

UNIVERSIDAD POLITÉCNICA SALESIANA

EL VECINO - CUENCA

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Asignatura: Sistemas Expertos

Tema: Informe de un Sistema Basado en Casos de Análisis de Vinos.

1.CODIGO

```
from tkinter import ttk
from tkinter import messagebox
import pandas as pd
import operator
from tkinter import *

root = Tk()

def process():
    reportWindow = Tk()
    reportWindow.title("Report")
    df = pd.read_csv('winequality-red.csv')
    lista = [list(row) for row in df.values]
    similares = {}

    cn = [float(fixedAciditySpinner.get()), float(volatileAciditySpinner.get()),
float(citricAciditySpinner.get()), float(residualSugarSpinner.get()),
float(chloridesSpinner.get()), float(freeSulfurDioxideSpinner.get()),
float(toalcoholSpinner+SulfurDioxideSpinner.get()),
float(densitySpinner.get()), float(phSpinner.get()), float(sulphatesSpinner.get()),
float(alcoholSpinner.get())]
    mini = [4.6, 0.12, 0, 0.9, 0.012, 1, 6, 0.99, 2.74, 0.33, 8.4]
    maxi = [15.9, 1.58, 1.0, 13.9, 0.611, 72.0, 289.0, 1.0, 4.01, 2.0, 14.9]
    weight = [float(fixedAcidityWeighchloridesSpinnerbox.get()),
float(volatileAcidityWeighchloridesSpinnerbox.get()),
float(citricAcidityWeighchloridesSpinnerbox.get()),
float(residualSugarWeighchloridesSpinnerbox.get()),
float(chloridesWeighchloridesSpinnerbox.get()),
float(freeSulfurDioxideWeightCbox.get()),
float(toalcoholSpinner+SulfurDioxideWeightCbox.get()),
float(densityWeightCbox.get()), float(phWeightCbox.get()),
float(sulphatesWeightCbox.get()), float(alcoholWeightCbox.get())]

    def similarity(ce):
        valor = 0
        for i in range(len(mini)):
            valor += weight[i] * (1 - ((abs(ce[i] - cn[i])) / (maxi[i] - mini[i])))
```

```

        return valor / sum(weight)

for i in range(len(lista)):
    fila = []
    fila = lista[i]
    x = similarity(fila)
    similares.update({str(i): round(x, 3)})

ordLista = dict(sorted(similares.items(), key=operator.itemgetter(1)))
cols = (
    "#Wine", "Fixed Acidity", "Volatile Acidity", "Citric Acid", "Residual Sugar",
    "Chlorides", "Free Sulfure Dioxide",
    "ToalcoholSpinner1 Sulfure Dioxide", "Density", "pH", "Sulphates", "Alcohol",
    "Quality", "Similarity")
tree = ttk.Treeview(reportWindow, columns=cols, show='headings')
vsb = ttk.Scrollbar(reportWindow, orient="vertical", command=tree.yview)
vsb.pack(side=RIGHT, fill=BOTH)

tree.configure(yscrollcommand=vsb.set)
for i in range(len(cols)):
    tree.heading(cols[i], text=cols[i])
    tree.column(cols[i], minwidth=0, width=50)
tree.pack(expand=YES, fill=BOTH)
alcoholSpinnerm = len(ordLista)
for i in range(alcoholSpinnerm):
    pos = int(list(ordLista.items())[i][0])
    v1 = lista[int(pos)][0]
    v2 = lista[int(pos)][1]
    v3 = lista[int(pos)][2]
    v4 = lista[int(pos)][3]
    v5 = lista[int(pos)][4]
    v6 = lista[int(pos)][5]
    v7 = lista[int(pos)][6]
    v8 = lista[int(pos)][7]
    v9 = lista[int(pos)][8]
    v10 = lista[int(pos)][9]
    v11 = lista[int(pos)][10]
    v12 = lista[int(pos)][11]
    sim = str(list(ordLista.items())[i][1])
    tree.insert("", 0, i, values=(str(pos), v1, v2, v3, v4, v5, v6, v7, v8, v9,
v10, v11, v12, sim))

# print("Item Mas Similar")
fpos = list(ordLista.items())[alcoholSpinnerm - 1][0]
fval = list(ordLista.items())[alcoholSpinnerm - 1][1]
res = lista[int(fpos)][11]
messagebox.showinfo(message="Calificacion: " + res)

lista = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

