# Uvoz podatkov

In [1]:
```
!head tabela-zivil.dat
```

```
#vrednosti      za      100g    vsakega zivila

#zivilo energija[kcal]  mascobe[g]      ogljikovihidrati[g]     proteini[g
]       Ca[mg]  Fe[mg]  VitaminC[mg]    Kalij[mg]       Natrij[mg]
Ovseni_kosmici  369     6.1     64      15.5    54      4.7     0       35
4       286
Jabolko 52      0.17    13.81   0.26    6       0.12    4.6     107     1
Pomfri  93      12      21.55   1.96    5       0.35    12.8    391     24
1
Govedina        254     20      0       17.17   18      1.94    0       29
5       66
Svinjina        236     17.99   0       17.18   15      1.05    0.7     30
2       65
Piscanec        114     1.65    0       23.2    12      0.73    0       23
9       68
Mleko   60      3.25    4.52    3.22    113     0.03    0       113     40
Sir_edamec      357     27.8    1.43    24.99   731     0.44    0       18
8       965
```

In [2]:
```
import pandas as pd
```

In [28]:
```
import numpy as np
```

In [3]:
```
fajl = !ls *.dat
fajl
```

Out[3]:
```
['tabela-zivil.dat']
```

In [4]:
```
zivila = pd.read_table(fajl[0], skiprows=1, sep="\t")
print("Imamo kak manjkajoč podatek?")
print(zivila.isna().any())
zivila.head()
```

```
Imamo kak manjkajoč podatek?
#zivilo                False
energija[kcal]         False
mascobe[g]             False
ogljikovihidrati[g]    False
proteini[g]            False
Ca[mg]                 False
Fe[mg]                 False
VitaminC[mg]           False
Kalij[mg]              False
Natrij[mg]             False
dtype: bool
```

Out[4]:

| | #zivilo | energija[kcal] | mascobe[g] | ogljikovihidrati[g] | proteini[g] | Ca |
|---|---|---|---|---|---|---|
| **0** | Ovseni_kosmici | 369 | 6.10 | 64.00 | 15.50 | 54 |
| **1** | Jabolko | 52 | 0.17 | 13.81 | 0.26 | 6 |
| **2** | Pomfri | 93 | 12.00 | 21.55 | 1.96 | 5 |
| **3** | Govedina | 254 | 20.00 | 0.00 | 17.17 | 18 |
| **4** | Svinjina | 236 | 17.99 | 0.00 | 17.18 | 15 |

# Prvi scenarij:

" Minimiziraj količino kalorij, če je priporočen minimalni dnevni vnos 70 g maščob, 310 g ogljikovih hidratov, 50 g proteinov, 1000 mg kalcija ter 18 mg železa. Upoštevaj tudi, da naj dnevni obroki količinsko ne presežejo dveh kilogramov hrane."

In [26]:
```
from scipy.optimize import linprog
```

In [80]:
```
c = zivila["energija[kcal]"]
b_ub = np.array([
    -70,
    -310,
    -50,
    -1000,
    -18,
    20
])
A = np.array([
    -zivila["mascobe[g]"],
    -zivila["ogljikovihidrati[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila)))
])

X = linprog(c, A_ub = A, b_ub = b_ub)
X
```

Out[80]:
```
     fun: 1288.991841997811
 message: 'Optimization terminated successfully.'
     nit: 14
   slack: array([  0.        ,   0.        ,  47.6545134 ,   0.        ,
        55.13152445,   0.        ])
  status: 0
 success: True
       x: array([  0.        ,   0.        ,   0.17491782,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.56219264,   0.        ,   4.95627636,
        14.30661317,   0.        ,   0.        ,   0.        ])
```

