

# S8

March 8, 2023

## 1 27 Kórfuboltamenn

### 1.1 1.

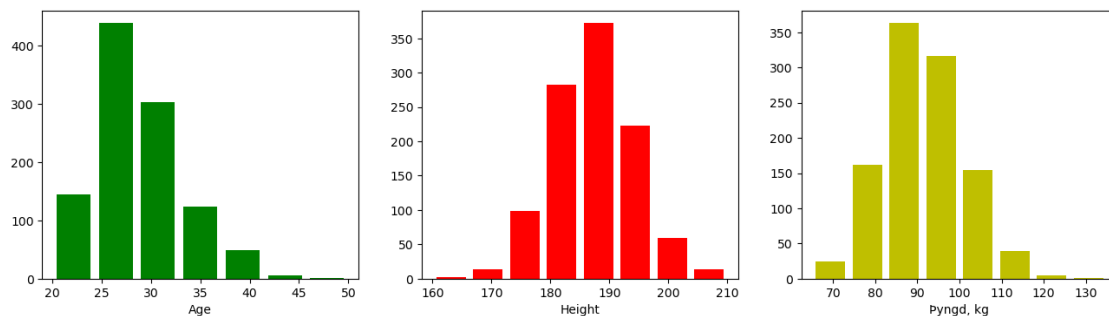
```
[2]: import numpy as np, numpy.linalg as la
import matplotlib.pyplot as plt

(age, height, weight) = np.loadtxt("https://cs.hi.is/python/karfa.txt").T
length = np.arange(len(age))
barWidth = 0.01

plt.figure(figsize=(16,4))
plt.subplot(1,3,1)
plt.hist(age, rwidth=0.8, bins=7, range=(20,50), color='g')
plt.xlabel('Age')

plt.subplot(1,3,2)
plt.hist(height, rwidth=0.8, bins=8, range=(160,210), color='r')
plt.xlabel('Height')

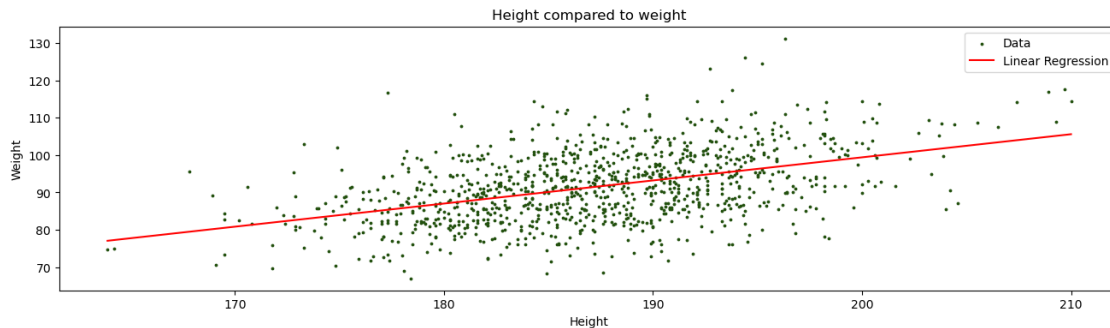
plt.subplot(1,3,3)
plt.hist(weight, rwidth=0.8, bins=8, range=(65,135), color='y')
plt.xlabel('Þyngd, kg')
plt.show()
```



## 1.2 2.

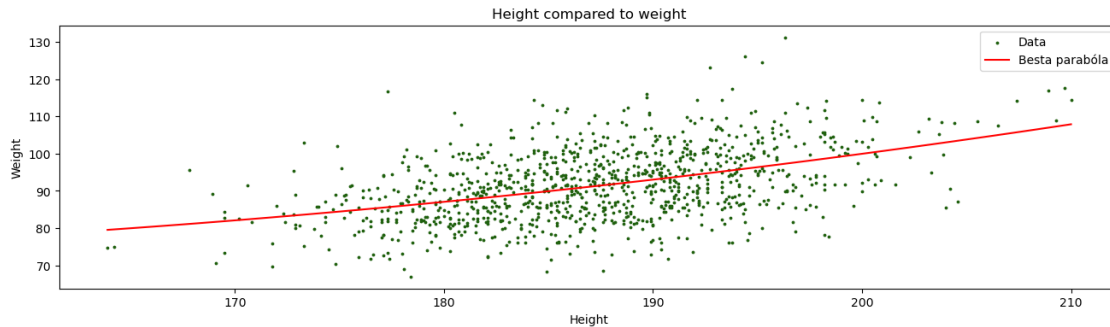
```
[3]: (a, b) = np.polyfit(height, weight, deg=1)
      (A,B,C)= np.polyfit(height, weight, deg=2)

      xp = np.linspace(min(height), max(height))
      yp = a*xp + b
      yp1 = A*xp**2+B*xp+C
      plt.figure(figsize=(16,4))
      plt.scatter(height, weight, c='#23510F', s=3, label="Data")
      plt.plot(xp, yp, c='r', label='Linear Regression')
      plt.xlabel('Height')
      plt.ylabel('Weight')
      plt.title("Height compared to weight")
      plt.legend()
      plt.show()
```