```

```

#Creacion de la venta principal
root.geometry('700x300') # anchura x altura
root.config(bg="lightblue")

Label(root, text="WINE QUALITY",fg="red",font=("Comic Sans MC",10,
'bold')).place(x=200, y=0)

Label(root, text="Fixed Acidity",font=('bold')).place(x=0, y=25)
fixedAciditySpinner = Spinbox(root, from_=4.6, to=15.9, width=5, increment=0.1,
font='Helvetica 12')
fixedAciditySpinner.place(x=150, y=25)

fixedAcidityWeighchloridesSpinnerbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
fixedAcidityWeighchloridesSpinnerbox.place(x=225, y=25)
fixedAcidityWeighchloridesSpinnerbox.current(3)

Label(root, text="Volatily Acidity",font=('bold')).place(x=308, y=25)
volatileAciditySpinner = Spinbox(root, from_=0.12, to=1.58, width=5, increment=0.01,
font='Helvetica 12')
volatileAciditySpinner.place(x=450, y=25)
volatileAcidityWeighchloridesSpinnerbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
volatileAcidityWeighchloridesSpinnerbox.place(x=525, y=25)
volatileAcidityWeighchloridesSpinnerbox.current(3)

Label(root, text="Citric Acid",font=('bold')).place(x=0, y=50)
citricAciditySpinner = Spinbox(root, from_=0.0, to=1.0, width=5, increment=0.1,
font='Helvetica 12')
citricAciditySpinner.place(x=150, y=50)
citricAcidityWeighchloridesSpinnerbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
citricAcidityWeighchloridesSpinnerbox.place(x=225, y=50)
citricAcidityWeighchloridesSpinnerbox.current(3)

Label(root, text="Residual Sugar",font=('bold')).place(x=308, y=50)
residualSugarSpinner = Spinbox(root, from_=0.9, to=13.9, width=5, increment=0.1,
font='Helvetica 12')
residualSugarSpinner.place(x=450, y=50)
residualSugarWeighchloridesSpinnerbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
residualSugarWeighchloridesSpinnerbox.place(x=525, y=50)
residualSugarWeighchloridesSpinnerbox.current(5)

Label(root, text="Chlorides",font=('bold')).place(x=0, y=75)
chloridesSpinner = Spinbox(root, from_=0.012, to=0.611, width=5, increment=0.001,
font='Helvetica 12')
chloridesSpinner.place(x=150, y=75)
chloridesWeighchloridesSpinnerbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
chloridesWeighchloridesSpinnerbox.place(x=225, y=75)

```

```
chloridesWeightchloridesSpinnerbox.current(1)
```

```
Label(root, text="Free Sulfur Dioxide",font=('bold')).place(x=308, y=75)
freeSulfurDioxideSpinner = Spinbox(root, from_=1.0, to=72.0, width=5, increment=1.0,
font='Helvetica 12')
freeSulfurDioxideSpinner.place(x=450, y=75)
freeSulfurDioxideWeightCbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
freeSulfurDioxideWeightCbox.place(x=525, y=75)
freeSulfurDioxideWeightCbox.current(1)
```

```
Label(root, text="Sulfure Dioxide",font=('bold')).place(x=0, y=100)
toalcoholSpinner1SulfurDioxideSpinner = Spinbox(root, from_=6.0, to=289.0, width=5,
increment=1, font='Helvetica 12')
toalcoholSpinner1SulfurDioxideSpinner.place(x=150, y=100)
toalcoholSpinner1SulfurDioxideWeightCbox = ttk.Combobox(root, values=lista, width=5,
font='Helvetica 12')
toalcoholSpinner1SulfurDioxideWeightCbox.place(x=225, y=100)
toalcoholSpinner1SulfurDioxideWeightCbox.current(1)
```

```
Label(root, text="Density",font=('bold')).place(x=308, y=100)
densitySpinner = Spinbox(root, from_=0.9900, to=1.0000, width=6, increment=0.0001,
font='Helvetica 12')
densitySpinner.place(x=450, y=100)
densityWeightCbox = ttk.Combobox(root, values=lista, width=5, font='Helvetica 12')
densityWeightCbox.place(x=525, y=100)
densityWeightCbox.current(1)
```

```
Label(root, text="pH",font=('bold')).place(x=0, y=125)
phSpinner = Spinbox(root, from_=2.74, to=4.01, width=5, increment=0.01,
font='Helvetica 12')
phSpinner.place(x=150, y=125)
phWeightCbox = ttk.Combobox(root, values=lista, width=5, font='Helvetica 12')
phWeightCbox.place(x=225, y=125)
phWeightCbox.current(6)
```

```
Label(root, text="Sulphates",font=('bold')).place(x=308, y=125)
sulphatesSpinner = Spinbox(root, from_=0.33, to=2.0, width=5, increment=0.01,
font='Helvetica 12')
sulphatesSpinner.place(x=450, y=125)
sulphatesWeightCbox = ttk.Combobox(root, values=lista, width=5, font='Helvetica 12')
sulphatesWeightCbox.place(x=525, y=125)
sulphatesWeightCbox.current(1)
```

```
Label(root, text="Alcohol",font=('bold')).place(x=0, y=150)
alcoholSpinner = Spinbox(root, from_=8.4, to=14.9, width=5, increment=0.1,
font='Helvetica 12')
alcoholSpinner.place(x=150, y=150)
alcoholWeightCbox = ttk.Combobox(root, values=lista, width=5, font='Helvetica 12')
alcoholWeightCbox.place(x=225, y=150)
alcoholWeightCbox.current(5)
```

```
btnProcess=Button(root, fg="red" ,font=("Comic Sans MC",20,
'bold'),text="Process",command=process)
btnProcess.place(x=275, y=200)
```

```
root.mainloop()
```