In [81]:
```
sum(X.x)
```

Out[81]: 19.999999999999996

Definiramo funkcijo, ki nam bo lepo izpisala rezultat

In [135]:
```
def izpisi2(x, zivila=zivila["#zivilo"]):
    print("Vrednost optimizirane funkcije: ", x.fun)
    df = pd.DataFrame(data={"Živilo": zivila, "Količina[kg]": 0.1*x.x}).s
ort_values("Količina[kg]",ascending=False)
    filter = df["Količina[kg]"] != 0
    return df[filter].style.bar(subset=["Količina[kg]"], color='#d65f5f')
.hide_index()
def izpisi(x, zivila=zivila["#zivilo"]):
    print("Vrednost optimizirane funkcije: ", x.fun)
    df = pd.DataFrame(data={"Živilo": zivila, "Količina[kg]": 0.1*x.x}).s
ort_values("Količina[kg]",ascending=False)
    filter = df["Količina[kg]"] != 0
    return df[filter]
izpisi2(X)
```

```
Vrednost optimizirane funkcije:  1288.991842
```

Out[135]:

| Živilo | Količina[kg] |
|---|---|
| Sol | 1.43066 |
| Kakav | 0.495628 |
| Marmelada | 0.0562193 |
| Pomfri | 0.0174918 |

In [75]:
```
zivila[zivila["#zivilo"] == "Sol"]
```

Out[75]:

| | #zivilo | energija[kcal] | mascobe[g] | ogljikovihidrati[g] | proteini[g] | Ca[mg] | |
|---|---|---|---|---|---|---|---|
| **44** | Sol | 0 | 0.0 | 0.0 | 0.0 | 24 | |

## Drugi scenarij:

"Upoˇstevate lahko ˇse minimalne vnose za vitamin C (60 mg), kalij (3500 mg) in sprejemljiv interval za natrij (500 mg – 2400 mg), ki so tudi na voljo v tabeli"

popravim A in b

In [83]:
```
c = zivila["energija[kcal]"]
b_ub = np.array([-70,-310,-50,-1000,-18,20, -60,-3500,2400,-500])
A = np.array([
    -zivila["mascobe[g]"],
    -zivila["ogljikovihidrati[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila))),
    -zivila["VitaminC[mg]"],
    -zivila["Kalij[mg]"],
    zivila["Natrij[mg]"],
    -zivila["Natrij[mg]"]

])

X2 = linprog(c, A_ub = A, b_ub = b_ub)
X2
```

Out[83]:
```
     fun: 1297.2737079300357
 message: 'Optimization terminated successfully.'
     nit: 37
   slack: array([    0.        ,     0.        ,    51.74546704,     0.
,
          54.63526427,     0.        ,     0.        ,  4699.48779986,
           0.        ,  1900.        ])
  status: 0
 success: True
       x: array([  0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.79670773,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.        ,   0.        ,   0.        ,   0.        ,
         0.96621125,   0.        ,   0.        ,   0.        ,
         0.        ,   0.2973317 ,   0.        ,   5.08939512,
         0.04362114,  12.80673307,   0.        ,   0.        ])
```

In [110]:
```
izpisi(X2)
```

```
Vrednost optimizirane funkcije:  7.43766292266
```

Out[110]:

| | Živilo | Količina[kg] |
|---|---|---|
| **17** | Solata | 1.15693 |
| **41** | Marmelada | 0.490572 |
| **15** | Fizol | 0.245238 |
| **8** | Kruh_bel | 0.102225 |
| **37** | Puran | 0.00503298 |

## Tretji scenarij:

Kako se rezultat razlikuje, ˇce zahtevamo minimalno 2000 kcal in namesto energije minimiziramo vnos maˇsˇcob?