## 1.3 3.

```
[4]: plt.figure(figsize=(16,4))
      plt.scatter(height, weight, c='#20610F', s=3, label='Data')
      plt.plot(xp, yp1, c='r', label='Besta parabóla')
      plt.xlabel('Height')
      plt.ylabel('Weight')
      plt.title("Height compared to weight")
      plt.legend()
      plt.show()
```



## 1.4 4.

```
[5]: def findmedian(a, b, c):
    eldri = []
    yngri = []
    for i,j in enumerate(a):
        if j <= c:
            yngri.append(b[i])
        if j > c:
            eldri.append(b[i])
    return np.mean(eldri), np.mean(yngri)

a, b = findmedian(age, height, np.median(age))

print("Miðtala er =", round(np.median(age),2))
print("Meðalhæð yngri er =", round(a,2))
print("Meðalhæð eldri er =", round(b,2))
```

Miðtala er = 27.98  
 Meðalhæð yngri er = 186.67  
 Meðalhæð eldri er = 187.74

## 2 34 Mannfjöldaspá fyrir Ísland

### 2.1 1.

```
[6]: A = np.loadtxt("https://cs.hi.is/python/aldursdreifing.txt", skiprows=1,
    dtype='float', delimiter="\t").T
age = A[0].astype(int)
number = A[1].astype(int)
deathRate = A[2].astype(float)
birthRate = A[3].astype(float)
immigrantsOverEmigrants = A[4].astype(int)
```

```

n = deathRate.shape[0]

def Leslie(f,p):
    matrix = np.zeros((n,n))
    matrix[0] = f
    for i in range(n-1):
        matrix[i+1,i] = 1-p[i]
    return(matrix)

fylki = Leslie(birthRate, deathRate)
list4matplot0 = []
print('Ár\tFjöldi')
for i in range(0, 56):
    summa = la.matrix_power(fylki, i) @ number
    list4matplot0.append(summa.sum())
    if i%5==0:
        print(str(i+2020).ljust(7), int(summa.sum()))

```

Ár	Fjöldi
2020	366517
2025	376516
2030	383912
2035	387681
2040	388190
2045	386031
2050	381831
2055	376259
2060	369496
2065	361280
2070	351467
2075	340356

## 2.2 2.

```

[7]: def totalsum(year,amount):
    for i in range(year):
        amount = fylki@amount+immigrantsOverEmigrants
    return amount
totalim = immigrantsOverEmigrants/number.sum()

list4matplot = []

print('Ár\tFjöldi')
for i in range(0, 56):
    summa1 = sum(totalsum(i,number))
    list4matplot.append(summa1)
    if i%5==0:

```

```
print(str(i+2020).ljust(7), int(summa1.sum()))
```

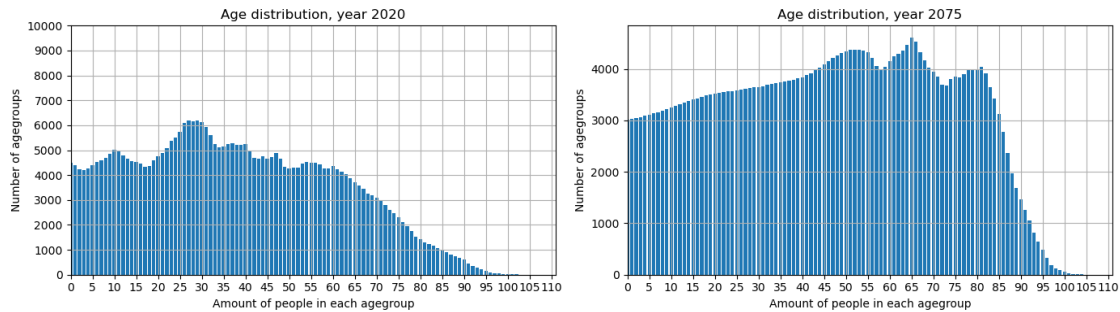
Ár	Fjöldi
2020	366517
2025	403853
2030	441835
2035	478872
2040	514289
2045	547839
2050	579758
2055	610728
2060	640991
2065	669937
2070	696624
2075	720461