2.EXPLICACION DE LA REALIZACION

Para la implementación de este sistema, se utilizó la fórmula que nos proporciona **wguillen**, la misma que se encuentra en las diapositivas que proporciona el autor.

Para ello debemos ir al repositorio del autor:

<https://github.com/wguilen/red-wine-quality-cbr/tree/master/presentation>

$$\text{Similaridade (A1C1, A1C2)} = 1 - \frac{|A1C2 - A1C1|}{(\text{val max} - \text{val min})}$$

Intervalo de
variação!
—

Fig. 1 Fórmula proporcionada por el autor.

Esta misma fórmula se utilizó en Python.

```
def similarity(ce):
    valor = 0
    for i in range(len(mini)):
        valor += weight[i] * (1 - ((abs(ce[i] - cn[i])) / (maxi[i] - mini[i])))
    return valor / sum(weight)
```

Cabe mencionar que para la implementación también me fui basando en el programa realizado en **JAVA**.

3.EJECUCION

Para la ejecución tomamos como base los valores por defecto que se presenta en la aplicación de java.

File Tools

Input


Fixed Acidity	4.6	0	Volatile Acidity	0.12	0	Citric Acidity	0	0
Residual Sugar	0.9	0	Chlorides	0.012	0	Free Sulfur Dioxide	1	0
Total Sulfur Dioxide	6	0	Density	0.99	0	pH	2.74	0
Sulphates	0.33	0	Alcohol	8.4	0			

Fig. 2 Ventana de la aplicación realizada en Java.

La ejecución de nuestra aplicación en Python.

tk #2

WINE QUALITY

Fixed Acidity	4.6	3	Volatile Acidity	0.12	3
Citric Acid	0.0	3	Residual Sugar	0.9	5
Chlorides	0.012	1	Free Sulfur Di	1	1
Sulfure Dioxide	6	1	Density	0.9900	1
pH	2.74	6	Sulphates	0.33	1
Alcohol	8.4	5			

Process

RESULTADOS:

Los datos procesados de archivo **csv**, conjunto con los atributos que en base a los datos de ingreso también nos proporciona la información de la calidad y la similitud con el nuevo caso.

