ERHVERVSAKADEMI
AARHUS

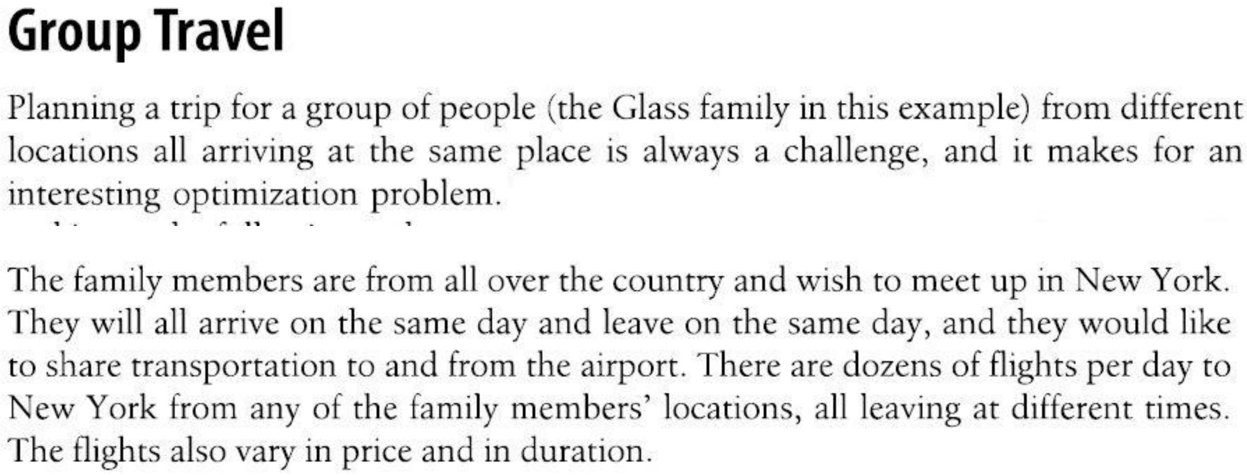
Opgave om Genetiske Algoritmer.

Sila.

Exercise – TravelPlans.

In groups of 2- 3.

Denne opgave handler om ved hjælp af Genetiske Algoritmer at finde en god travel plan sådan at familien Glass kan mødes i New York. Undgå unødvendig ventetid, og derefter tage samlet afsted til hjembyer, igen uden unødvendig ventetid i lufthavnen.



Group Travel

Planning a trip for a group of people (the Glass family in this example) from different locations all arriving at the same place is always a challenge, and it makes for an interesting optimization problem.

The family members are from all over the country and wish to meet up in New York. They will all arrive on the same day and leave on the same day, and they would like to share transportation to and from the airport. There are dozens of flights per day to New York from any of the family members' locations, all leaving at different times. The flights also vary in price and in duration.

Mulige flytider er angivet i filen schedule.txt

Problemstillinger er beskrevet i bogen ”Collective intelligence”, uddrag på Canvas.

Læs deri for yderlige information om problemstillingen.

Givet eksempel kode Flight_GA (Canvas) skal man sammenligne forskellige algoritmer.

Opgave 0)

Inden i starter med at kigge på koden, diskuter hvordan I, i et Python program, ville repræsentere en travel plan, og kunne sammenligne den med en anden travelplan. Når I har gjort det, gå så videre med opgaverne her nedenfor.

Opgave a)

Udskriv cost for en løsning til problemstillingen.

F.eks.

```
# Below, represents a solution in which Seymour takes the second flight of the day from
Boston
# to New York, and the fifth flight back to Boston on the day he returns. Franny
# takes the fourth flight from Dallas to New York, and the third flight back.
s=[1,4,3,2,7,3,6,3,2,4,5,3]
printschedule(s)
print('Cost of solution - %', schedulecost(s))
print("")
```

Identificer cost-funktionen – Og lav evt. din/jeres egen version af cost-functionen i programmet.

Opgave b)

Lav random løsninger – og gem den bedste. Jf.

```
domain=[(0,8)]*(len(people)*2)
s=randomoptimize(domain,schedulecost)
```

Prøv det.

Opgave c)

I en hillclimbing solution – starter vi med en cost, og prøver at lave små ændringer, der forbedrer

det samlede resultat. Hvor langt kan vi komme med det?

```
s=hillclimb(domain,schedulecost)
printschedule(s)
```

Prøv det.

Opgave d)

Endelig skal vi prøve at eksperimenterer med en GA algoritme:

```
#s=geneticoptimize(domain,schedulecost)

Eksperimenter med:

Populations størrelse.

Mutation rate:

Antallet af individer/gener, der overføres fra generation til generation uden
At være udsat for selection eller mutation.

Antallet af generationer vi kører algoritmen.

Med hvilke parametre settings opnås det bedste resultat?
```

Opgave e)

Hvilken algoritme gav de bedste resultater?

Eksempel Runs:

```
C:/Users/sila/PycharmProjects/GeneticAlgorithms/Flight_GA.py

   Seymour       BOS  8:04-10:11 $ 95 12:08-14:05 $142

    Franny       DAL 12:19-15:25 $342 10:51-14:16 $256

     Zooey       CAK 10:53-13:36 $189  9:58-12:56 $249

      Walt       MIA  9:15-12:29 $225 16:50-19:26 $304

     Buddy       ORD 16:43-19:00 $246 10:33-13:11 $132

       Les       OMA 11:08-13:07 $175 15:07-17:21 $129

Cost of solution - % 5285
```

```
A random optimize algorithm solution

   Seymour       BOS 11:16-13:29 $ 83 10:33-12:03 $ 74

    Franny       DAL 10:30-14:57 $290  7:57-11:15 $347

     Zooey       CAK  8:27-10:45 $139 10:32-13:16 $139

      Walt       MIA 11:28-14:40 $248 12:37-15:05 $170

     Buddy       ORD 12:44-14:17 $134  7:50-10:08 $164

       Les       OMA  7:39-10:24 $219  9:31-11:43 $210
```

```
Cost of solution - % 3657


Hill climbing
   Seymour       BOS  9:45-11:50 $172  9:58-11:18 $130
    Franny       DAL  9:08-12:12 $364  9:49-13:51 $229
     Zooey       CAK  9:15-12:14 $247  8:19-11:16 $122
      Walt       MIA  7:34- 9:40 $324  8:23-11:07 $143
     Buddy       ORD  8:25-10:34 $157  9:11-10:42 $172
       Les       OMA  9:15-12:03 $ 99 15:07-17:21 $129
Cost of solution - % 3282


Genetic Algorithm
   Seymour       BOS 12:34-15:02 $109 10:33-12:03 $ 74
    Franny       DAL 10:30-14:57 $290 10:51-14:16 $256
     Zooey       CAK 10:53-13:36 $189 10:32-13:16 $139
      Walt       MIA 11:28-14:40 $248 12:37-15:05 $170
     Buddy       ORD 12:44-14:17 $134 10:33-13:11 $132
       Les       OMA 11:08-13:07 $175 11:07-13:24 $171
Cost of solution - % 2591


Process finished with exit code 0
```