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Luis Fauré Navarro - AG2

Actividad Guiada 2

Url: https://github.com/lfauren/03MAIR-Algoritmos-de-Optimizacion-2019/tree/master/AG2

In [0]:
```
from time import time
#Función para calcular el tiempo de ejecución
def calcular_tiempo(f):
    def wrapper(*args, **kwargs):
        inicio = time()
        resultado = f(*args, **kwargs)
        tiempo = time() - inicio
        print("Tiempo de ejecución para algoritmo: "+str(tiempo))
        return resultado
    return wrapper
```

In [2]:
```
import math
import random

N=1000
LISTA_2D = [(random.randrange(1,N*10),random.randrange(1,N*10)) for _ in range(N)]
print(LISTA_2D)
```

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```

In [1]:
```python
def distancia(A,B):
  if type(A) is int or type(A) is float:
    return abs(B-A)
  else:
    return math.sqrt(sum([(A[i]-B[i])**2 for i in range(len(A))]))

distancia((1,3),(2,5))
```

Out[1]:
```
2.23606797749979
```

In [6]:
```python
# Fuerza bruta
@calcular_tiempo
def distancia_fuerza_bruta(L):
  mejor_distancia = 100000e10
  A,B = (),()
  for i in range(len(L)):
    for j in range(i+1,len(L)):
        if distancia(L[i],L[j]) < mejor_distancia:
          A,B = L[i],L[j]
  return A,B

distancia_fuerza_bruta(LISTA_2D)
```

```
Tiempo de ejecución para algoritmo: 1.1288862228393555
```

Out[6]:
```
((986, 9587), (6460, 3359))
```

In [34]:
```python
def distancia_divide_y_venceras(L):
  if len(L) < 10:
```

```
    return distancia_fuerza_bruta(L)
  #pivote = sum([L[i][0] for i in range(len(L))])/len(L)
  LISTA_IZQ = sorted(L, key=lambda x: x[0])[:len(L)//2]
  LISTA_DER = sorted(L, key=lambda x: x[0])[len(L)//2:]
  PUNTOS_LISTA_IZQ = distancia_divide_y_venceras(LISTA_IZQ)
  PUNTOS_LISTA_DER = distancia_divide_y_venceras(LISTA_DER)
  return distancia_fuerza_bruta(PUNTOS_LISTA_IZQ + PUNTOS_LISTA_DER)

@calcular_tiempo
def LANZA(L):
  return distancia_divide_y_venceras(L)

SOL = LANZA(LISTA_2D[:15])
print(SOL)
```

```
Tiempo de ejecución para algoritmo: 0.00016617774963378906
Tiempo de ejecución para algoritmo: 7.867813110351562e-05
Tiempo de ejecución para algoritmo: 1.7642974853515625e-05
Tiempo de ejecución para algoritmo: 0.002064228057861328
((9091, 3885), (9423, 7527))
```

In [30]:

```
TARIFAS = [[0,5,4,3,999,999,999],
           [999,0,999,2,3,999,11],
           [999,999, 0,1,999,4,10],
           [999,999,999, 0,5,6,9],
           [999,999, 999,999,0,999,4],
           [999,999, 999,999,999,0,3],
           [999,999,999,999,999,999,0]]

def Precios(TARIFAS):
  N=len(TARIFAS[0])
  PRECIOS = [[9999]*N for i in [9999]*N]
  RUTAS = [[""]*N for i in [""]*N]
  for i in range(N-1):
    for j in range(i+1,N):
      MIN = TARIFAS[i][j]
      RUTAS[i][j] = i
      for k in range(i,j):
        if PRECIOS[i][k] + TARIFAS[k][j] < MIN:
          MIN = min(MIN, PRECIOS[i][k] + TARIFAS[k][j])
```

```
            RUTAS[i][j] = k
        PRECIOS[i][j] = MIN
    return PRECIOS, RUTAS

PRECIOS, RUTAS = Precios(TARIFAS)
print(PRECIOS)
print()
print(RUTAS)

def calcular_ruta(RUTAS, desde, hasta):
    if desde == hasta:
        return desde
    else:
        return str(calcular_ruta(RUTAS,desde,RUTAS[desde][hasta])) + ',' + str(RUTAS[desde][hasta])

print('\nLa ruta es:')
calcular_ruta(RUTAS,0,6)
```

```
[[9999, 5, 4, 3, 8, 8, 11], [9999, 9999, 999, 2, 3, 8, 7], [9999, 9999, 9999, 1, 6, 4, 7], [999
9, 9999, 9999, 9999, 5, 6, 9], [9999, 9999, 9999, 9999, 9999, 999, 4], [9999, 9999, 9999, 9999,
9999, 9999, 9999, 3], [9999, 9999, 9999, 9999, 9999, 9999, 9999]]

[['', 0, 0, 0, 1, 2, 5], ['', '', 1, 1, 1, 3, 4], ['', '', '', 2, 3, 2, 5], ['', '', '', '', 3,
3, 3], ['', '', '', '', '', 4, 4], ['', '', '', '', '', '', 5], ['', '', '', '', '', '', '']]

La ruta es:
```

Out[30]: '0,0,2,5'