Report													
#Wine	Fixed Acids	Volatiles	Citric Acid	Residual Sugar	Chlorides	Free Sulfur Dioxide	Total Alcohol	Density	pH	Sulphates	Alcohol	Quality	Similarity
1113	8.9	0.24	0.39	1.6	0.07400000	3.0	10.0	0.99698	3.12	0.59	9.5	6	0.784
34	5.2	0.32	0.25	1.8	0.10300000	13.0	50.0	0.9957	3.38	0.55	9.2	5	0.784
1256	7.5	0.59	0.22	1.8	0.08199999	43.0	60.0	0.99498999	3.1	0.42	9.2	5	0.783
550	6.8	0.51	0.01	2.1	0.07400000	9.0	25.0	0.9958	3.33	0.56	9.5	6	0.783
167	7.3	0.55	0.03	1.6	0.07200000	17.0	42.0	0.9956	3.37	0.48	9.0	4	0.783
10	6.7	0.58	0.08	1.8	0.09699999	15.0	65.0	0.9959	3.28	0.54	9.2	5	0.783
1328	6.5	0.52	0.11	1.8	0.073	13.0	38.0	0.9955	3.34	0.52	9.3	5	0.781
49	5.6	0.31	0.37	1.4	0.07400000	12.0	96.0	0.9954	3.32	0.58	9.2	5	0.781
1500	7.5	0.725	0.04	1.5	0.076	8.0	15.0	0.99508	3.26	0.53	9.6	5	0.78
97	7.0	0.5	0.25	2.0	0.07	3.0	22.0	0.9963	3.25	0.63	9.2	5	0.78
1365	7.8	0.5	0.09	2.2	0.115	10.0	42.0	0.9971	3.18	0.62	9.5	5	0.779
1246	7.4	0.74	0.07	1.7	0.086	15.0	48.0	0.99502000	3.12	0.48	10.0	5	0.779
1110	8.3	0.53	0.0	1.4	0.07	6.0	14.0	0.99593	3.25	0.64	10.0	6	0.779
129	6.1	0.38	0.15	1.8	0.07200000	6.0	19.0	0.9955	3.42	0.57	9.4	5	0.779
80	6.2	0.45	0.2	1.6	0.069	3.0	15.0	0.9958	3.41	0.56	9.2	5	0.779
723	7.1	0.31	0.3	2.2	0.053	36.0	127.0	0.9965	2.94	1.62	9.5	5	0.778
242	7.7	0.58	0.1	1.8	0.102	28.0	109.0	0.99565	3.08	0.49	9.8	6	0.778
52	6.6	0.5	0.04	2.1	0.068	6.0	14.0	0.9955	3.39	0.64	9.4	6	0.778
1369	6.6	0.61	0.0	1.6	0.069	4.0	8.0	0.99396000	3.33	0.37	10.4	4	0.777
1183	6.8	0.66	0.07	1.6	0.07	16.0	61.0	0.99572	3.29	0.6	9.3	5	0.777
27	7.9	0.43	0.21	1.6	0.106	10.0	37.0	0.9966	3.17	0.91	9.5	5	0.777
22	7.9	0.43	0.21	1.6	0.106	10.0	37.0	0.9966	3.17	0.91	9.5	5	0.777
1131	5.9	0.19	0.21	1.7	0.045	57.0	135.0	0.99341	3.32	0.44	9.5	5	0.776
23	8.5	0.49	0.11	2.3	0.084	9.0	67.0	0.9968	3.17	0.53	9.4	5	0.776
1348	7.2	0.655	0.03	1.8	0.078	7.0	12.0	0.99587	3.34	0.39	9.5	5	0.775
1347	7.2	0.655	0.03	1.8	0.078	7.0	12.0	0.99587	3.34	0.39	9.5	5	0.775

Sistema nos indica la calidad del vino.

tk

WINE QUALITY

Fixed Acids

4.6

3

Volatiles

0.12

3

Citric Acid

0.0

3

Residual Sugar

0.9

5

Chlorides

0.012

1

Free Sulfur Dioxide

1

1

Sulfur Dioxide

6

1

Density

0.9900

1

pH

2.74

6

Alcohol

8.4

5

Qualification: 6

OK

WeightChox = ttk.Combobox(root, values=lista, width=5, font='Helvetica 12')

Report

line	Fixed A	Volatil	Citric	Residua	Chlorid	Free Su	Totalcoh	Density	pH	Sulphat	Alcohol	Quality	Similar
32	8.4	0.39	0.1	1.7	0.075	6.0	25.0	0.9958	3.09	0.43	9.7	6	0.81
70	10.0	0.69	0.11	1.4	0.084	8.0	24.0	0.9957	2.88	0.47	9.7	5	0.809
9	7.0	0.62	0.18	1.5	0.062	7.0	50.0	0.9951	3.08	0.6	9.3	5	0.809
20	7.8	0.53	0.01	1.6	0.077	3.0	19.0	0.995	3.16	0.46	9.8	5	0.806
18	7.8	0.53	0.01	1.6	0.077	3.0	19.0	0.995	3.16	0.46	9.8	5	0.806
92	7.1	0.62	0.06	1.3	0.07	5.0	12.0	0.9942	3.17	0.48	9.8	5	0.806
38	6.0	0.5	0.0	1.4	0.057	15.0	26.0	0.9944	3.36	0.45	9.5	5	0.801
37	6.0	0.5	0.0	1.4	0.057	15.0	26.0	0.9944	3.36	0.45	9.5	5	0.801
36	6.0	0.5	0.0	1.4	0.057	15.0	26.0	0.9944	3.36	0.45	9.5	5	0.801

4.ANALISI DE RESULTADOS

Desde mi punto de vista realmente no sé con qué exactitud es tan importante cada una de las características para ver la calidad de un vino, pero revisando algunas fuentes de empresa que

se dedican a la explotación de este campo, puedo decir que el sistema tiene una gran similitud a la forma en la que realmente se realiza este proceso.