```
My Code for the task can be viewed at:
https://github.com/sayarghoshroy/COVID-19_Modelling_for_India
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3) Now, note that for many continuous $f(x)$ which sort of ease down towards $f(x) = 0$; the true zero can happen when $x \to \infty$ i.e f becomes asymptotic.
In my modelling using SIR; if we consider $f(x) \equiv I$; x being the day number; then 'I' reaches 0 after a threshold. So, we can say when $I = 0$; it's safe to move outside. To compute $I = 0$; we use binary search on answer to find the smallest possible t, $t \in \{1, 2, \dots\}$ s.t $I(t) = 0$.

Based on my implementation $I(t) = 0$ at $t = 659$

Note that, there is evidence to prove that once lockdown lifts, in case of silent & asymptomatic patients, the curve can rise again.

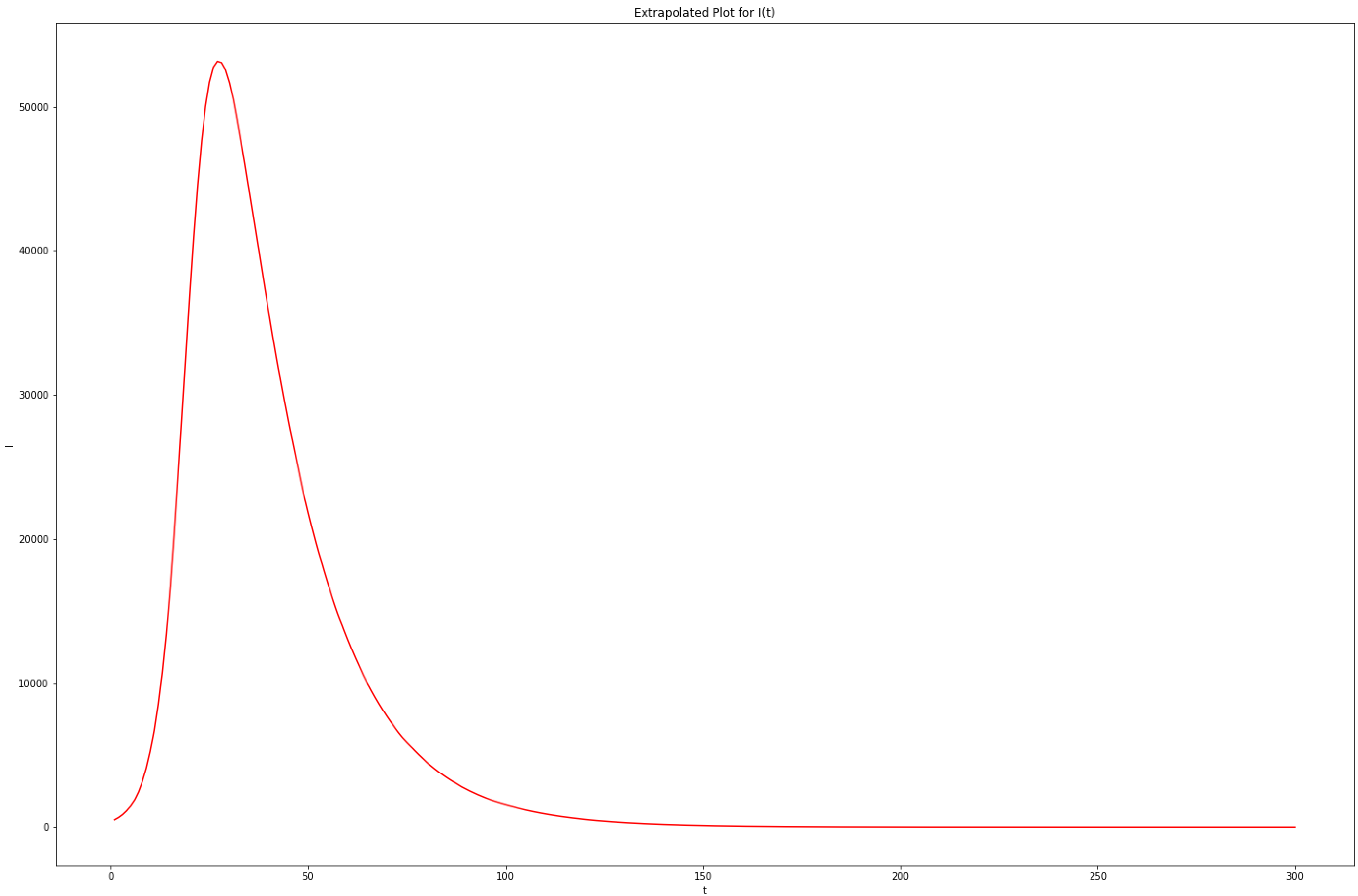
Also, if we were to consider a soft threshold say $I(t) = \alpha$ to calculate, when it is safe to move out; α would depend on the area's population, high for densely populated areas & small for sparse areas $\therefore$ α itself is a function of N & country area. α can also, therefore be region-specific.

