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**DAA – LAB 03**

1. **AIM:** To use Divide and conquer algorithm to calculate the Net Salaries of employees of ABC co Ltd

## 2. PROGRAM

```
try:
    emp = pd.read_csv('employeesabc.csv')
    print(emp.head())
except FileNotFoundError:
    print("Error: The file 'employeesabc.csv' was not found.")
emp['Net Salary'] = pd.NA

def calculate_net_salaries(emp):
    """
    This function calculates the net salary for each employee in the
    DataFrame.

    Arguments:
    emp (DataFrame): The DataFrame containing employee salary data.

    Returns:
    None
    """

    emp['Gross Salary'] = pd.to_numeric(emp['Gross Salary'])

    for i in range(len(emp)):
        gross_salary = emp.at[i, 'Gross Salary']

        if pd.isna(gross_salary):
            print(f"Error: Missing gross salary at row {i}.")
            return
```

```

        if gross_salary < 0:
            print(f"Error: Negative gross salary at row {i}: {gross_salary}")
            return

        tax = gross_salary * 0.2
        pf = gross_salary * 0.1
        net_salary = gross_salary - tax - pf

        emp.at[i, 'Net Salary'] = net_salary

# Run the function
calculate_net_salaries(emp)
print(emp.head())

net_salaries = emp['Net Salary'].tolist()

def linear_search(salaries):
    """
    This function finds the indices of the minimum and maximum salaries in a
    list.

    Arguments:
    salaries (list): A list of net_salary values of each employee.

    Returns:
    arr (list): A list of size 2 containing the indices of the minimum and
    maximum salaries.
    """

    min_index = 0
    max_index = 0

    for i in range(1, len(salaries)):
        if salaries[i] < salaries[min_index]:
            min_index = i
        if salaries[i] > salaries[max_index]:
            max_index = i

```

```

        return min_index, max_index
#DRIVER CODE
mini, maxi = linear_search(net_salaries)
#Displaying Output
print("By LINEAR METHOD")
print("Employee with minimum salary :")
print(emp.at[mini, 'First Name'] + ' ' + emp.at[mini, 'Last Name'] + ' with a
net salary of ' + str(emp.at[mini, 'Net Salary']))
print("Employee with maximum salary:")
print(emp.at[maxi, 'First Name'] + ' ' + emp.at[maxi, 'Last Name'] + ' with a
net salary of ' + str(emp.at[maxi, 'Net Salary']))

def divide_and_conquer(salaries, left, right):
    """
        This function finds the indices of the minimum and maximum salaries in a
list using
        the divide and conquer approach.

        Arguments:
        salaries (list): A list of net salary values.
        left (int): The left index of the current sublist.
        right (int): The right index of the current sublist.

        Returns:
        arr (list): A list containing the indices of the minimum and maximum
salaries.
    """

    if left == right:
        return left, left

    if right == left + 1:
        if salaries[left] < salaries[right]:
            return left, right
        else:
            return right, left

    mid = (left + right) // 2
    min_left, max_left = divide_and_conquer(salaries, left, mid)
    min_right, max_right = divide_and_conquer(salaries, mid + 1, right)

```

```

        min_index = min_left if salaries[min_left] < salaries[min_right] else
min_right
        max_index = max_left if salaries[max_left] > salaries[max_right] else
max_right

    return min_index, max_index

#DRIVER CODE
mini,maxi=divide_and_conquer(net_salaries,0,len(net_salaries)-1)
#Displaying output
print("BY DIVIDE AND CONQUER METHOD")
print("Employee with minimum salary:")
print(emp.at[mini, 'First Name'] + ' ' + emp.at[mini, 'Last Name'] + ' with a
net salary of ' + str(emp.at[mini, 'Net Salary']))
print("Employee with maximum salary:")
print(emp.at[maxi, 'First Name'] + ' ' + emp.at[maxi, 'Last Name'] + ' with a
net salary of ' + str(emp.at[maxi, 'Net Salary']))

```

### 3. TESTCASES

#### a. POSITIVE

- All values present and of correct Data Type

```

➡ By LINEAR METHOD
Employee with minimum salary :
Rebecca Woods with a net salary of 38508.399999999994
Employee with maximum salary:
Lindsey Mcmillan with a net salary of 112297.5

```

```

➡ BY DIVIDE AND CONQUER METHOD
Employee with minimum salary:
Rebecca Woods with a net salary of 38508.399999999994
Employee with maximum salary:
Lindsey Mcmillan with a net salary of 112297.5

```



By LINEAR METHOD

Employee with minimum salary :

Jacob Jones with a net salary of 31619.0

Employee with maximum salary:

Michael Griffin with a net salary of 126673.40000000001



BY DIVIDE AND CONQUER METHOD

Employee with minimum salary:

Jacob Jones with a net salary of 31619.0

Employee with maximum salary:

Michael Griffin with a net salary of 126673.40000000001



By LINEAR METHOD

Employee with minimum salary :

Maria Smith with a net salary of 31093.299999999996

Employee with maximum salary:

Joseph Lewis with a net salary of 125909.0

✓  
0s

```
[7] def divide_and_conquer(salaries, left, right):
```



BY DIVIDE AND CONQUER METHOD

Employee with minimum salary:

Maria Smith with a net salary of 31093.299999999996

Employee with maximum salary:

Joseph Lewis with a net salary of 125909.0



By LINEAR METHOD

Employee with minimum salary :

Cathy Rogers with a net salary of 36423.799999999996

Employee with maximum salary:

Jason Adkins with a net salary of 110051.900000000001



BY DIVIDE AND CONQUER METHOD

Employee with minimum salary:

Cathy Rogers with a net salary of 36423.799999999996

Employee with maximum salary:

Jason Adkins with a net salary of 110051.900000000001



By LINEAR METHOD

Employee with minimum salary :

Katherine Mendez with a net salary of 28296.8

Employee with maximum salary:

Wanda Garcia with a net salary of 126671.30000



BY DIVIDE AND CONQUER METHOD

Employee with minimum salary:


Katherine Mendez with a net salary of 28296.8

Employee with maximum salary:

Wanda Garcia with a net salary of 126671.30000

## b. NEGATIVE TESTCASES

- Gross Salary Negative


 Error: Negative gross salary at row 0: -64741

	ID	First Name	Last Name	Base Salary	HRA	Total Allowance	Bonus	\
0	1	Meagan	Perez	44525	12170	2490	1282	
1	2	Stephen	Collins	45097	10150	3329	3668	
2	3	Jill	Lee	76299	8244	2885	1815	
3	4	Deborah	Lewis	63721	19578	6564	3377	
4	5	Kristine	Garcia	90732	14165	7865	3680	


  

	PF Contribution	Gross Salary	Net Salary
0	4274	-64741	<NA>
1	3041	65285	<NA>
2	9682	98925	<NA>
3	5431	98671	<NA>
4	13829	130271	<NA>

- Incorrect CSV Filename mentioned

 Error: The file 'employeesabc.csv' was not found.

- Missing Value of Gross Salary

 Error: Missing gross salary at row 0.

	ID	First Name	Last Name	Base Salary	HRA	Total Allowance	Bonus	\
0	1	Meagan	Perez	44525	12170	2490	1282	
1	2	Stephen	Collins	45097	10150	3329	3668	
2	3	Jill	Lee	76299	8244	2885	1815	
3	4	Deborah	Lewis	63721	19578	6564	3377	
4	5	Kristine	Garcia	90732	14165	7865	3680	

	PF Contribution	Gross Salary	Net Salary
0	4274	NaN	<NA>
1	3041	65285.0	<NA>
2	9682	98925.0	<NA>
3	5431	98671.0	<NA>
4	13829	130271.0	<NA>

**CONCLUSION:**

Hence, we studied how to apply Divide and conquer Method for searching maximum and minimum values in a large Array. Using this approach saves us a lot of time and is far more efficient than linear approach. This taught us that when we have larger datasets (say 2000 records) efficiency of the algorithm we implement is important.