

Homework 1

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Smart glasses bass model approximation

Smart glasses are the closest thing to smart watches. The bass model approximation will be representative due to this. I've chosen smartwatch sales data from Finland to approximate it.

```
In [6]: import numpy as np
import pandas as pd
from scipy.optimize import curve_fit

#
# Data from:
# Gotech. (January 28, 2021). Retail sales of smartphones, smartwatches and mobile phones in Fi
# Retrieved September 29, 2023, from https://www.statista.com/statistics/702452/smartphones-smc
#

data = pd.DataFrame({
    "year": np.arange(5) + 2016,
    "sales": [25.90, 26.60, 35.10, 69.90, 106.10]
})

data["cumulative"] = data["sales"].cumsum()
data
```

```
Out[6]:
```

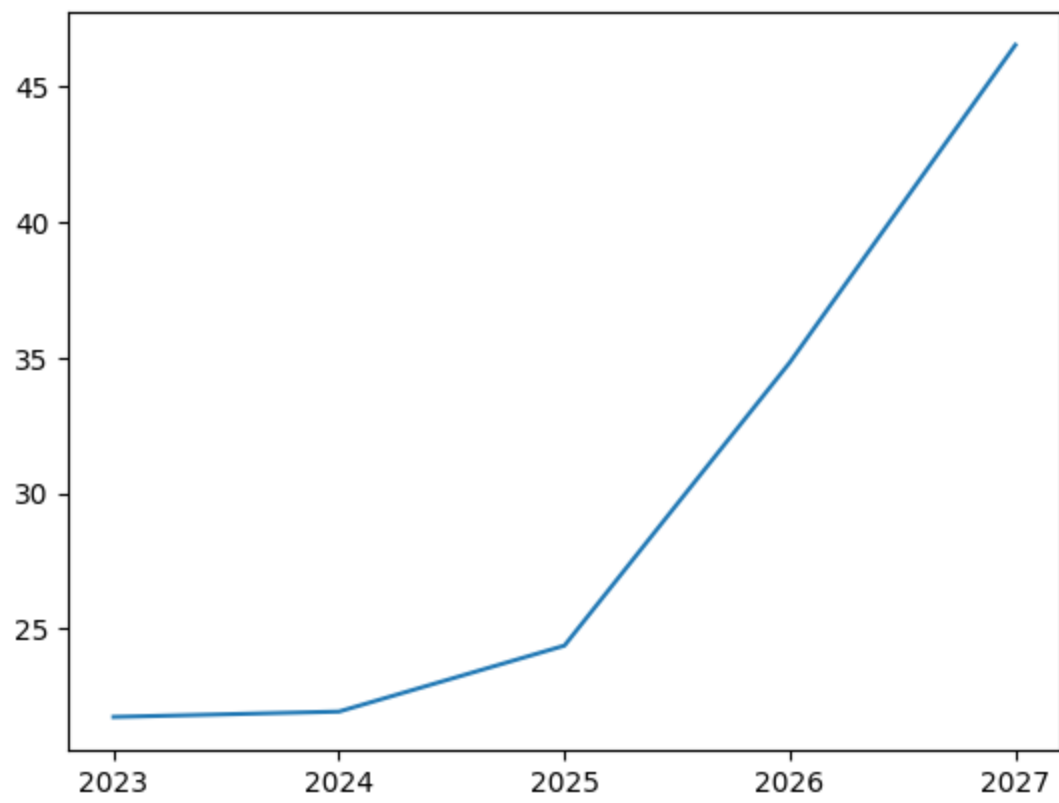
	year	sales	cumulative
0	2016	25.9	25.9
1	2017	26.6	52.5
2	2018	35.1	87.6
3	2019	69.9	157.5
4	2020	106.1	263.6

```
In [8]: def bass(x, innovation, imitation, market):
        return (innovation + (imitation/market) * x) * (market - x)

popt, pcov = curve_fit(bass, data.cumulative, data.sales)
popt
```

```
Out[8]: array([-2.46517732e-01,  1.93309889e-02, -5.94090467e+01])
```

```
In [14]: from matplotlib import pyplot as plt
plt.plot((np.arange(5)+2023), bass(data["sales"], *popt))
plt.xticks((np.arange(5)+2023));
```



Here, we shift the approximation to start at 2023 to match the market timing.