Najprej brez drugih vezi:

In [111]:
```
c = zivila["mascobe[g]"]
b_ub = np.array([-2000])
A = np.array([
    -zivila["energija[kcal]"]

])

X3 = linprog(c, A_ub = A, b_ub = b_ub)
izpisi(X3)
```

```
Vrednost optimizirane funkcije:  -0.0
```

```
/home/peter/anaconda3/lib/python3.6/site-packages/pandas/io/formats/style.
py:960: RuntimeWarning: divide by zero encountered in double_scalars
  zero_normed = width * (0 - s.min()) / (s.max() - s.min())
```

Out[111]:

| | Živilo | Količina[kg] |
|---|---|---|
| **42** | Med | 0.657895 |

Haha, zakon... OK, pa če upoštevamo še use ostale vezi ka sm jih jemu prej?

In [112]:
```
c = zivila["mascobe[g]"]
b_ub = np.array([-310,
                 -50,
                 -1000,
                 -18,
                 20,
                 -60,
                 -3500,
                 2400,
                 -500,
                 -2000
                ])
A = np.array([
    -zivila["ogljikovihidrati[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila))),
    -zivila["VitaminC[mg]"],
    -zivila["Kalij[mg]"],
    zivila["Natrij[mg]"],
    -zivila["Natrij[mg]"],
    -zivila["energija[kcal]"]
])

X4 = linprog(c, A_ub = A, b_ub = b_ub)
izpisi(X4)
```

```
Vrednost optimizirane funkcije:  7.43766292266
```

Out[112]:

| | Živilo | Količina[kg] |
|---|---|---|
| **17** | Solata | 1.15693 |
| **41** | Marmelada | 0.490572 |
| **15** | Fizol | 0.245238 |
| **8** | Kruh_bel | 0.102225 |
| **37** | Puran | 0.00503298 |

# 5 del; omejitev količine posameznih živil

Postopam enako, le da dodam še enotske vektorje v prostoru živil in v b_up dodam normalnejšo količino.

In [116]:
```
d = len(zivila)
kopija = zivila.copy()

for i, hr in enumerate(kopija["#zivilo"].values):
    kopija[hr] = np.zeros(d)
    kopija[hr][i] = 1
```

```
/home/peter/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:6:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs
/stable/indexing.html#indexing-view-versus-copy
```

In [134]:
```
c = zivila["energija[kcal]"]
b_ub = np.array([-70,
                 -310,
                 -50,
                 -1000,
                 -18,
                 20,
                 -60,
                 -3500,
                 2400,
                 -500,
                 #-2000,
                 1, #Solata v enotah 100g
                 0.5, #Marmelada
                 2,
                 1,
                 2,
                 2,
                 1,
                 4,
                4,
                 0.1,
                 3,
                 2,
                 1
                ])
A = np.array([
    -zivila["mascobe[g]"],
    -zivila["ogljikovihidrati[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila))),
    -zivila["VitaminC[mg]"],
    -zivila["Kalij[mg]"],
    zivila["Natrij[mg]"],
    -zivila["Natrij[mg]"],
    #-zivila["energija[kcal]"],
    zivila["Solata"],
    zivila["Marmelada"],
    zivila["Pomaranca"],
    zivila["Zelje"],
    zivila["Brokoli"],
    zivila["Strocji_fizol"],
    zivila["Korenje"],
    zivila["Kruh_bel"],
    zivila["Radenska"],
    zivila["Kakav"],
    zivila["Pomfri"],
    zivila["Jagode"],
    zivila["Paprika"]
])

X5 = linprog(c, A_ub = A, b_ub = b_ub)
izpisi2(X5)
```

```
Vrednost optimizirane funkcije:  1658.92854735
```

Out[134]:

| | Živilo | Količina[kg] |
|---|---|---|
| **2** | Pomfri | 0.3 |
| **29** | Brokoli | 0.2 |
| **36** | Pomaranca | 0.2 |
| **21** | Jagode | 0.2 |
| **34** | Strocji_fizol | 0.2 |
| **45** | Radenska | 0.192389 |
| **8** | Kruh_bel | 0.131007 |
| **24** | Torta | 0.112841 |
| **32** | Paprika | 0.1 |
| **33** | Korenje | 0.1 |
| **17** | Solata | 0.1 |
| **18** | Zelje | 0.1 |
| **41** | Marmelada | 0.0275023 |
| **7** | Sir_edamec | 0.0260315 |
| **43** | Kakav | 0.01 |
| **44** | Sol | 0.000228716 |

