ebola

July 26, 2019

0.1 2014 Ebola Outbreak Analysis

Death cases for viral/bacterial outbreaks usually follow an exponential growth

We analyse the 2014 Ebola outbreak in Africa country by country and examine the overall behaviour of the death numbers with respect to time

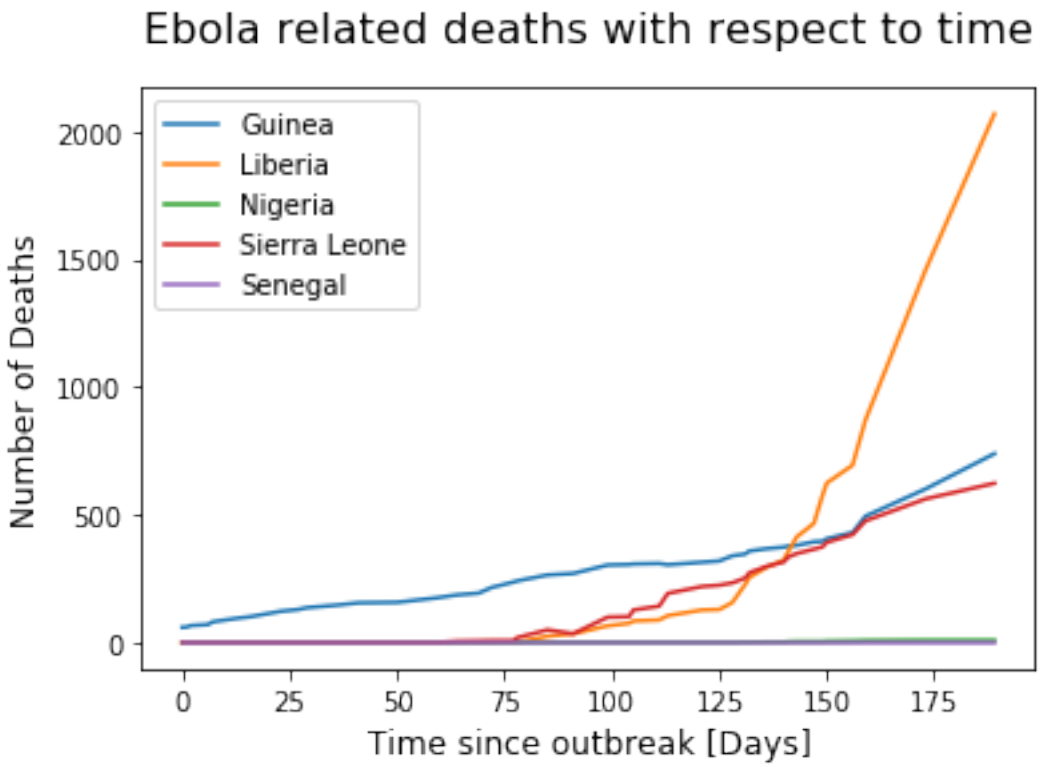
[8]:
```
%pylab inline

with open("ebola.txt") as f:
    data = list()                  # létrehozunk egy adatok táblázatot, amiben a␣
↪forrásfájlhoz hasonló struktúrával elmentjük az adatokat
    for i in range(16):
        data += [list()]
    for row in f:
        if row[0] != "#":
            for i in range(len(data)):            # Mivel a forrásfájl␣
↪oszlopaiban voltak az összetartozó adatok, ezeket rendezzük listába
                data[i] += [int(row.split()[i])] # Az adatokat pedig int␣
↪tipusként tároljuk


plot(data[0], data[2], label="Guinea")
plot(data[0], data[5], label="Liberia")
plot(data[0], data[8], label="Nigeria")
plot(data[0], data[11], label="Sierra Leone")
plot(data[0], data[14], label="Senegal")
xlabel("Time since outbreak [Days]", size=12)
ylabel("Number of Deaths", size=12)
title("Ebola related deaths with respect to time", size = 16, y = 1.05)
legend(loc=0)
```

```
Populating the interactive namespace from numpy and matplotlib
```

