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AAD Practical 5

Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 5

Problem : McCormick & Company is an American food company that manufactures, markets, and distributes spices, seasoning mixes, condiments, and other flavoring products for the industrial, restaurant, institutional, and home markets, they are having some number quantity of different categories item food, kindly help them to sort data using any three sorting methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the comparison between them. Design the algorithm for the same and implement using the programming language of your choice. Make comparative analysis for various use cases & input size.

Code :

```
import random
import matplotlib.pyplot as plt
from matplotlib import use
use('GTK3Agg')
import YSL_io as YSL


# Insertion Sort
def insrtn_sort(ysl):
n = len(ysl)
count = 0
```

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```
for i in range(1, n):
key = ysl[i]
j = i - 1
while j ⩾ 0 and key < ysl[j]:
ysl[j + 1] = ysl[j]
j -= 1
count += 1
ysl[j + 1] = key
return count



# Bubble Sort
def bble_sort(ysl):
n = len(ysl)
count = 0
for i in range(n):
flag = False
for j in range(0, n - i - 1):
count += 1
if ysl[j] > ysl[j + 1]:
ysl[j], ysl[j + 1] = ysl[j + 1], ysl[j]
flag = True
if not flag:
break
```

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```
return count



# Selection Sort
def slctn_sort(ysl):
n = len(ysl)
count = 0
for i in range(n):
min_index = i
for j in range(i + 1, n):
count += 1
if ysl[j] < ysl[min_index]:
min_index = j
ysl[i], ysl[min_index] = ysl[min_index], ysl[i]
return count



# Function to plot the comparison graph for a data category
def compare(size, algos, labels, colors, data_category="random"):
plt.figure()
plt.xlabel("Data Size")
plt.ylabel("Count of Iterations")
plt.title(f"\nSorting Algorithm Comparison for {data_category} data\n",
fontsize=15)
```

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```
for i, algo in enumerate(algos):
iterations = []
for s in size:
data = [random.randint(1, 100) for y in range(s)]
if data_category == "ascending":
data.sort()
elif data_category == "descending":
data.sort(reverse=True)
iterations.append(algo(data))
# print(f'\n{data}')

plt.plot(size, iterations, marker="o", label=labels[i], color=colors[i])
if i==0:
YSL.printGRN(f'\nFor {data_category.capitalize()} data, number of
iterations using {labels[i]} for sizes - {size}', end=' : ')
print(iterations)
elif i==1:
YSL.printORNG(f'For {data_category.capitalize()} data, number of
iterations using {labels[i]} for sizes - {size}', end=' : ')
print(iterations)
else:
YSL.printBLU(f'For {data_category.capitalize()} data, number of iterations
using {labels[i]} for sizes - {size}', end=' : ')
```

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```
print(iterations)


plt.legend()
plt.grid(True)



size = [10, 20, 30, 50, 80]

algos = [insrtn_sort, bble_sort, slctn_sort]
methods = ["Insertion Sort", "Bubble Sort", "Selection Sort"]

colors = ["#a347ba", "#5e81cc", "#b75969"]

compare(size, algos, methods, colors, "ascending")
compare(size, algos, methods, colors, "descending")
compare(size, algos, methods, colors)



plt.show()
```

Output :

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