## 2.3 3.

```
[9]: import matplotlib.pyplot as plt

plt.figure(figsize=(14,4))
plt.subplot(1,2,1)
plt.title('Age distribution, year 2020')
plt.xlabel('Amount of people in each agegroup')
plt.ylabel('Number of agegroups')
plt.xlim(0,111)
plt.ylim(0,10000)
plt.xticks(range(0,111,5))
plt.yticks(range(0,11000,1000))
plt.bar(list(range(111)),number)
plt.grid(True)

plt.subplot(1,2,2)
plt.title('Age distribution, year 2075')
plt.xlabel('Amount of people in each agegroup')
plt.ylabel('Number of agegroups')
plt.xlim(0,111)
plt.xticks(range(0,111,5))
plt.yticks(range(0,11000,1000))
plt.bar(list(range(111)),summa)
plt.grid(True)
plt.tight_layout()
plt.show()
```



## 2.4 4.

```
[13]: def totalsumm(year, totalamount):
    for i in range(year):
        s = totalim * totalamount.sum()
        totalamount = fylki@totalamount+s
    return totalamount

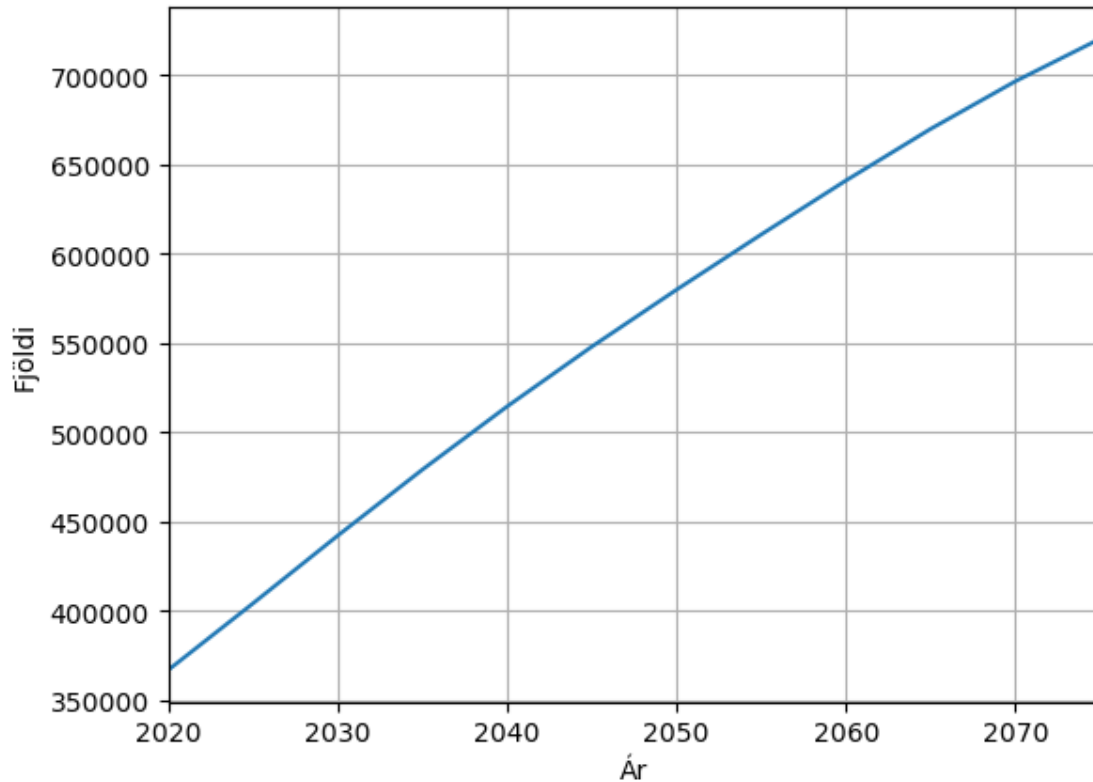
list4matplot1 = []

print('Ár\tFjöldi')
for i in range(0, 56):
    summa2 = sum(totalsumm(i, (number+totalim)))
    list4matplot1.append(summa2)
    if i%5==0:
        print(str(i+2020).ljust(7), int(summa2.sum()))

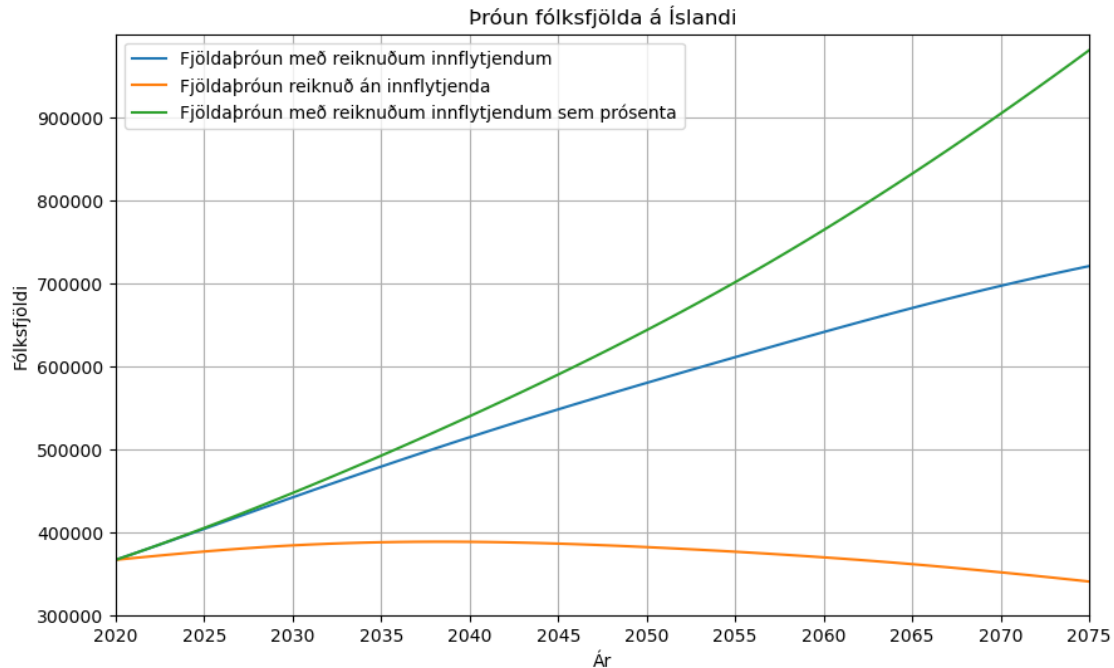
year = np.arange(2020, 2076, 5)
x = [sum(totalsumm(i, number)) for i in range(0, 60, 5)]
plt.xlabel('Ár')
plt.ylabel('Fjöldi')
plt.plot(year, x)
plt.xlim(2020, 2075)
plt.grid()
```