[8]:
```
<matplotlib.legend.Legend at 0x7f3561975dd8>
```

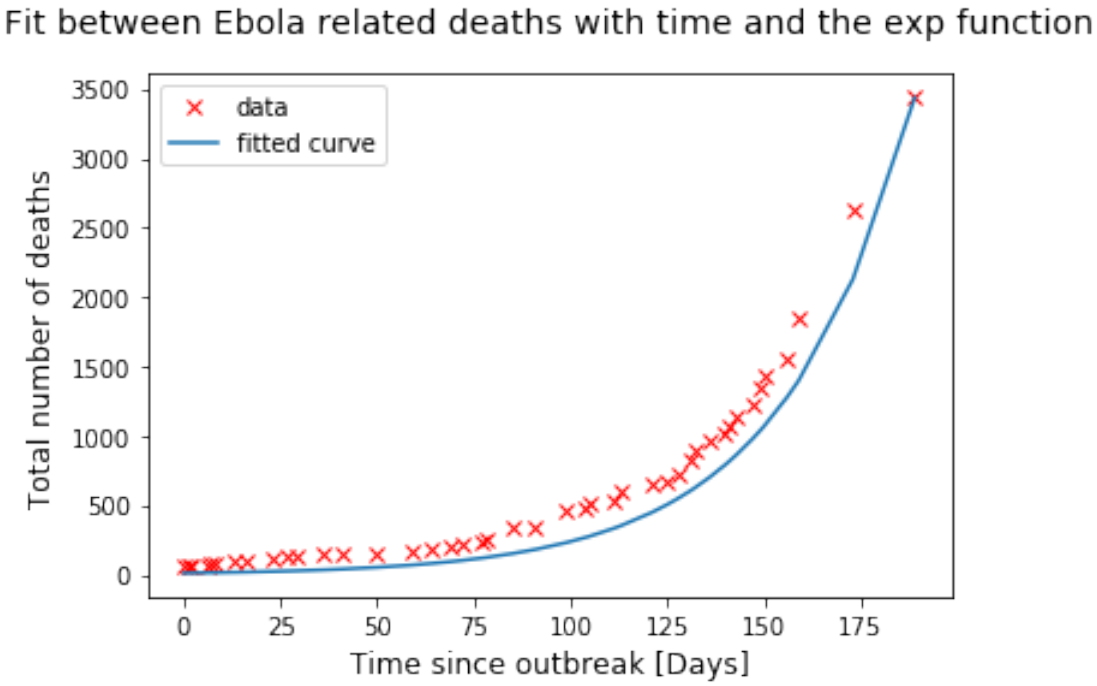


[12]:
```
out = zeros(len(data[0]))
for i in range(len(data[0])):
    out[i] = data[2][i] + data[5][i] + data[8][i] + data[11][i] + data[14][i]
dout_dt = diff(out)/diff(data[0])
alpha = mean(dout_dt/out[1:])
A = out[-1] / exp(alpha * data[0][-1])
print('Constant coefficient:', A)
print('Exponential coefficient: ', alpha)

plot(data[0], out, "rx", label="data")
plot(data[0], A * exp(alpha * array(data[0])), label="fitted curve")
title("Fit between Ebola related deaths with time and the exp function",␣
 ↪size=14, y=1.05)
legend(loc=0)
xlabel("Time since outbreak [Days]", size=12)
ylabel("Total number of deaths", size=12)
```

```
Constant coefficient: 11.98543262168431
Exponential coefficient:  0.029943090191900588
```

[12]:
```
Text(0, 0.5, 'Total number of deaths')
```



[11]:
```
deaths_oneyr = A*exp(alpha*365)
print('The total deaths in a year according to this model are:␣
 ↪',int(deaths_oneyr))
```

```
The total deaths in a year according to this model are:  668585
```

The fitted curve visually represents the danger of these outbreaks. In a year, 668585 could have died without international humanitarian support. This also represents a limitation of the model to extrapolate to longer times, since it does not take into account external factors influencing the spread of the virus.

[ ]: