidity_0.638823121', 'Acidity_0.639425812',
'Acidity_0.640408505', 'Acidity_0.642705013', 'Acidity_0.643928312',
'Acidity_0.643951904', 'Acidity_0.644180673', 'Acidity_0.648231211',
'Acidity_0.649804223', 'Acidity_0.650677868', 'Acidity_0.653144112',
'Acidity_0.657650379', 'Acidity_0.658072598', 'Acidity_0.659567289',
'Acidity_0.660725219', 'Acidity_0.660854694', 'Acidity_0.661329719',
'Acidity_0.665209153', 'Acidity_0.666779313', 'Acidity_0.667613531',
'Acidity_0.668996327', 'Acidity_0.671129906', 'Acidity_0.671572499',
'Acidity_0.671943146', 'Acidity_0.673504733', 'Acidity_0.673782716',
'Acidity_0.673818582', 'Acidity_0.675495193', 'Acidity_0.675817641',
'Acidity_0.676821939', 'Acidity_0.679080972', 'Acidity_0.679908751',
'Acidity_0.680343871', 'Acidity_0.681981804', 'Acidity_0.683851588',
'Acidity_0.685408528', 'Acidity_0.688424659', 'Acidity_0.689321251',
'Acidity_0.69013069', 'Acidity_0.691372124', 'Acidity_0.692202456',
'Acidity_0.693524526', 'Acidity_0.695032573', 'Acidity_0.699535471',
'Acidity_0.699819954', 'Acidity_0.700071292', 'Acidity_0.701310229',
'Acidity_0.701403599', 'Acidity_0.701928115', 'Acidity_0.703618681',
'Acidity_0.703823703', 'Acidity_0.706485347', 'Acidity_0.706917641',
'Acidity_0.710305734', 'Acidity_0.710723883', 'Acidity_0.716829312',
'Acidity_0.719461552', 'Acidity_0.71993501', 'Acidity_0.72019566',
'Acidity_0.7209638', 'Acidity_0.721337439', 'Acidity_0.722045686',
'Acidity_0.722138309', 'Acidity_0.723795542', 'Acidity_0.7241907',
'Acidity_0.724561237', 'Acidity_0.725999977', 'Acidity_0.726775672',
'Acidity_0.727058624', 'Acidity_0.73058333', 'Acidity_0.733549657',
'Acidity_0.734982747', 'Acidity_0.735253371', 'Acidity_0.735685801',
'Acidity_0.73875602', 'Acidity_0.743703336', 'Acidity_0.744692034',
'Acidity_0.749383473', 'Acidity_0.750552752', 'Acidity_0.752009811',
'Acidity_0.753302007', 'Acidity_0.753544133', 'Acidity_0.754841662',
'Acidity_0.75567379', 'Acidity_0.758104622', 'Acidity_0.76256805',
'Acidity_0.764295402', 'Acidity_0.766026809', 'Acidity_0.768755986',
'Acidity_0.772937754', 'Acidity_0.773249664', 'Acidity_0.774225621',
'Acidity_0.775272528', 'Acidity_0.775481436', 'Acidity_0.776321633',
'Acidity_0.777577489', 'Acidity_0.777769952', 'Acidity_0.78028109',
'Acidity_0.780419902', 'Acidity_0.784539205', 'Acidity_0.784607915',
'Acidity_0.790723217', 'Acidity_0.791113178', 'Acidity_0.794783487',
'Acidity_0.795889952', 'Acidity_0.796064138', 'Acidity_0.797920023',
'Acidity_0.801162074', 'Acidity_0.802316898', 'Acidity_0.803017634',

'Acidity_0.803956698', 'Acidity_0.806262665', 'Acidity_0.807576524',
'Acidity_0.807895795', 'Acidity_0.809907288', 'Acidity_0.810122508',
'Acidity_0.810334873', 'Acidity_0.811045605', 'Acidity_0.812995828',
'Acidity_0.813678164', 'Acidity_0.814293361', 'Acidity_0.81596028',
'Acidity_0.816618795', 'Acidity_0.816681247', 'Acidity_0.818821014',
'Acidity_0.819827005', 'Acidity_0.820800826', 'Acidity_0.821488579',
'Acidity_0.822411546', 'Acidity_0.823026283', 'Acidity_0.825066953',
'Acidity_0.826550768', 'Acidity_0.836379512', 'Acidity_0.837749293',
'Acidity_0.837869179', 'Acidity_0.837999604', 'Acidity_0.838015685',
'Acidity_0.839021075', 'Acidity_0.841770053', 'Acidity_0.842211258',
'Acidity_0.843975672', 'Acidity_0.848923139', 'Acidity_0.851873006',
'Acidity_0.855149248', 'Acidity_0.85622891', 'Acidity_0.856356498',
'Acidity_0.859575031', 'Acidity_0.859773406', 'Acidity_0.863598197',
'Acidity_0.86478663', 'Acidity_0.86587971', 'Acidity_0.866186822',
'Acidity_0.866285324', 'Acidity_0.869982944', 'Acidity_0.871449566',
'Acidity_0.872470725', 'Acidity_0.873307948', 'Acidity_0.874231935',
'Acidity_0.876718842', 'Acidity_0.8772043', 'Acidity_0.879334374',
'Acidity_0.880198889', 'Acidity_0.882688273', 'Acidity_0.884102443',
'Acidity_0.889659108', 'Acidity_0.892245948', 'Acidity_0.893563954',
'Acidity_0.894076504', 'Acidity_0.894756027', 'Acidity_0.895274255',
'Acidity_0.896418974', 'Acidity_0.896653238', 'Acidity_0.897683852',
'Acidity_0.898164308', 'Acidity_0.903033551', 'Acidity_0.914096944',
'Acidity_0.914403502', 'Acidity_0.916157533', 'Acidity_0.918075613',
'Acidity_0.91807892', 'Acidity_0.919506782', 'Acidity_0.919588001',
'Acidity_0.920605642', 'Acidity_0.922071266', 'Acidity_0.922163803',
'Acidity_0.923862967', 'Acidity_0.923973334', 'Acidity_0.924515772',
'Acidity_0.924712224', 'Acidity_0.925927314', 'Acidity_0.926895465',
'Acidity_0.931078465', 'Acidity_0.933022857', 'Acidity_0.933636263',
'Acidity_0.936264265', 'Acidity_0.9389107', 'Acidity_0.939595556',
'Acidity_0.939702545', 'Acidity_0.942478981', 'Acidity_0.943887284',
'Acidity_0.944422302', 'Acidity_0.947553035', 'Acidity_0.94783296',
'Acidity_0.947932207', 'Acidity_0.950782318', 'Acidity_0.953241072',
'Acidity_0.953487839', 'Acidity_0.955717019', 'Acidity_0.956300718',
'Acidity_0.956782203', 'Acidity_0.957153269', 'Acidity_0.957374782',
'Acidity_0.958543825', 'Acidity_0.960135336', 'Acidity_0.960661464',
'Acidity_0.963957113', 'Acidity_0.964165879', 'Acidity_0.96430594',
'Acidity_0.967041295', 'Acidity_0.971095716', 'Acidity_0.972018806',
'Acidity_0.97284771', 'Acidity_0.97422529', 'Acidity_0.977101501',
'Acidity_0.977638764', 'Acidity_0.978183746', 'Acidity_0.985013262',
'Acidity_0.988540998', 'Acidity_0.990331149', 'Acidity_0.991549395',
'Acidity_0.994854424', 'Acidity_0.995985405', 'Acidity_0.99610046',
'Acidity_0.999308201', 'Acidity_1.001952064', 'Acidity_1.002259234',
'Acidity_1.002717725', 'Acidity_1.003508224', 'Acidity_1.003754094',
'Acidity_1.004462732', 'Acidity_1.004476849', 'Acidity_1.006506949',
'Acidity_1.006877454', 'Acidity_1.009155619', 'Acidity_1.010299062',
'Acidity_1.010451335', 'Acidity_1.01084709', 'Acidity_1.014805472',
'Acidity_1.01775056', 'Acidity_1.018572989', 'Acidity_1.019526009',
'Acidity_1.020470369', 'Acidity_1.021798877', 'Acidity_1.024242635',

'Acidity_1.025434143', 'Acidity_1.030098094', 'Acidity_1.03430939',
'Acidity_1.035643365', 'Acidity_1.03812053', 'Acidity_1.040265446',
'Acidity_1.041804277', 'Acidity_1.045148744', 'Acidity_1.04606777',
'Acidity_1.047021307', 'Acidity_1.048440252', 'Acidity_1.049428799',
'Acidity_1.05090811', 'Acidity_1.052510895', 'Acidity_1.053746966',
'Acidity_1.054380314', 'Acidity_1.054633563', 'Acidity_1.054950604',
'Acidity_1.059464845', 'Acidity_1.059900355', 'Acidity_1.062466224',
'Acidity_1.062597044', 'Acidity_1.063990358', 'Acidity_1.070209221',
'Acidity_1.071129708', 'Acidity_1.072321024', 'Acidity_1.073826134',
'Acidity_1.078184946', 'Acidity_1.079333971', 'Acidity_1.079932807',
'Acidity_1.083694885', 'Acidity_1.08475409', 'Acidity_1.085271327',
'Acidity_1.086971353', 'Acidity_1.088504595', 'Acidity_1.090284676',
'Acidity_1.094332865', 'Acidity_1.095010268', 'Acidity_1.097634922',
'Acidity_1.101818513', 'Acidity_1.102208093', 'Acidity_1.105284862',
'Acidity_1.105737675', 'Acidity_1.105971772', 'Acidity_1.108448274',
'Acidity_1.117163222', 'Acidity_1.12172416', 'Acidity_1.122215319',
'Acidity_1.122494601', 'Acidity_1.123206738', 'Acidity_1.124419217',
'Acidity_1.124935316', 'Acidity_1.126991099', 'Acidity_1.128191131',
'Acidity_1.129927802', 'Acidity_1.132168505', 'Acidity_1.133950788',
'Acidity_1.13433461', 'Acidity_1.136907353', 'Acidity_1.136970464',
'Acidity_1.136985378', 'Acidity_1.137425853', 'Acidity_1.139624355',
'Acidity_1.142108458', 'Acidity_1.148905922', 'Acidity_1.151235848',
'Acidity_1.152768549', 'Acidity_1.153000012', 'Acidity_1.155649163',
'Acidity_1.155864135', 'Acidity_1.155911804', 'Acidity_1.161389507',
'Acidity_1.1627936', 'Acidity_1.163699508', 'Acidity_1.165776955',
'Acidity_1.16616104', 'Acidity_1.166970737', 'Acidity_1.168432716',
'Acidity_1.168838186', 'Acidity_1.168981716', 'Acidity_1.175072561',
'Acidity_1.176172575', 'Acidity_1.176424009', 'Acidity_1.177378852',
'Acidity_1.182446876', 'Acidity_1.18419642', 'Acidity_1.185050162',
'Acidity_1.186177549', 'Acidity_1.186414598', 'Acidity_1.189698829',
'Acidity_1.191130833', 'Acidity_1.192569843', 'Acidity_1.193021804',
'Acidity_1.193854061', 'Acidity_1.193891254', 'Acidity_1.194249236',
'Acidity_1.195273442', 'Acidity_1.210290501', 'Acidity_1.21299242',
'Acidity_1.21543583', 'Acidity_1.215772084', 'Acidity_1.216429866',
'Acidity_1.217177815', 'Acidity_1.21731347', 'Acidity_1.220319515',
'Acidity_1.220969825', 'Acidity_1.221682298', 'Acidity_1.221697782',
'Acidity_1.222003358', 'Acidity_1.223084441', 'Acidity_1.224430811',
'Acidity_1.224928763', 'Acidity_1.225941103', 'Acidity_1.225988563',
'Acidity_1.226940054', 'Acidity_1.227386779', 'Acidity_1.22898763',
'Acidity_1.229222876', 'Acidity_1.230691463', 'Acidity_1.23370899',
'Acidity_1.234749952', 'Acidity_1.236271681', 'Acidity_1.239641077',
'Acidity_1.241980192', 'Acidity_1.243595847', 'Acidity_1.245359039',
'Acidity_1.248791791', 'Acidity_1.250970347', 'Acidity_1.260253613',
'Acidity_1.262024005', 'Acidity_1.264206323', 'Acidity_1.264944552',
'Acidity_1.2649463', 'Acidity_1.265160783', 'Acidity_1.265621547',
'Acidity_1.266060162', 'Acidity_1.268758457', 'Acidity_1.271455342',
'Acidity_1.271605588', 'Acidity_1.271769835', 'Acidity_1.274318228',
'Acidity_1.278969028', 'Acidity_1.279871941', 'Acidity_1.280264687',

'Acidity_1.281925544', 'Acidity_1.282263396', 'Acidity_1.28361462',
'Acidity_1.283893863', 'Acidity_1.284231392', 'Acidity_1.284336116',
'Acidity_1.285039755', 'Acidity_1.285942944', 'Acidity_1.28669118',
'Acidity_1.291181186', 'Acidity_1.292195002', 'Acidity_1.293012809',
'Acidity_1.293193656', 'Acidity_1.293471827', 'Acidity_1.29348935',
'Acidity_1.294323927', 'Acidity_1.296747816', 'Acidity_1.2971345',
'Acidity_1.30054503', 'Acidity_1.300693775', 'Acidity_1.303473702',
'Acidity_1.304226459', 'Acidity_1.305533314', 'Acidity_1.307264909',
'Acidity_1.307555892', 'Acidity_1.307998921', 'Acidity_1.3090311',
'Acidity_1.312900519', 'Acidity_1.313167949', 'Acidity_1.313860721',
'Acidity_1.317743743', 'Acidity_1.322156035', 'Acidity_1.325830189',
'Acidity_1.32628185', 'Acidity_1.32712058', 'Acidity_1.327763059',
'Acidity_1.328699376', 'Acidity_1.330072744', 'Acidity_1.333438049',
'Acidity_1.334702168', 'Acidity_1.334893586', 'Acidity_1.338008142',
'Acidity_1.338036233', 'Acidity_1.339130788', 'Acidity_1.339616741',
'Acidity_1.340208338', 'Acidity_1.341249631', 'Acidity_1.342735852',
'Acidity_1.346230253', 'Acidity_1.346573723', 'Acidity_1.348302458',
'Acidity_1.34871204', 'Acidity_1.349920757', 'Acidity_1.350938849',
'Acidity_1.353161003', 'Acidity_1.355485212', 'Acidity_1.358347765',
'Acidity_1.360220777', 'Acidity_1.365203893', 'Acidity_1.366933888',
'Acidity_1.367064815', 'Acidity_1.371001437', 'Acidity_1.371130948',
'Acidity_1.372600604', 'Acidity_1.376426937', 'Acidity_1.378138082',
'Acidity_1.379010378', 'Acidity_1.379090343', 'Acidity_1.382718983',
'Acidity_1.383166033', 'Acidity_1.384035334', 'Acidity_1.384495608',
'Acidity_1.384627576', 'Acidity_1.385557299', 'Acidity_1.385611637',
'Acidity_1.386487028', 'Acidity_1.387407917', 'Acidity_1.389061921',
'Acidity_1.389285206', 'Acidity_1.393033847', 'Acidity_1.397096248',
'Acidity_1.39885364', 'Acidity_1.399388786', 'Acidity_1.400482969',
'Acidity_1.401459762', 'Acidity_1.402366123', 'Acidity_1.402970488',
'Acidity_1.403469653', 'Acidity_1.403521232', 'Acidity_1.408120843',
'Acidity_1.410038052', 'Acidity_1.412873536', 'Acidity_1.41309275',
'Acidity_1.414178188', 'Acidity_1.416983091', 'Acidity_1.41772588',
'Acidity_1.421059511', 'Acidity_1.422806645', 'Acidity_1.426287521',
'Acidity_1.42771444', 'Acidity_1.428455306', 'Acidity_1.430354006',
'Acidity_1.433817427', 'Acidity_1.434992327', 'Acidity_1.436332986',
'Acidity_1.436344794', 'Acidity_1.436373326', 'Acidity_1.436965362',
'Acidity_1.438698948', 'Acidity_1.441385597', 'Acidity_1.444897577',
'Acidity_1.445026966', 'Acidity_1.445360694', 'Acidity_1.44882124',
'Acidity_1.449094973', 'Acidity_1.451621714', 'Acidity_1.453685894',
'Acidity_1.454577903', 'Acidity_1.454755859', 'Acidity_1.454817252',
'Acidity_1.455562203', 'Acidity_1.458007057', 'Acidity_1.460762294',
'Acidity_1.461085428', 'Acidity_1.461894077', 'Acidity_1.466043609',
'Acidity_1.466224085', 'Acidity_1.471594734', 'Acidity_1.472263329',
'Acidity_1.472535448', 'Acidity_1.475863572', 'Acidity_1.482428335',
'Acidity_1.487473202', 'Acidity_1.488269518', 'Acidity_1.489581235',
'Acidity_1.490174669', 'Acidity_1.491628066', 'Acidity_1.49337749',
'Acidity_1.493954536', 'Acidity_1.495648024', 'Acidity_1.496261501',
'Acidity_1.499011058', 'Acidity_1.50001457', 'Acidity_1.500926927',

'Acidity_1.501072134', 'Acidity_1.501562875', 'Acidity_1.501762219',
'Acidity_1.503667484', 'Acidity_1.505616743', 'Acidity_1.508189676',
'Acidity_1.508887162', 'Acidity_1.50903555', 'Acidity_1.510439023',
'Acidity_1.510653955', 'Acidity_1.511514415', 'Acidity_1.512497334',
'Acidity_1.514154771', 'Acidity_1.516106884', 'Acidity_1.516530547',
'Acidity_1.518602253', 'Acidity_1.525039867', 'Acidity_1.525044452',
'Acidity_1.526001912', 'Acidity_1.527393697', 'Acidity_1.529106684',
'Acidity_1.529469089', 'Acidity_1.533792693', 'Acidity_1.539828557',
'Acidity_1.543986894', 'Acidity_1.550666826', 'Acidity_1.551755314',
'Acidity_1.552371873', 'Acidity_1.554838145', 'Acidity_1.555914074',
'Acidity_1.556972107', 'Acidity_1.557792118', 'Acidity_1.560880955',
'Acidity_1.561226504', 'Acidity_1.561895451', 'Acidity_1.562067587',
'Acidity_1.565061386', 'Acidity_1.565237962', 'Acidity_1.566993752',
'Acidity_1.570413149', 'Acidity_1.57326933', 'Acidity_1.575293784',
'Acidity_1.581261549', 'Acidity_1.58151545', 'Acidity_1.582143197',
'Acidity_1.584665032', 'Acidity_1.58489876', 'Acidity_1.585767282',
'Acidity_1.594064952', 'Acidity_1.599195218', 'Acidity_1.599796456',
'Acidity_1.599882026', 'Acidity_1.599886607', 'Acidity_1.60008799',
'Acidity_1.601038247', 'Acidity_1.602278558', 'Acidity_1.602770371',
'Acidity_1.603692081', 'Acidity_1.607589568', 'Acidity_1.608708742',
'Acidity_1.610284105', 'Acidity_1.61098811', 'Acidity_1.611813638',
'Acidity_1.612088232', 'Acidity_1.613529813', 'Acidity_1.615739883',
'Acidity_1.617416928', 'Acidity_1.617889109', 'Acidity_1.618756068',
'Acidity_1.619183695', 'Acidity_1.622219956', 'Acidity_1.622376046',
'Acidity_1.622793192', 'Acidity_1.625841828', 'Acidity_1.629186243',
'Acidity_1.630534548', 'Acidity_1.631091306', 'Acidity_1.631611692',
'Acidity_1.632220274', 'Acidity_1.632592779', 'Acidity_1.634416382',
'Acidity_1.638728705', 'Acidity_1.639280607', 'Acidity_1.640197921',
'Acidity_1.643451555', 'Acidity_1.64595436', 'Acidity_1.649339187',
'Acidity_1.65215817', 'Acidity_1.652870764', 'Acidity_1.653082221',
'Acidity_1.656620737', 'Acidity_1.656877646', 'Acidity_1.657770128',
'Acidity_1.658262189', 'Acidity_1.659750865', 'Acidity_1.66131914',
'Acidity_1.663726188', 'Acidity_1.665924398', 'Acidity_1.667069825',
'Acidity_1.667884513', 'Acidity_1.66902099', 'Acidity_1.67188245',
'Acidity_1.68390841', 'Acidity_1.686512224', 'Acidity_1.689841773',
'Acidity_1.689852489', 'Acidity_1.691025405', 'Acidity_1.691561916',
'Acidity_1.692455508', 'Acidity_1.692950967', 'Acidity_1.69937263',
'Acidity_1.700165743', 'Acidity_1.702742816', 'Acidity_1.70291443',
'Acidity_1.704576907', 'Acidity_1.709708209', 'Acidity_1.712699274',
'Acidity_1.716681323', 'Acidity_1.721389057', 'Acidity_1.723107676',
'Acidity_1.723307547', 'Acidity_1.723762318', 'Acidity_1.723936784',
'Acidity_1.724026084', 'Acidity_1.724251569', 'Acidity_1.725500851',
'Acidity_1.7260921', 'Acidity_1.732524419', 'Acidity_1.735372229',
'Acidity_1.746986998', 'Acidity_1.750426491', 'Acidity_1.752883205',
'Acidity_1.75325013', 'Acidity_1.753576087', 'Acidity_1.754105271',
'Acidity_1.756848405', 'Acidity_1.760895731', 'Acidity_1.762176077',
'Acidity_1.76244588', 'Acidity_1.765241847', 'Acidity_1.767633005',
'Acidity_1.769225354', 'Acidity_1.770603947', 'Acidity_1.775343683',