# Part 7: Nizko-OH dieta

minimiziram OH intake ob omejitvi 2000kcal The Dietary Guidelines for Americans by the United States Department of Agriculture (USDA) recommends three healthy patterns of diet, summarized in table below, for a 2000 kcal diet.[10]

In [140]:
```
c = zivila["ogljikovihidrati[g]"]
b_ub = np.array([-70, -50,-1000,-18,20, -60,-3500,2400,-500])
A = np.array([
    -zivila["mascobe[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila))),
    -zivila["VitaminC[mg]"],
    -zivila["Kalij[mg]"],
    zivila["Natrij[mg]"],
    -zivila["Natrij[mg]"]

])
b_eq = [2000]
A_eq = [zivila["energija[kcal]"]]

X7 = linprog(c, A_ub = A, b_ub = b_ub)
izpisi2(X7)
```

```
Vrednost optimizirane funkcije:  2.03137771937
```

Out[140]:

| **Živilo** | **Količina[kg]** |
|---|---|
| Postrv | 1.92489 |
| Paprika | 0.0274526 |
| Skusa_soljena | 0.0269328 |
| Sir_edamec | 0.0207253 |

Vidimo, da bo potrebno omejiti živila:

In [139]:
```
c = zivila["ogljikovihidrati[g]"]
b_ub = np.array([-70, -50,-1000,-18,20, -60,-3500,2400,-500, 6, 1,0.5,2,1
,2,2,1,4,4,0.1,3,2,1,6])
A = np.array([
    -zivila["mascobe[g]"],
    -zivila["proteini[g]"],
    -zivila["Ca[mg]"],
    -zivila["Fe[mg]"],
    np.ones((len(zivila))),
    -zivila["VitaminC[mg]"],
    -zivila["Kalij[mg]"],
    zivila["Natrij[mg]"],
    -zivila["Natrij[mg]"],
    zivila["Postrv"],
    zivila["Solata"],
    zivila["Marmelada"],
    zivila["Pomaranca"],
    zivila["Zelje"],
    zivila["Brokoli"],
    zivila["Strocji_fizol"],
    zivila["Korenje"],
    zivila["Kruh_bel"],
    zivila["Radenska"],
    zivila["Kakav"],
    zivila["Pomfri"],
    zivila["Jagode"],
    zivila["Paprika"],
    zivila["Svinjina"]
])
b_eq = [2000]
A_eq = [zivila["energija[kcal]"]]

X7 = linprog(c, A_ub = A, b_ub = b_ub)
izpisi2(X7)
```

```
Vrednost optimizirane funkcije:  2.81102423971
```

Out[139]:

| **Živilo** | **Količina[kg]** |
|---|---|
| Postrv | 0.6 |
| Svinjina | 0.6 |
| Radenska | 0.4 |
| Govedina | 0.286937 |
| Sir_edamec | 0.0694068 |
| Paprika | 0.0287738 |
| Skusa_soljena | 0.0148825 |

# Paleo dieta

""" EAT

```
Grass-fed meats
Fish/seafood
Fresh fruits
Fresh vegetables
Eggs
Nuts
Seeds
Healthy oils (olive, walnut, flaxseed, macadamia, avocado, coconut)
```

DON’T EAT

```
Cereal grains
Legumes (including peanuts)
Dairy
Refined sugar
Potatoes
Processed foods
Overly salty foods
Refined vegetable oils
Candy/junk/processed food
```

""" vir: https://ultimatepaleoguide.com/paleo-diet-food-list/ (https://ultimatepaleoguide.com/paleo-diet-food-list/)

In [ ]: