Data Structures and Algorithms.
Degree in Applied Mathematics and Computing
Degree in Data Science and Computing
University Carlos III of Madrid

ACADEMIC COURSE 2023-2024

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Vaccination campaign

Our health center stores detailed information about patients, but for this application, we are going to assume that only the following information needs to be stored (see **class Patient**):

A health center is an object of the **HealthCenter** class which is a subclass of the **DList** class. In the **HealthCenter** class we have to add the following functions:

1. The **'addPatient'** function takes a patient object as input and includes it in the health center's patient list. The list should be sorted alphabetically, and the method should insert the new patient at the appropriate position. The patient object is only added if it is not already stored in the patient list. **Ensure that the complexity of your solution is linear.**

2. The function, *searchPatients* receives two values as input parameters; year, vaccine. The function finds and lists all patients who received the specified vaccine and were born in the given year. The function will return a new center whose patient list meets the search criteria defined by the input arguments of the function. **Ensure that the complexity of your solution is linear.**

3. The function, *minus* receives an object of the **HealthCenter** class, "**other**", and returns a new health center containing the patients of the calling center "**self**", but these patients cannot belong to the "**other**" center. Remember that the list of patients must be sorted alphabetically, and that no duplicates are allowed. **Your solution must be as efficient as possible.**

    Please follow the instructions below:

    - **Avoid using a sorting algorithm to sort the list.**

    - **You are not allowed to use any function from the DList class.**

```python
from dlist import DList
from dlist import DNode

class Patient:
    """Class to represent a Patient"""
    def __init__(self,name,year,vaccine):
        self.name=name
        self.year=year          #Birth year (for example, 1974)
        self.vaccine=vaccine    #1 or 0 (Yes or no)

class HealthCenter(DList):
    """Class to represent a Health Center"""


    def addPatient(self,patient):

        //write here your code



    def searchPatients(self,year,vaccine=None):

        // write here your code



    def minus(self,other):

        // write here your code
```

```python
if __name__ == '__main__':

    HCenter1 = HealthCenter()

    HCenter1.addPatient(Patient("Smith, James", 1985, 1))
    HCenter1.addPatient(Patient("Johnson, Emily", 1992, 0))
    HCenter1.addPatient(Patient("Williams, Daniel", 1978, 1))
    HCenter1.addPatient(Patient("Jones, Olivia", 2000, 0))
    HCenter1.addPatient(Patient("Brown, Benjamin", 1989, 1))
    HCenter1.addPatient(Patient("Davis, Sophia", 1995, 0))
    HCenter1.addPatient(Patient("Miller, Matthew", 1983, 1))
    HCenter1.addPatient(Patient("Wilson, Emma",1998, 0))
    HCenter1.addPatient(Patient("Moore, Ethan" , 1976, 1))

    HCenter2 = HealthCenter()

    HCenter2.addPatient(Patient("Taylor, Ava" , 1990, 0))
    HCenter2.addPatient(Patient("Anderson, Liam", 1987, 1))
    HCenter2.addPatient(Patient("Thomas, Grace", 1993, 0))
    HCenter2.addPatient(Patient("Jackson, Noah", 1982, 1))
    HCenter2.addPatient(Patient("White, Amelia", 1999, 0))
    HCenter2.addPatient(Patient("Harris, Alexander", 1974, 1))
    HCenter2.addPatient(Patient("Martin, Chloe", 1991, 0))
    HCenter2.addPatient(Patient("Thompson, Samuel", 1986, 1))
    HCenter2.addPatient(Patient("Robinson, Lily", 1997, 0))
    HCenter2.addPatient(Patient("Hall, Aiden", 1980, 1))
    HCenter2.addPatient(Patient("Turner, Mia", 1994, 0))


    print("---------------------------------")
    print(HCenter1.searchPatients(1978, 1))
    print()
    print(HCenter1.minus(HCenter2))
    print()
```