'Acidity_1.775743836', 'Acidity_1.776869606', 'Acidity_1.777255205',
'Acidity_1.780316712', 'Acidity_1.782646005', 'Acidity_1.783110374',
'Acidity_1.784271472', 'Acidity_1.786843109', 'Acidity_1.787328054',
'Acidity_1.787465613', 'Acidity_1.788154413', 'Acidity_1.789026195',
'Acidity_1.789687083', 'Acidity_1.791805414', 'Acidity_1.795992671',
'Acidity_1.798356068', 'Acidity_1.798605677', 'Acidity_1.799675359',
'Acidity_1.8014555', 'Acidity_1.802374182', 'Acidity_1.807043143',
'Acidity_1.810950768', 'Acidity_1.811327489', 'Acidity_1.811772403',
'Acidity_1.815367793', 'Acidity_1.815548893', 'Acidity_1.817069571',
'Acidity_1.818460298', 'Acidity_1.818489534', 'Acidity_1.820526057',
'Acidity_1.821120048', 'Acidity_1.822181262', 'Acidity_1.827255633',
'Acidity_1.830054885', 'Acidity_1.833452686', 'Acidity_1.83351112',
'Acidity_1.837355596', 'Acidity_1.83775147', 'Acidity_1.838720084',
'Acidity_1.840285348', 'Acidity_1.841722975', 'Acidity_1.842190395',
'Acidity_1.854235285', 'Acidity_1.86746951', 'Acidity_1.869629941',
'Acidity_1.870309153', 'Acidity_1.871943764', 'Acidity_1.874067405',
'Acidity_1.875565732', 'Acidity_1.876060595', 'Acidity_1.877042092',
'Acidity_1.880348648', 'Acidity_1.881426498', 'Acidity_1.882161474',
'Acidity_1.885015984', 'Acidity_1.885183745', 'Acidity_1.886580978',
'Acidity_1.892157515', 'Acidity_1.895399271', 'Acidity_1.897369292',
'Acidity_1.899782249', 'Acidity_1.899972028', 'Acidity_1.901277095',
'Acidity_1.904027416', 'Acidity_1.904849585', 'Acidity_1.906740297',
'Acidity_1.913664613', 'Acidity_1.914618382', 'Acidity_1.920543098',
'Acidity_1.921861905', 'Acidity_1.92667469', 'Acidity_1.929992575',
'Acidity_1.931514995', 'Acidity_1.933060621', 'Acidity_1.934600389',
'Acidity_1.935006729', 'Acidity_1.937289864', 'Acidity_1.937378487',
'Acidity_1.93905777', 'Acidity_1.943418859', 'Acidity_1.945986711',
'Acidity_1.949540556', 'Acidity_1.950120377', 'Acidity_1.951705686',
'Acidity_1.952776768', 'Acidity_1.95327206', 'Acidity_1.954562057',
'Acidity_1.954753513', 'Acidity_1.95499173', 'Acidity_1.956843866',
'Acidity_1.96329495', 'Acidity_1.965934989', 'Acidity_1.966674682',
'Acidity_1.970783741', 'Acidity_1.975611851', 'Acidity_1.975668692',
'Acidity_1.976318514', 'Acidity_1.979674831', 'Acidity_1.981723613',
'Acidity_1.983392167', 'Acidity_1.983451961', 'Acidity_1.985320996',
'Acidity_1.98565023', 'Acidity_1.986156356', 'Acidity_1.986412486',
'Acidity_1.987429612', 'Acidity_1.99553046', 'Acidity_1.996529898',
'Acidity_1.999641554', 'Acidity_2.000125146', 'Acidity_2.004537615',
'Acidity_2.004807236', 'Acidity_2.005504657', 'Acidity_2.00555776',
'Acidity_2.006451575', 'Acidity_2.008429932', 'Acidity_2.008481011',
'Acidity_2.009993218', 'Acidity_2.011494167', 'Acidity_2.012270168',
'Acidity_2.012687026', 'Acidity_2.01698413', 'Acidity_2.01900265',
'Acidity_2.019215518', 'Acidity_2.020624473', 'Acidity_2.023841607',
'Acidity_2.024089693', 'Acidity_2.0247306', 'Acidity_2.025756513',
'Acidity_2.030695991', 'Acidity_2.035405642', 'Acidity_2.039177066',
'Acidity_2.040200065', 'Acidity_2.040601557', 'Acidity_2.046075689',
'Acidity_2.047649446', 'Acidity_2.049558231', 'Acidity_2.050011062',
'Acidity_2.052889264', 'Acidity_2.056639697', 'Acidity_2.058232952',
'Acidity_2.058357127', 'Acidity_2.064066964', 'Acidity_2.064118217',

'Acidity_2.065728297', 'Acidity_2.066437685', 'Acidity_2.068649561',
'Acidity_2.069446272', 'Acidity_2.069509514', 'Acidity_2.070395901',
'Acidity_2.070556012', 'Acidity_2.071983608', 'Acidity_2.073017847',
'Acidity_2.07799313', 'Acidity_2.078826028', 'Acidity_2.079393199',
'Acidity_2.081537202', 'Acidity_2.086618541', 'Acidity_2.094503274',
'Acidity_2.095870617', 'Acidity_2.097802087', 'Acidity_2.099729971',
'Acidity_2.102015829', 'Acidity_2.102061885', 'Acidity_2.105816187',
'Acidity_2.106155005', 'Acidity_2.10991205', 'Acidity_2.114409958',
'Acidity_2.119538103', 'Acidity_2.120352636', 'Acidity_2.120970261',
'Acidity_2.124362402', 'Acidity_2.124385261', 'Acidity_2.127518998',
'Acidity_2.129436957', 'Acidity_2.131648699', 'Acidity_2.133817463',
'Acidity_2.135494154', 'Acidity_2.138542689', 'Acidity_2.141838373',
'Acidity_2.145083279', 'Acidity_2.148164161', 'Acidity_2.148967097',
'Acidity_2.150572298', 'Acidity_2.153440221', 'Acidity_2.157878307',
'Acidity_2.157909715', 'Acidity_2.158032334', 'Acidity_2.158860894',
'Acidity_2.165079371', 'Acidity_2.165801374', 'Acidity_2.168927943',
'Acidity_2.16902306', 'Acidity_2.171090444', 'Acidity_2.177282174',
'Acidity_2.181118542', 'Acidity_2.185607723', 'Acidity_2.189273559',
'Acidity_2.190118648', 'Acidity_2.190636353', 'Acidity_2.191127139',
'Acidity_2.191252624', 'Acidity_2.191434769', 'Acidity_2.191859787',
'Acidity_2.193147335', 'Acidity_2.193171589', 'Acidity_2.193523816',
'Acidity_2.196099992', 'Acidity_2.199468715', 'Acidity_2.199487687',
'Acidity_2.200526984', 'Acidity_2.201416622', 'Acidity_2.203022165',
'Acidity_2.204141635', 'Acidity_2.205699038', 'Acidity_2.211755911',
'Acidity_2.215031084', 'Acidity_2.215688603', 'Acidity_2.219890486',
'Acidity_2.221258172', 'Acidity_2.221617546', 'Acidity_2.229527803',
'Acidity_2.232521943', 'Acidity_2.233682316', 'Acidity_2.23487766',
'Acidity_2.236754113', 'Acidity_2.245048782', 'Acidity_2.252121481',
'Acidity_2.256195514', 'Acidity_2.257634168', 'Acidity_2.258237957',
'Acidity_2.263811944', 'Acidity_2.264292465', 'Acidity_2.266989042',
'Acidity_2.269546816', 'Acidity_2.274141292', 'Acidity_2.275525222',
'Acidity_2.277992284', 'Acidity_2.279462306', 'Acidity_2.280094899',
'Acidity_2.287287185', 'Acidity_2.287350346', 'Acidity_2.288403252',
'Acidity_2.292332884', 'Acidity_2.294602509', 'Acidity_2.295017632',
'Acidity_2.297794779', 'Acidity_2.300330525', 'Acidity_2.302842585',
'Acidity_2.30860314', 'Acidity_2.308864383', 'Acidity_2.309331461',
'Acidity_2.309399752', 'Acidity_2.311174821', 'Acidity_2.311521591',
'Acidity_2.316583272', 'Acidity_2.319098048', 'Acidity_2.323921689',
'Acidity_2.325145985', 'Acidity_2.329274555', 'Acidity_2.330347175',
'Acidity_2.331284997', 'Acidity_2.338540166', 'Acidity_2.342807242',
'Acidity_2.343417978', 'Acidity_2.344657884', 'Acidity_2.345164631',
'Acidity_2.34552157', 'Acidity_2.347861337', 'Acidity_2.35380814',
'Acidity_2.355625894', 'Acidity_2.358023613', 'Acidity_2.359771783',
'Acidity_2.360765322', 'Acidity_2.36743413', 'Acidity_2.377949333',
'Acidity_2.380855802', 'Acidity_2.38179469', 'Acidity_2.383936244',
'Acidity_2.386965287', 'Acidity_2.388514589', 'Acidity_2.388586111',
'Acidity_2.391349211', 'Acidity_2.392763422', 'Acidity_2.392864652',
'Acidity_2.39350287', 'Acidity_2.396013951', 'Acidity_2.397487419',

'Acidity_2.399052542', 'Acidity_2.400152227', 'Acidity_2.400968257',
'Acidity_2.405654839', 'Acidity_2.405837627', 'Acidity_2.40789327',
'Acidity_2.411086303', 'Acidity_2.414170509', 'Acidity_2.416317749',
'Acidity_2.419515928', 'Acidity_2.42129939', 'Acidity_2.422487722',
'Acidity_2.422747057', 'Acidity_2.423539068', 'Acidity_2.423928679',
'Acidity_2.424332415', 'Acidity_2.430187757', 'Acidity_2.432501809',
'Acidity_2.43431229', 'Acidity_2.434754044', 'Acidity_2.434947598',
'Acidity_2.442705012', 'Acidity_2.445013853', 'Acidity_2.446554704',
'Acidity_2.448169699', 'Acidity_2.450725045', 'Acidity_2.453387601',
'Acidity_2.453666286', 'Acidity_2.454228211', 'Acidity_2.458897674',
'Acidity_2.465236699', 'Acidity_2.465401734', 'Acidity_2.466289385',
'Acidity_2.469651486', 'Acidity_2.473983711', 'Acidity_2.474673276',
'Acidity_2.476016393', 'Acidity_2.476398328', 'Acidity_2.476740123',
'Acidity_2.477579568', 'Acidity_2.48045173', 'Acidity_2.48128233',
'Acidity_2.481557725', 'Acidity_2.482959627', 'Acidity_2.484374946',
'Acidity_2.492781622', 'Acidity_2.493781985', 'Acidity_2.501694047',
'Acidity_2.502066301', 'Acidity_2.503739294', 'Acidity_2.504311868',
'Acidity_2.50518817', 'Acidity_2.505367723', 'Acidity_2.5054737',
'Acidity_2.506834119', 'Acidity_2.508858741', 'Acidity_2.518020811',
'Acidity_2.518374081', 'Acidity_2.518539233', 'Acidity_2.519346925',
'Acidity_2.520626892', 'Acidity_2.520905121', 'Acidity_2.523712283',
'Acidity_2.523858095', 'Acidity_2.524172585', 'Acidity_2.524304064',
'Acidity_2.527526345', 'Acidity_2.530517323', 'Acidity_2.533952804',
'Acidity_2.536835582', 'Acidity_2.541203984', 'Acidity_2.544447652',
'Acidity_2.545395225', 'Acidity_2.545422919', 'Acidity_2.548896236',
'Acidity_2.551831691', 'Acidity_2.552587448', 'Acidity_2.553833014',
'Acidity_2.557250685', 'Acidity_2.560803351', 'Acidity_2.563835795',
'Acidity_2.564238209', 'Acidity_2.564829402', 'Acidity_2.565322523',
'Acidity_2.568845781', 'Acidity_2.569365201', 'Acidity_2.57033771',
'Acidity_2.571582061', 'Acidity_2.573083876', 'Acidity_2.573280752',
'Acidity_2.575010153', 'Acidity_2.575213796', 'Acidity_2.576581178',
'Acidity_2.576949552', 'Acidity_2.577473097', 'Acidity_2.579043452',
'Acidity_2.586432022', 'Acidity_2.589012926', 'Acidity_2.589351111',
'Acidity_2.589818171', 'Acidity_2.59718064', 'Acidity_2.597690447',
'Acidity_2.598926778', 'Acidity_2.599186237', 'Acidity_2.59971145',
'Acidity_2.599989695', 'Acidity_2.600239701', 'Acidity_2.600716106',
'Acidity_2.603010577', 'Acidity_2.604484205', 'Acidity_2.60786687',
'Acidity_2.608624768', 'Acidity_2.608796602', 'Acidity_2.613614988',
'Acidity_2.614692534', 'Acidity_2.617780266', 'Acidity_2.618615143',
'Acidity_2.620061624', 'Acidity_2.620943417', 'Acidity_2.621552305',
'Acidity_2.621636473', 'Acidity_2.624366428', 'Acidity_2.626433539',
'Acidity_2.626749321', 'Acidity_2.627274158', 'Acidity_2.635430475',
'Acidity_2.642948241', 'Acidity_2.647722423', 'Acidity_2.648944119',
'Acidity_2.649874004', 'Acidity_2.650961932', 'Acidity_2.651101705',
'Acidity_2.652943776', 'Acidity_2.653468431', 'Acidity_2.657543409',
'Acidity_2.66212605', 'Acidity_2.662200873', 'Acidity_2.662547829',
'Acidity_2.663416258', 'Acidity_2.665086812', 'Acidity_2.666099628',
'Acidity_2.667098506', 'Acidity_2.669102823', 'Acidity_2.67598861',

'Acidity_2.683269381', 'Acidity_2.684720448', 'Acidity_2.68483651',
'Acidity_2.686067904', 'Acidity_2.687006687', 'Acidity_2.691332311',
'Acidity_2.693643818', 'Acidity_2.696619742', 'Acidity_2.697240797',
'Acidity_2.697917877', 'Acidity_2.700550217', 'Acidity_2.701821479',
'Acidity_2.702748283', 'Acidity_2.706358361', 'Acidity_2.708657416',
'Acidity_2.7095919', 'Acidity_2.709944697', 'Acidity_2.71103408',
'Acidity_2.714357454', 'Acidity_2.718979289', 'Acidity_2.719665829',
'Acidity_2.720059239', 'Acidity_2.720284244', 'Acidity_2.721538302',
'Acidity_2.722973293', 'Acidity_2.723642804', 'Acidity_2.724329759',
'Acidity_2.724627734', 'Acidity_2.728708138', 'Acidity_2.733986236',
'Acidity_2.740924761', 'Acidity_2.74473663', 'Acidity_2.747653602',
'Acidity_2.753851267', 'Acidity_2.755812939', 'Acidity_2.759441226',
'Acidity_2.766830845', 'Acidity_2.767157405', 'Acidity_2.769458608',
'Acidity_2.771449533', 'Acidity_2.77301531', 'Acidity_2.776502937',
'Acidity_2.779827015', 'Acidity_2.786759187', 'Acidity_2.788116753',
'Acidity_2.790841777', 'Acidity_2.790905995', 'Acidity_2.792589273',
'Acidity_2.801796005', 'Acidity_2.802812312', 'Acidity_2.803937963',
'Acidity_2.810348673', 'Acidity_2.810378257', 'Acidity_2.814021899',
'Acidity_2.821766372', 'Acidity_2.823337043', 'Acidity_2.825652933',
'Acidity_2.829489418', 'Acidity_2.831482849', 'Acidity_2.834503938',
'Acidity_2.836815744', 'Acidity_2.840613192', 'Acidity_2.843064411',
'Acidity_2.860697945', 'Acidity_2.862160014', 'Acidity_2.865048371',
'Acidity_2.87016191', 'Acidity_2.871475348', 'Acidity_2.872205132',
'Acidity_2.87351138', 'Acidity_2.874555906', 'Acidity_2.878142344',
'Acidity_2.887083647', 'Acidity_2.892003722', 'Acidity_2.892828747',
'Acidity_2.90375397', 'Acidity_2.904401259', 'Acidity_2.90534156',
'Acidity_2.909939244', 'Acidity_2.914469166', 'Acidity_2.918977767',
'Acidity_2.926372989', 'Acidity_2.92642631', 'Acidity_2.927230832',
'Acidity_2.928774852', 'Acidity_2.932793736', 'Acidity_2.936344233',
'Acidity_2.936987174', 'Acidity_2.943281752', 'Acidity_2.943658081',
'Acidity_2.943828562', 'Acidity_2.948829885', 'Acidity_2.949225886',
'Acidity_2.954526914', 'Acidity_2.96054524', 'Acidity_2.9637063',
'Acidity_2.965505402', 'Acidity_2.966694832', 'Acidity_2.973010155',
'Acidity_2.975223485', 'Acidity_2.97738182', 'Acidity_2.977411637',
'Acidity_2.979749725', 'Acidity_2.981116267', 'Acidity_2.98479691',
'Acidity_2.990700053', 'Acidity_3.002468885', 'Acidity_3.004852758',
'Acidity_3.007054198', 'Acidity_3.007831395', 'Acidity_3.02180759',
'Acidity_3.02839618', 'Acidity_3.030761684', 'Acidity_3.03179765',
'Acidity_3.040761752', 'Acidity_3.04163101', 'Acidity_3.048116271',
'Acidity_3.050600945', 'Acidity_3.052069553', 'Acidity_3.062536423',
'Acidity_3.065090038', 'Acidity_3.067087102', 'Acidity_3.068997143',
'Acidity_3.079908093', 'Acidity_3.080107647', 'Acidity_3.086566434',
'Acidity_3.091904815', 'Acidity_3.096682929', 'Acidity_3.096691118',
'Acidity_3.097818375', 'Acidity_3.09905486', 'Acidity_3.103715262',
'Acidity_3.104203842', 'Acidity_3.104922831', 'Acidity_3.129403535',
'Acidity_3.133728152', 'Acidity_3.139484639', 'Acidity_3.145872884',
'Acidity_3.152707213', 'Acidity_3.159536667', 'Acidity_3.160949687',
'Acidity_3.170053076', 'Acidity_3.174687485', 'Acidity_3.184188187',

'Acidity_3.188345866', 'Acidity_3.188874035', 'Acidity_3.189154084',
'Acidity_3.200821467', 'Acidity_3.201419042', 'Acidity_3.20408054',
'Acidity_3.206656298', 'Acidity_3.207720704', 'Acidity_3.216363849',
'Acidity_3.220223691', 'Acidity_3.220311509', 'Acidity_3.220818231',
'Acidity_3.225935051', 'Acidity_3.230441357', 'Acidity_3.232687294',
'Acidity_3.246392767', 'Acidity_3.247621524', 'Acidity_3.251512146',
'Acidity_3.253430006', 'Acidity_3.256333414', 'Acidity_3.259328603',
'Acidity_3.267287974', 'Acidity_3.270969072', 'Acidity_3.276022921',
'Acidity_3.283154894', 'Acidity_3.285412981', 'Acidity_3.291172928',
'Acidity_3.292110029', 'Acidity_3.296287937', 'Acidity_3.301476164',
'Acidity_3.306494887', 'Acidity_3.311386373', 'Acidity_3.316119737',
'Acidity_3.319835117', 'Acidity_3.321828024', 'Acidity_3.32511205',
'Acidity_3.336713101', 'Acidity_3.34199466', 'Acidity_3.342109929',
'Acidity_3.347671368', 'Acidity_3.350155927', 'Acidity_3.35747973',
'Acidity_3.364612329', 'Acidity_3.368594087', 'Acidity_3.368661424',
'Acidity_3.374035449', 'Acidity_3.378856539', 'Acidity_3.380683335',
'Acidity_3.383837679', 'Acidity_3.3848004', 'Acidity_3.387447604',
'Acidity_3.38751734', 'Acidity_3.389386459', 'Acidity_3.399375591',
'Acidity_3.401455383', 'Acidity_3.404747277', 'Acidity_3.405436263',
'Acidity_3.411549677', 'Acidity_3.416639346', 'Acidity_3.418052336',
'Acidity_3.419852669', 'Acidity_3.422270784', 'Acidity_3.428367426',
'Acidity_3.436560049', 'Acidity_3.43973372', 'Acidity_3.441841889',
'Acidity_3.447199193', 'Acidity_3.451955025', 'Acidity_3.453014147',
'Acidity_3.460221928', 'Acidity_3.467810108', 'Acidity_3.47299406',
'Acidity_3.488602631', 'Acidity_3.489358464', 'Acidity_3.496538098',
'Acidity_3.496943154', 'Acidity_3.499264098', 'Acidity_3.501481092',
'Acidity_3.502273108', 'Acidity_3.506464979', 'Acidity_3.509665067',
'Acidity_3.510518945', 'Acidity_3.518451596', 'Acidity_3.527774311',
'Acidity_3.532238446', 'Acidity_3.537846194', 'Acidity_3.538732353',
'Acidity_3.540891827', 'Acidity_3.543470082', 'Acidity_3.551641608',
'Acidity_3.554015134', 'Acidity_3.555318358', 'Acidity_3.557674731',
'Acidity_3.559569799', 'Acidity_3.56533263', 'Acidity_3.565493262',
'Acidity_3.569300942', 'Acidity_3.582814236', 'Acidity_3.59055577',
'Acidity_3.591669472', 'Acidity_3.592090472', 'Acidity_3.597187215',
'Acidity_3.598619133', 'Acidity_3.599024519', 'Acidity_3.600796684',
'Acidity_3.604772068', 'Acidity_3.604999027', 'Acidity_3.607232346',
'Acidity_3.612062408', 'Acidity_3.612383361', 'Acidity_3.615340239',
'Acidity_3.616898168', 'Acidity_3.617288034', 'Acidity_3.618673557',
'Acidity_3.620053885', 'Acidity_3.62855493', 'Acidity_3.637884115',
'Acidity_3.654805327', 'Acidity_3.658487446', 'Acidity_3.669770294',
'Acidity_3.670181522', 'Acidity_3.674093248', 'Acidity_3.67749718',
'Acidity_3.683016111', 'Acidity_3.689580857', 'Acidity_3.696714537',
'Acidity_3.701673772', 'Acidity_3.725119774', 'Acidity_3.725729501',
'Acidity_3.738833794', 'Acidity_3.739759196', 'Acidity_3.744711358',
'Acidity_3.752627485', 'Acidity_3.758296168', 'Acidity_3.760518321',
'Acidity_3.761634732', 'Acidity_3.764854713', 'Acidity_3.766012647',
'Acidity_3.767958209', 'Acidity_3.768027336', 'Acidity_3.778604046',
'Acidity_3.782451601', 'Acidity_3.793323716', 'Acidity_3.794659404',