Ár	Fjöldi
2020	366517
2025	404946
2030	447139
2035	492090
2040	539603
2045	589813
2050	643294
2055	701110

2060	763977
2065	831800
2070	904090
2075	980591



```
[15]: plt.figure(figsize=(10,6))
plt.title('Þróun fólksfjölda á Íslandi')
plt.xlabel('Ár')
plt.ylabel('Fólksfjöldi')
plt.ylim(300000,1000000)
plt.yticks(np.arange(300000,900001, 100000))
plt.xlim(2020,2075)
plt.xticks(np.arange(2020, 2076,5))
plt.plot(list(range(2020,2076)),list4matplot,label='Fjöldapróun með reiknuðum,
↳innflytjendum')
plt.plot(list(range(2020,2076)),list4matplot0,label='Fjöldapróun reiknuð án,
↳innflytjenda')
plt.plot(list(range(2020,2076)),list4matplot1, label='Fjöldapróun með reiknuðum,
↳innflytjendum sem prósentu')
plt.legend()
plt.grid(True)
plt.show()
```



## 2.5 5.

Eins og má sjá á síðustu mynd er mjög mikilvægt fyrir okkur að fá innflytjendur. Ef fólk myndi ekki þora að flytja hingað þá myndi Ísland líklegast enda á frekar slæmum stað. Við værum í góðum málum til 2040 en eftir það væri það bara niðurleið. Dánartíðni er það há miðað við fæðingartíðni að við verðum að fá innflytjendur til þess að halda þessu landi gangandi. Hinsvegar er fjölgun á Íslandi miðað við innflytjendur orðin frekar mikil árið 2075. Einnig er áhugavert að sjá hvernig aldursdreifing er árið 2020 og svo árið 2075. Stærsti hópur árið 2020 er í kringum 30 ára en árið 2075 er stærsti hópurinn í kringum 67 ára. Þetta getur verið slæmt fyrir samfélagið því flestir sem eru 65+ ára eru komin á ellilífeyri. Þetta mun hafa áhrif á yngri kynslóð.