'Acidity_3.812018328', 'Acidity_3.816880808', 'Acidity_3.825229936',
'Acidity_3.827240359', 'Acidity_3.831942983', 'Acidity_3.844658129',
'Acidity_3.84744379', 'Acidity_3.856590968', 'Acidity_3.86888573',
'Acidity_3.889340641', 'Acidity_3.905349775', 'Acidity_3.923279611',
'Acidity_3.954487792', 'Acidity_3.979854814', 'Acidity_3.991479474',
'Acidity_3.991795286', 'Acidity_4.020885915', 'Acidity_4.022184389',
'Acidity_4.024592092', 'Acidity_4.034392859', 'Acidity_4.036879974',
'Acidity_4.037146399', 'Acidity_4.04329901', 'Acidity_4.046948428',
'Acidity_4.04877488', 'Acidity_4.072019984', 'Acidity_4.076830586',
'Acidity_4.077163435', 'Acidity_4.082158867', 'Acidity_4.093808854',
'Acidity_4.09531232', 'Acidity_4.110698064', 'Acidity_4.125106377',
'Acidity_4.125265455', 'Acidity_4.127360306', 'Acidity_4.13039773',
'Acidity_4.147140619', 'Acidity_4.147865892', 'Acidity_4.157028537',
'Acidity_4.158394682', 'Acidity_4.169748166', 'Acidity_4.173553001',
'Acidity_4.17939151', 'Acidity_4.207055592', 'Acidity_4.210413891',
'Acidity_4.21395771', 'Acidity_4.263594155', 'Acidity_4.264650581',
'Acidity_4.266416653', 'Acidity_4.280580332', 'Acidity_4.288667532',
'Acidity_4.300782725', 'Acidity_4.306460128', 'Acidity_4.306908269',
'Acidity_4.308434418', 'Acidity_4.312841326', 'Acidity_4.324596042',
'Acidity_4.325308624', 'Acidity_4.329863961', 'Acidity_4.334399653',
'Acidity_4.348131862', 'Acidity_4.371277287', 'Acidity_4.392352372',
'Acidity_4.393658725', 'Acidity_4.405949342', 'Acidity_4.430772373',
'Acidity_4.434521041', 'Acidity_4.43608798', 'Acidity_4.472115939',
'Acidity_4.514503907', 'Acidity_4.595794222', 'Acidity_4.59635612',
'Acidity_4.619550751', 'Acidity_4.622510262', 'Acidity_4.623162668',
'Acidity_4.659482955', 'Acidity_4.67363368', 'Acidity_4.687954168',
'Acidity_4.689126107', 'Acidity_4.705961188', 'Acidity_4.738312808',
'Acidity_4.74391499', 'Acidity_4.787568824', 'Acidity_4.80783425',
'Acidity_4.815610945', 'Acidity_4.820600657', 'Acidity_4.85770709',
'Acidity_4.892835064', 'Acidity_4.902216626', 'Acidity_4.91079485',
'Acidity_4.915941101', 'Acidity_4.940053725', 'Acidity_4.96733684',
'Acidity_4.989297317', 'Acidity_4.999895803', 'Acidity_5.000494671',
'Acidity_5.011310465', 'Acidity_5.05127048', 'Acidity_5.087458065',
'Acidity_5.098353797', 'Acidity_5.123757212', 'Acidity_5.125138503',
'Acidity_5.131967121', 'Acidity_5.136138788', 'Acidity_5.170171939',
'Acidity_5.189715685', 'Acidity_5.201887028', 'Acidity_5.206389947',
'Acidity_5.240468622', 'Acidity_5.26838182', 'Acidity_5.303691147',
'Acidity_5.305217658', 'Acidity_5.361157242', 'Acidity_5.373434788',
'Acidity_5.381199793', 'Acidity_5.389839871', 'Acidity_5.416040003',
'Acidity_5.458589887', 'Acidity_5.465399138', 'Acidity_5.478025057',
'Acidity_5.529057165', 'Acidity_5.529861296', 'Acidity_5.536747898',
'Acidity_5.538526181', 'Acidity_5.552320288', 'Acidity_5.560108693',
'Acidity_5.568768151', 'Acidity_5.588124235', 'Acidity_5.614975313',
'Acidity_5.651337095', 'Acidity_5.685252925', 'Acidity_5.746699131',
'Acidity_5.890655101', 'Acidity_5.91888783', 'Acidity_6.004566164',
'Acidity_6.008854208', 'Acidity_6.13106252', 'Acidity_6.13896523',
'Acidity_6.17198647', 'Acidity_6.184145401', 'Acidity_6.267182876',
'Acidity_6.348869952', 'Acidity_6.70139469', 'Acidity_7.193374375',

```
'Acidity_7.404736238', 'Quality_good']
Dimensiones de X: (4000, 4006)
Dimensiones de y (objetivo): (4000,)
Primeros 5 valores de y: 0    1.844900
1    0.853286
2    2.838636
3    3.637970
4    3.030874
Name: Juiciness, dtype: float64
Dimensiones de X_train: (2800, 4006)
Dimensiones de X_test: (1200, 4006)
Dimensiones de y_train: (2800,)
Dimensiones de y_test: (1200,)
```

```
[25]: from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import numpy as np

resultados3 = []

print("Iniciando entrenamiento de modelos")

for nombre, modelo in modelos_regresion:
    print(f"\nEntrenando {nombre}...")

    modelo.fit(X3_train, y3_train)

    # Predicciones
    y3_train_pred = modelo.predict(X3_train)
    y3_test_pred = modelo.predict(X3_test)

    # Métricas
    r2_train = r2_score(y3_train, y3_train_pred)
    r2_test = r2_score(y3_test, y3_test_pred)

    # Guardar resultados
    resultados3.append({
        'Modelo': nombre,
        'R2 Train': r2_train,
        'R2 Test': r2_test,
    })

    print(f" {nombre} completado. R2 Test: {r2_test:.4f}")

df_resultados3 = pd.DataFrame(resultados3).sort_values(by='R2 Test',
↪ascending=False)
```

Iniciando entrenamiento de modelos

Entrenando Regresión Lineal...
Regresión Lineal completado. R2 Test: 0.0028

Entrenando Árbol de Decisión...
Árbol de Decisión completado. R2 Test: 0.0278

Entrenando Random Forest...
Random Forest completado. R2 Test: 0.4210

```
[26]: df_resultados3
```

```
[26]:
```

	Modelo	R2 Train	R2 Test
2	Random Forest	0.920601	0.420977
1	Árbol de Decisión	1.000000	0.027840
0	Regresión Lineal	1.000000	0.002801

0.7 TABLA RESUMEN DE LOS 3 PROBLEMAS DE APRENDIZAJE SUPERVISADO

```
[27]: # Etiquetas para cada problema
df_resultados['Problema'] = "Problema 1"
df_resultados['Tema'] = "Clasificación del tratamiento médico"
df_resultados['Métrica'] = "Accuracy"

df_resultados2['Problema'] = "Problema 2"
df_resultados2['Tema'] = "Clasificación de calidad de manzanas"
df_resultados2['Métrica'] = "Accuracy"

df_resultados3['Problema'] = "Problema 3"
df_resultados3['Tema'] = "Predicción de jugosidad de la manzana"
df_resultados3['Métrica'] = "R²"

# Reorganizar columnas según tipo
df_clasif1 = df_resultados[['Problema', 'Tema', 'Modelo', 'Métrica', 'Accuracy_
    ↪Train', 'Accuracy Test']].copy()
df_clasif2 = df_resultados2[['Problema', 'Tema', 'Modelo', 'Métrica', 'Accuracy_
    ↪Train', 'Accuracy Test']].copy()
df_reg = df_resultados3[['Problema', 'Tema', 'Modelo', 'Métrica', 'R2 Train',
    ↪'R2 Test']].copy()

# Uniformar nombres de columnas
df_clasif1.rename(columns={'Accuracy Train': 'Train', 'Accuracy Test': 'Test'},
    ↪inplace=True)
df_clasif2.rename(columns={'Accuracy Train': 'Train', 'Accuracy Test': 'Test'},
    ↪inplace=True)
df_reg.rename(columns={'R2 Train': 'Train', 'R2 Test': 'Test'}, inplace=True)
```

```

# Unir todos los resultados
df_comparativo = pd.concat([df_clasif1, df_clasif2, df_reg], ignore_index=True)

# Marcar el mejor modelo (según mayor valor de Test)
df_comparativo['Mejor Modelo'] = ''
for problema in df_comparativo['Problema'].unique():
    idx_max = df_comparativo[df_comparativo['Problema'] == problema]['Test'].
    ↪idxmax()
    df_comparativo.loc[idx_max, 'Mejor Modelo'] = ''

# Mostrar
import IPython.display as dsp
dsp.display(df_comparativo.round(3).sort_values(by=['Problema', 'Test'],
    ↪ascending=[True, False]))

```

	Problema	Tema	Modelo \
0	Problema 1	Clasificación del tratamiento médico	Random Forest
1	Problema 1	Clasificación del tratamiento médico	Árbol de Decisión
2	Problema 1	Clasificación del tratamiento médico	Regresión Logística
3	Problema 2	Clasificación de calidad de manzanas	Random Forest
4	Problema 2	Clasificación de calidad de manzanas	Árbol de Decisión
5	Problema 2	Clasificación de calidad de manzanas	Regresión Logística
6	Problema 3	Predicción de jugosidad de la manzana	Random Forest
7	Problema 3	Predicción de jugosidad de la manzana	Árbol de Decisión
8	Problema 3	Predicción de jugosidad de la manzana	Regresión Lineal

	Métrica	Train	Test	Mejor Modelo
0	Accuracy	1.000	0.966	
1	Accuracy	1.000	0.932	
2	Accuracy	0.917	0.898	
3	Accuracy	1.000	0.848	
4	Accuracy	1.000	0.788	
5	Accuracy	0.727	0.741	
6	R ²	0.921	0.421	
7	R ²	1.000	0.028	
8	R ²	1.000	0.003	

0.8 CONCLUSIÓN DE LA PARTE 1

En esta sección se abordaron tres problemas distintos de aprendizaje supervisado, empleando modelos de clasificación y regresión para evaluar su rendimiento en tareas específicas. A continuación, se destacan los principales hallazgos:

Problema 1 – Clasificación del tratamiento médico (multiclase): El modelo con mejor desempeño fue Random Forest, alcanzando un Accuracy Test de 0.966, superando tanto a los árboles de decisión como a la regresión logística. Este resultado refleja su capacidad para manejar relaciones no lineales y múltiples clases de forma eficiente.

Problema 2 – Clasificación de calidad de manzanas (binaria): Nuevamente, Random Forest obtuvo

el mejor resultado (Accuracy Test de 0.848), confirmando su robustez ante variables categóricas y numéricas en contextos de clasificación binaria. Aunque la regresión logística mostró un rendimiento aceptable, no fue competitiva frente a los modelos de árbol.

Problema 3 – Predicción de jugosidad de la manzana (regresión): En este escenario de regresión, Random Forest Regressor también demostró ser el modelo más eficaz, alcanzando un R^2 Test de 0.421, lo que indica que fue capaz de capturar mejor la variabilidad de la variable objetivo. Los modelos de regresión lineal y árbol de decisión tuvieron un ajuste pobre sobre los datos.

A través del análisis de métricas como Accuracy y R^2 , se evidenció que Random Forest fue el modelo más consistente y efectivo en todos los problemas planteados. Su versatilidad, capacidad de generalización y manejo de datos mixtos lo convierten en una excelente elección para tareas de clasificación y regresión dentro del aprendizaje supervisado.

#

PARTE N.2 APRENDIZAJE NO SUPERVISADO

0.9 LIBRERIAS UTILIZADAS

```
[28]: #librerias a Utilizar
import scipy.stats
import seaborn as sns
from sklearn.decomposition import PCA
from scipy.cluster.hierarchy import dendrogram, linkage
from sklearn.metrics import silhouette_score, silhouette_samples
from sklearn.cluster import AgglomerativeClustering
from sklearn.cluster import KMeans
from yellowbrick.cluster import KElbowVisualizer
import matplotlib.cm as cm
import numpy as np

[29]: def graficaSilueta(X: np.array, cluster_labels, n_clusters):
    # Calcular coeficiente de silueta
    silhouette_avg = silhouette_score(X, cluster_labels)
    silhouette_vals = silhouette_samples(X, cluster_labels)
    print(f"Coeficiente de Silueta Promedio: {silhouette_avg:.3f}")

    # Subplots
    fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(18, 7))
    ax1.set_xlim([-1, 1])

    # Gráfica de silueta
    y_lower = 10
    for i in range(n_clusters):
        cluster_silhouette_vals = silhouette_vals[cluster_labels == i]
        cluster_silhouette_vals.sort()
        y_upper = y_lower + len(cluster_silhouette_vals)
```

```

        ax1.fill_betweenx(np.arange(y_lower, y_upper), 0,
↪cluster_silhouette_vals, alpha=0.7)
        ax1.text(-0.05, (y_lower + y_upper) / 2, str(i))
        y_lower = y_upper + 10

    ax1.axvline(x=silhouette_avg, color="red", linestyle="--",
↪label="Silhouette Score")
    ax1.set_xlabel("Coeficiente de Silueta")
    ax1.set_ylabel("Muestras")
    ax1.set_title("Gráfico de Silueta")
    ax1.legend()

    # Gráfico 2D de los clusters formados
    colors = cm.nipy_spectral(cluster_labels.astype(float) / n_clusters)
    ax2.scatter(X[:, 0], X[:, 1], marker=".", s=60, lw=0, alpha=0.7, c=colors,
↪edgecolor="k")
    ax2.set_title("Clusters visualizados en 2D")
    ax2.set_xlabel("Componente 1")
    ax2.set_ylabel("Componente 2")

    plt.show()
    return silhouette_avg

```

0.10 PROBLEMA N.1 (APRENDIZAJE NO SUPERVISADO)

Agrupar conjunto de datos en base a las características de los pacientes de los datos de Apendicitis pediátrica.

[30]: *# Cargar y preparar datos limpios del dataset de Apendicitis Pediátrica*

```

df_limpio = df_limpio.copy()      # Usamos el dataset ya limpio
df_limpio.dropna(inplace=True)    # Por si queda algún nulo
df_limpio.head(2)                 # Verificamos las primeras filas

```

```

[30]:      Age   BMI   Sex  Height  Weight  Length_of_Stay  Management \
0  12.68  16.9  female   148.0    37.0             3.0  conservative
1  14.10  31.9   male   147.0    69.5             2.0  conservative

      Severity  Diagnosis_Presumptive      Diagnosis  ...  RDW  \
0  uncomplicated      appendicitis      appendicitis  ...  12.2
1  uncomplicated      appendicitis  no appendicitis  ...  12.7

      Thrombocyte_Count  CRP  Dysuria   Stool  Peritonitis  Psoas_Sign  US_Performed  \
0                254.0  0.0     no  normal           no         yes         yes
1                151.0  3.0     yes  normal           no         yes         yes

US_Number  Free_Fluids

```

```
0      882.0      no
1      883.0      no
```

[2 rows x 34 columns]

```
[31]: # --- Convertir columnas categóricas a numéricas ---
df_encoded = df_limpio.copy()
le = LabelEncoder()

for column in df_encoded.columns:
    if df_encoded[column].dtype == 'object':
        df_encoded[column] = le.fit_transform(df_encoded[column])

# --- Aplicar PCA para reducción de dimensiones ---
random_state = 2018
pca = PCA(n_components=0.99, random_state=random_state) # Mantener 99% de la
↳varianza
X_pca = pca.fit_transform(df_encoded)

# Convertir a DataFrame para visualización/futuro uso
X_pca = pd.DataFrame(data=X_pca, index=df_encoded.index)

# Verificar resultado
X_pca.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 589 entries, 0 to 781
Data columns (total 3 columns):
#   Column  Non-Null Count  Dtype
---  -
0    0      589 non-null    float64
1    1      589 non-null    float64
2    2      589 non-null    float64
dtypes: float64(3)
memory usage: 18.4 KB
```

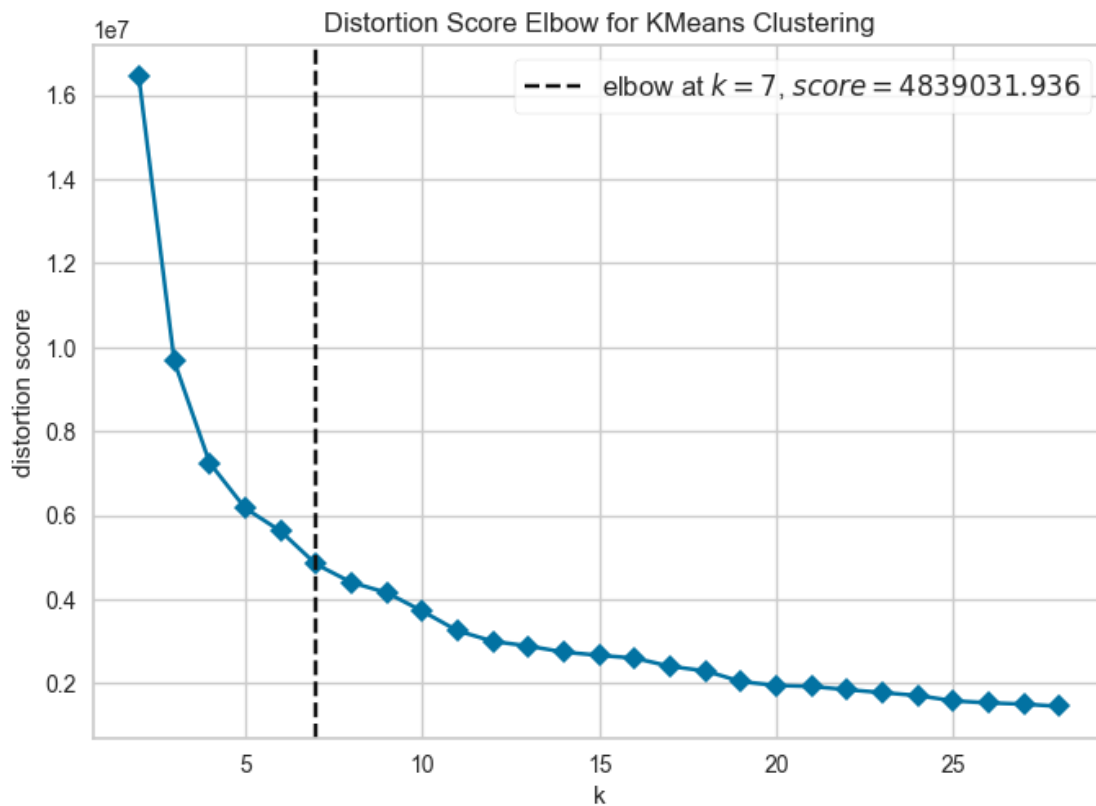
Metodo Aplicado: K-Means

```
[32]: # Modelo base
model = KMeans(random_state=20)

# Visualizador del método del codo
visualizer = KElbowVisualizer(model, k=(2, 29), timings=False)

# Usar X_pca como entrada (correcto en tu flujo)
visualizer.fit(X_pca)
visualizer.show()
```

```
# Obtener K óptimo
k_optimo = visualizer.elbow_value_
print(f"Número óptimo de clusters según el método del codo: {k_optimo}")
```



Número óptimo de clusters según el método del codo: 7

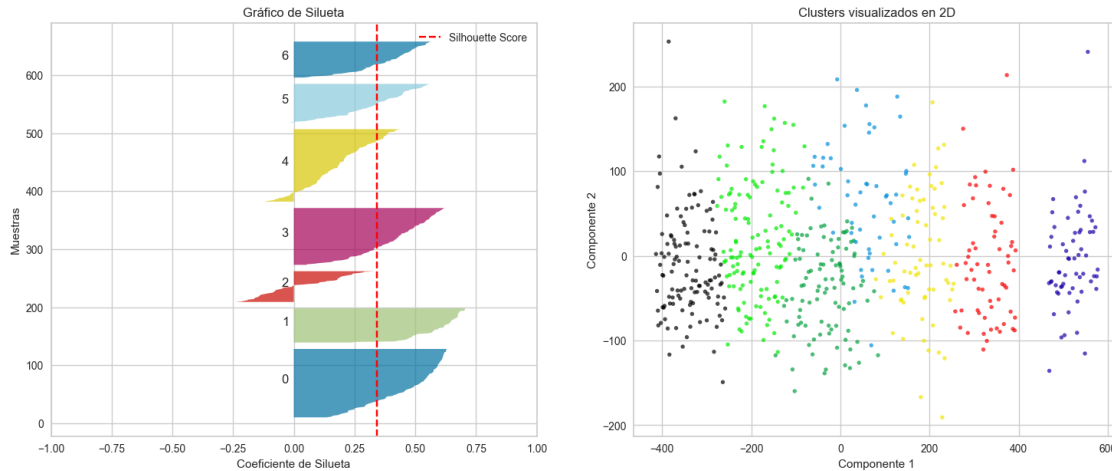
```
[33]: # Creación del modelo de K-Means Clustering
nombre2 = "K-Means Clustering"

kmeans = KMeans(n_clusters=k_optimo, random_state=35)
y_km = kmeans.fit_predict(X_pca)

# Guardar resultados en DataFrame
resultadokm = pd.DataFrame(X_pca)
resultadokm['cluster'] = y_km

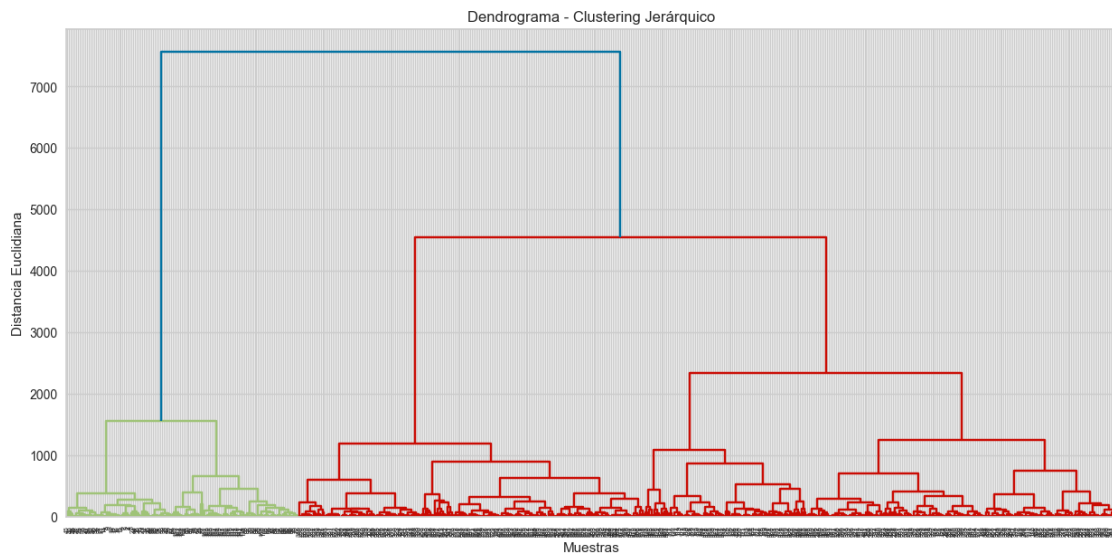
# Diccionario para almacenar el resultado del coeficiente de silueta
resultado_n = {}
resultado_n[nombre2] = graficaSilueta(X_pca.values, y_km, kmeans.n_clusters)
```

Coeficiente de Silueta Promedio: 0.342



Metodo Aplicado - Clustering jerárquico aglomerativo

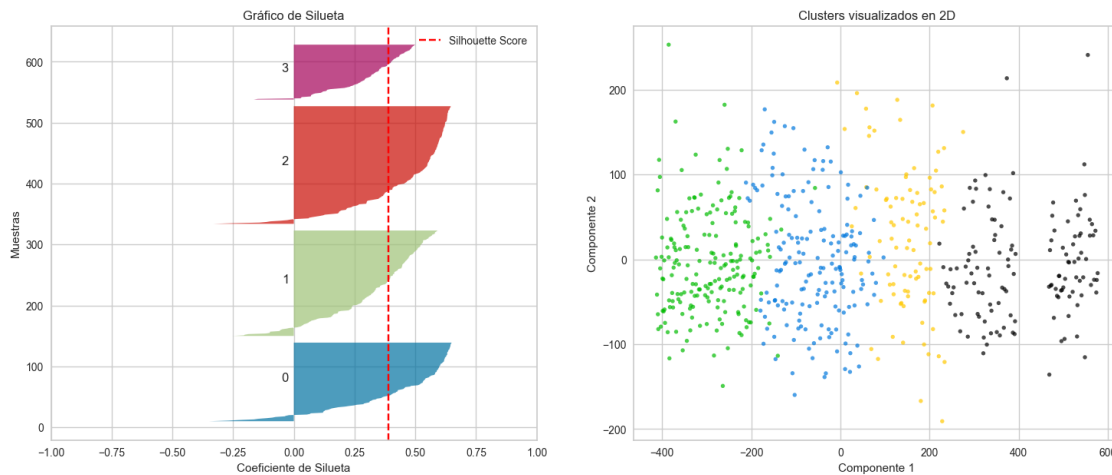
```
[34]: # Crear dendrograma para estimar el número de clusters
linked = linkage(X_pca, method='ward')
plt.figure(figsize=(15, 7))
dendrogram(linked, orientation='top')
plt.title("Dendrograma - Clustering Jerárquico")
plt.xlabel("Muestras")
plt.ylabel("Distancia Euclidiana")
plt.show()
```



```
[35]: # Crear modelo y evaluar con gráfica de silueta
nombre3 = "Agglomerative Clustering"
cluster = AgglomerativeClustering(n_clusters=4, metric='euclidean',
    linkage='ward')
cluster_labels = cluster.fit_predict(X_pca)

# Guardar en el diccionario de resultados
resultado_n[nombre3] = graficaSilueta(X_pca.values, cluster_labels, cluster.
    n_clusters)
```

Coefficiente de Silueta Promedio: 0.390



```
[36]: # Crear DataFrame con los resultados del Problema 1
tabla_resultado_1 = pd.DataFrame(
    list(resultado_n.items()),
    columns=["Modelo/Algoritmo", "Coeficiente Silueta"]
)

# Agregar columna de identificación del problema
tabla_resultado_1["Problema"] = "Problema 1"

# Reordenar columnas
tabla_resultado_1 = tabla_resultado_1[["Problema", "Modelo/Algoritmo",
    "Coeficiente Silueta"]]

# Mostrar tabla
tabla_resultado_1
```

```
[36]:
```

	Problema	Modelo/Algoritmo	Coeficiente Silueta
0	Problema 1	K-Means Clustering	0.342127
1	Problema 1	Agglomerative Clustering	0.390028

0.11 PROBLEMA N.2 (APRENDIZAJE NO SUPERVISADO)

Agrupar conjunto de datos en base a las características de la manzana.

```
[37]: # Cargar y preparar datos limpios del dataset de Características de la Manzana
df_apple = df_apple_limpio.copy()          # Usamos el dataset limpio
df_apple.dropna(inplace=True)              # Eliminamos posibles valores nulos
df_apple.head(2)                           # Mostramos las primeras filas
```

```
[37]:   A_id      Size      Weight  Sweetness  Crunchiness  Juiciness  Ripeness  \
0    0.0 -3.970049 -2.512336   5.346330    -1.012009    1.844900    0.32984
1    1.0 -1.195217 -2.839257   3.664059     1.588232    0.853286    0.86753

      Acidity Quality
0 -0.491590483    good
1 -0.722809367    good
```

```
[38]: # --- Convertir columnas categóricas a numéricas ---
df_encoded_apple = df_apple.copy()
le = LabelEncoder()

for column in df_encoded_apple.columns:
    if df_encoded_apple[column].dtype == 'object':
        df_encoded_apple[column] = le.fit_transform(df_encoded_apple[column])

# --- Aplicar PCA para reducción de dimensiones ---
random_state = 2018
pca = PCA(n_components=0.99, random_state=random_state) # Mantener 99% de la
↳varianza
X_pca_apple = pca.fit_transform(df_encoded_apple)

# Convertir a DataFrame para visualización/futuro uso
X_pca_apple = pd.DataFrame(data=X_pca_apple, index=df_encoded_apple.index)

# Verificar resultado
X_pca_apple.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 4000 entries, 0 to 3999
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0    0      4000 non-null    float64
1    1      4000 non-null    float64
dtypes: float64(2)
memory usage: 93.8 KB
```

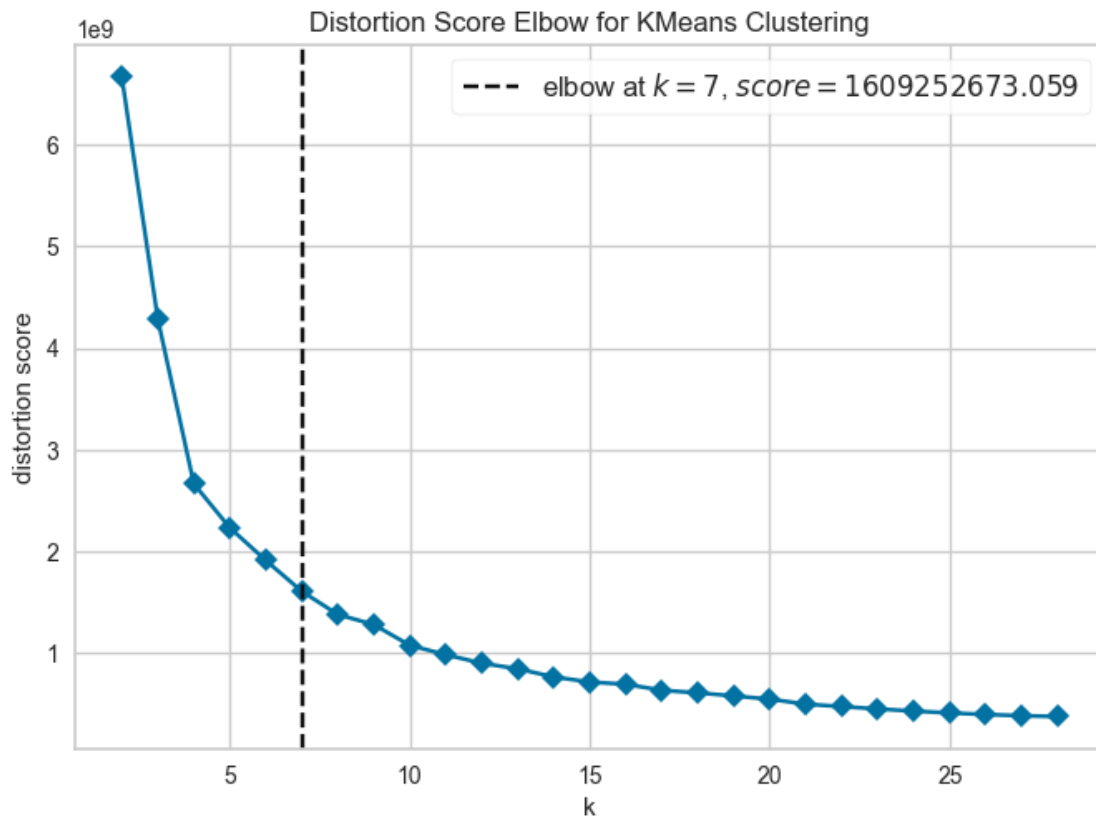
Metodo Aplicado - K-Means

```
[39]: # Modelo base
model_apple = KMeans(random_state=20)

# Visualizador del método del codo
visualizer_apple = KElbowVisualizer(model_apple, k=(2, 29), timings=False)

# Usar X_pca_apple como entrada
visualizer_apple.fit(X_pca_apple)
visualizer_apple.show()

# Obtener k óptimo
k_optimo_apple = visualizer_apple.elbow_value_
print(f"Número óptimo de clusters según el método del codo (manzanas):_
↳ {k_optimo_apple}")
```



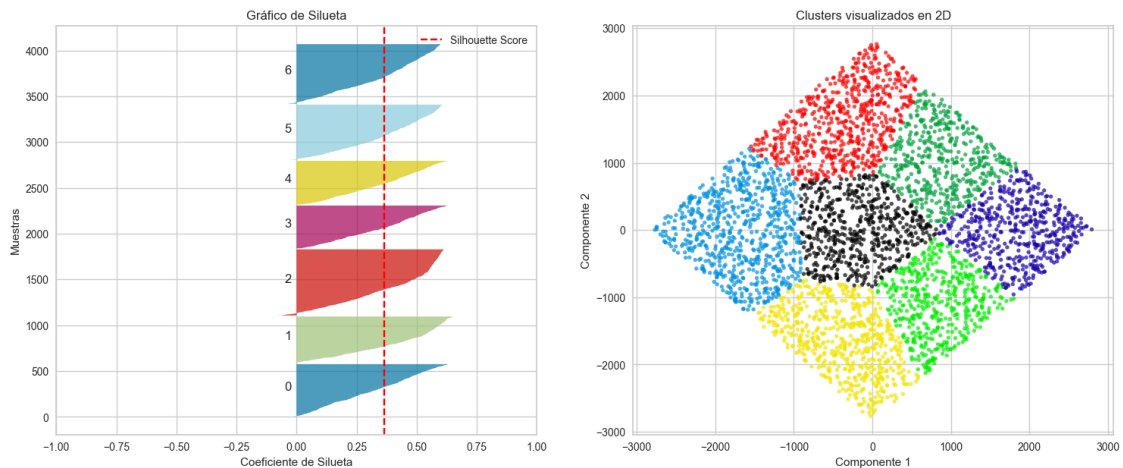
Número óptimo de clusters según el método del codo (manzanas): 7

```
[40]: # Creación del modelo de K-Means Clustering para manzanas
nombre_apple_kmeans = "K-Means Clustering"
kmeans_apple = KMeans(n_clusters=k_optimo_apple, random_state=35)
y_km_apple = kmeans_apple.fit_predict(X_pca_apple)
```

```
# Guardar resultados en DataFrame
resultadokm_apple = pd.DataFrame(X_pca_apple)
resultadokm_apple['cluster'] = y_km_apple

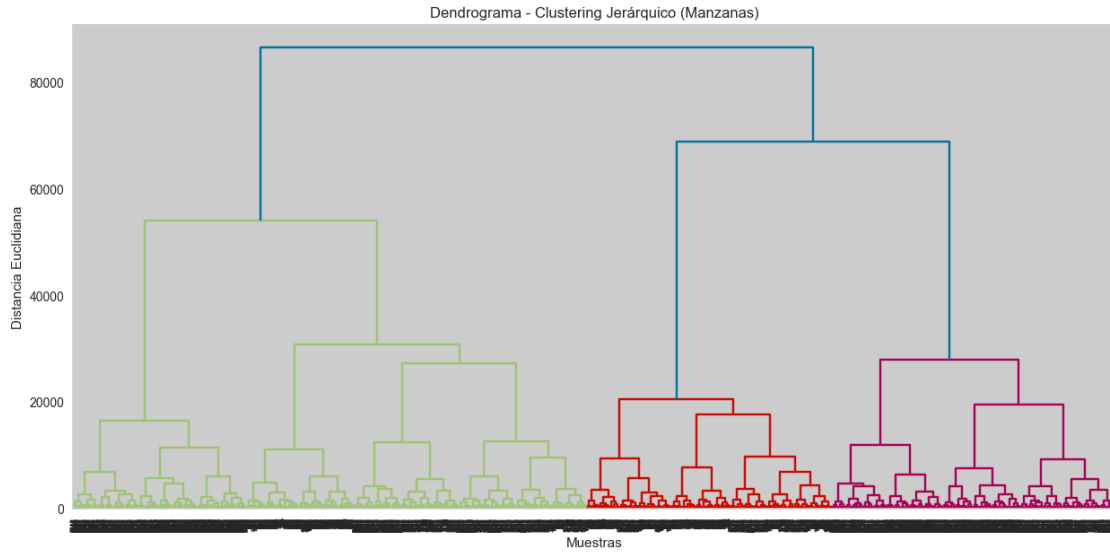
# Diccionario para almacenar el coeficiente de silueta
resultado_apple = {}
resultado_apple[nombre_apple_kmeans] = graficaSilueta(
    X_pca_apple.values, y_km_apple, kmeans_apple.n_clusters
)
```

Coeficiente de Silueta Promedio: 0.366



Metodo Aplicado - Clustering jerárquico aglomerativo

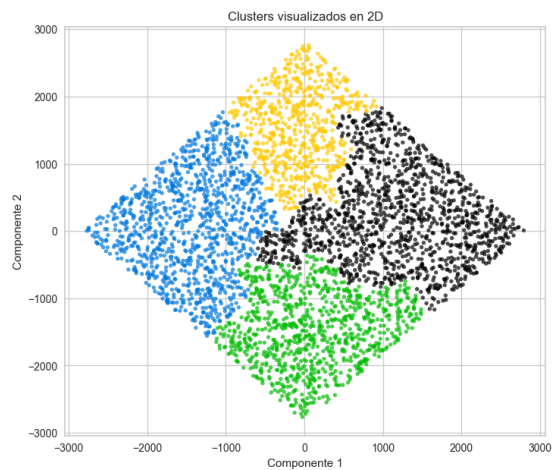
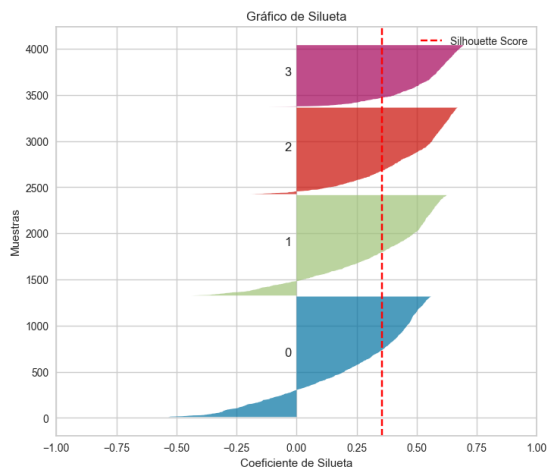
```
[41]: # Crear dendrograma para estimar el número de clusters
linked_apple = linkage(X_pca_apple, method='ward')
plt.figure(figsize=(15, 7))
dendrogram(linked_apple, orientation='top')
plt.title("Dendrograma - Clustering Jerárquico (Manzanas)")
plt.xlabel("Muestras")
plt.ylabel("Distancia Euclidiana")
plt.show()
```



```
[42]: # Crear modelo y evaluar con gráfica de silueta
nombre_apple_agglom = "Agglomerative Clustering"
cluster_apple = AgglomerativeClustering(n_clusters=4, metric='euclidean',
    linkage='ward')
cluster_labels_apple = cluster_apple.fit_predict(X_pca_apple)

# Guardar en el diccionario de resultados
resultado_apple[nombre_apple_agglom] = graficaSilueta(
    X_pca_apple.values, cluster_labels_apple, cluster_apple.n_clusters
)
```

Coefficiente de Silueta Promedio: 0.356



```
[43]: # Crear DataFrame con los resultados del Problema 2
tabla_resultado_2 = pd.DataFrame(
    list(resultado_apple.items()),
    columns=["Modelo/Algoritmo", "Coeficiente Silueta"]
)

# Agregar columna de identificación del problema
tabla_resultado_2["Problema"] = "Problema 2"

# Reordenar columnas
tabla_resultado_2 = tabla_resultado_2[["Problema", "Modelo/Algoritmo",
    ↪ "Coeficiente Silueta"]]

# Mostrar tabla
tabla_resultado_2
```

```
[43]:
```

	Problema	Modelo/Algoritmo	Coeficiente Silueta
0	Problema 2	K-Means Clustering	0.366423
1	Problema 2	Agglomerative Clustering	0.355615

0.12 TABLA RESUMEN DE LOS 2 PROBLEMAS DE APRENDIZAJE NO SUPERVISADO

```
[44]: tabla_final = pd.concat([tabla_resultado_1, tabla_resultado_2],
    ↪ ignore_index=True)
tabla_final
```

```
[44]:
```

	Problema	Modelo/Algoritmo	Coeficiente Silueta
0	Problema 1	K-Means Clustering	0.342127
1	Problema 1	Agglomerative Clustering	0.390028
2	Problema 2	K-Means Clustering	0.366423
3	Problema 2	Agglomerative Clustering	0.355615

```
[45]: from matplotlib.colors import to_hex

# Apendicitis (Agglomerative Clustering)
n_clusters_ap = cluster.n_clusters
colors_ap = [to_hex(cm.nipy_spectral(i / n_clusters_ap)) for i in
    ↪ range(n_clusters_ap)]

# Manzanas (K-Means Clustering)
n_clusters_apple = kmeans_apple.n_clusters
colors_apple = [to_hex(cm.nipy_spectral(i / n_clusters_apple)) for i in
    ↪ range(n_clusters_apple)]

graficar_apendicitis = X_pca.copy()
```

```

graficar_apendicitis['cluster'] = cluster_labels # Etiquetas del modelo
↳ Agglomerativo
graficar_apple = X_pca_apple.copy()
graficar_apple['cluster'] = y_km_apple # Etiquetas del modelo K-Means

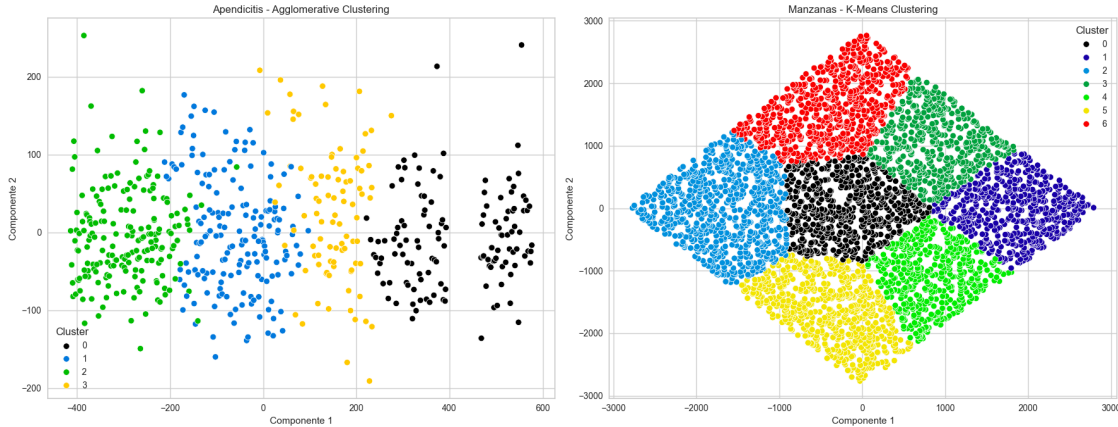
fig, axes = plt.subplots(1, 2, figsize=(18, 7))

# --- Subplot 1: Apendicitis ---
sns.scatterplot(
    data=graficar_apendicitis,
    x=0, y=1,
    hue='cluster',
    palette=colors_ap,
    legend='full',
    ax=axes[0]
)
axes[0].set_title("Apendicitis - Agglomerative Clustering")
axes[0].set_xlabel("Componente 1")
axes[0].set_ylabel("Componente 2")
axes[0].grid(True)
axes[0].legend(title="Cluster")

# --- Subplot 2: Manzanas ---
sns.scatterplot(
    data=graficar_apple,
    x=0, y=1,
    hue='cluster',
    palette=colors_apple,
    legend='full',
    ax=axes[1]
)
axes[1].set_title("Manzanas - K-Means Clustering")
axes[1].set_xlabel("Componente 1")
axes[1].set_ylabel("Componente 2")
axes[1].grid(True)
axes[1].legend(title="Cluster")

# Mostrar figura
plt.tight_layout()
plt.show()

```



0.13 CONCLUSIÓN DE LA PARTE 2

En esta sección se aplicaron algoritmos de agrupamiento no supervisado a dos conjuntos de datos distintos con el objetivo de identificar patrones subyacentes sin utilizar etiquetas de clase.

Problema 1: Apendicitis Pediátrica Se evaluaron los modelos K-Means Clustering y Agglomerative Clustering. El mejor desempeño lo obtuvo Agglomerative Clustering con un coeficiente de silueta de 0.390, superando a K-Means (0.342). Esto sugiere que el agrupamiento jerárquico fue más eficaz para separar a los pacientes en grupos coherentes con base en sus características clínicas.

Problema 2: Características de la Manzana En este caso, K-Means Clustering obtuvo el mejor resultado, con un coeficiente de silueta de 0.366, frente a 0.356 de Agglomerative Clustering. Esto indica que la forma de los grupos dentro de este conjunto de datos se adapta mejor a la suposición de agrupaciones esféricas que maneja K-Means.

Los resultados evidencian que la elección del algoritmo de agrupamiento más adecuado depende del tipo de datos y su distribución. Además, el uso del método del codo y dendrogramas permitió seleccionar el número óptimo de clusters, mientras que la reducción de dimensiones con PCA facilitó una visualización clara en 2D del agrupamiento para cada caso. Ambos problemas cumplieron con los criterios de evaluación, incluyendo la interpretación gráfica y cuantitativa de los resultados obtenidos.