For the case of India; we have the following solutions:

$I(t) = 0$ at $t = 659$
$I(t) = 1$ at $t = 238$
$I(t) = 2$ at $t = 224$
$I(t) = 3$ at $t = 217$
$I(t) = 4$ at $t = 211$

Now, saying that we cannot go out even if one person is a bit extreme. Hence, we consider soft threshold and in such a case, for $\alpha \approx 8$, $I(t) = \alpha$ at $t \approx 200$. In 200 days, the spread is mostly gone.

Even on setting $\alpha = 30$, $I(t) = \alpha$ happens at $t \approx 175$.



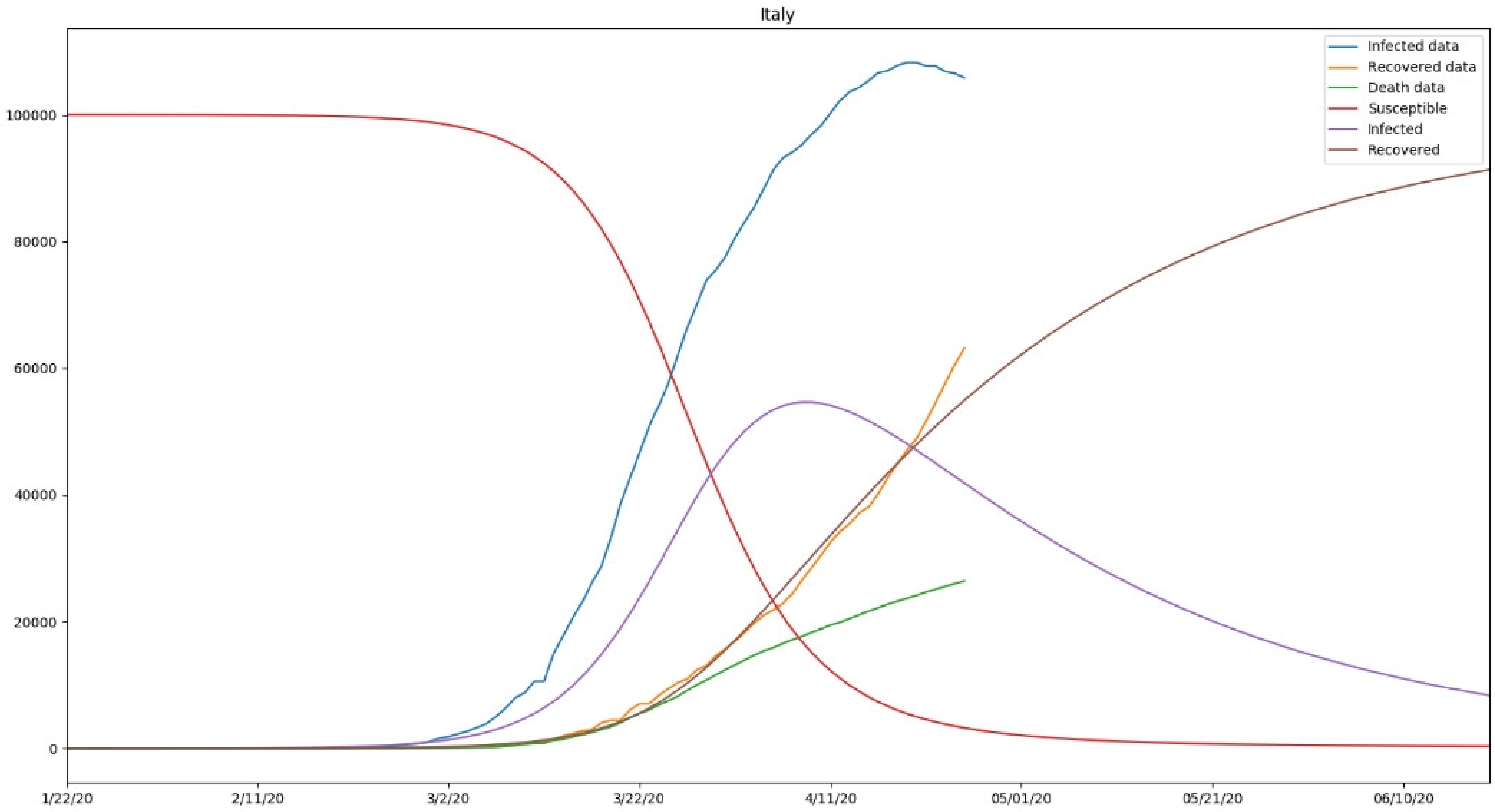
Extrapolated Plot for I(t)
50000
40000
30000
20000
10000
0
0
50
100
150
200
250
300
t
I

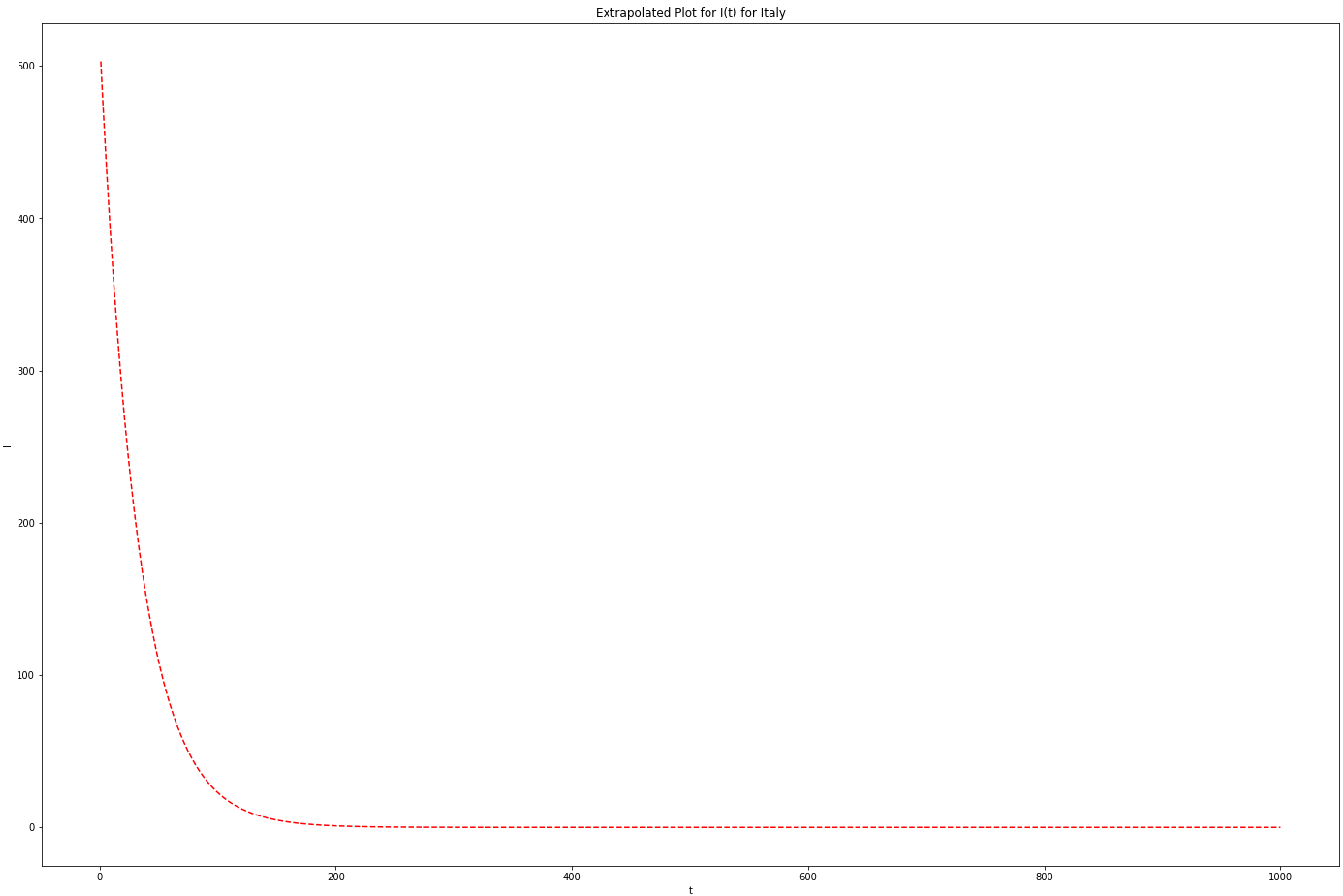
Now consider the case for Italy; their curve has a much wider bell and hence; the I(t) takes significantly more time to hit I(t) = 50 (say). This is clear from the image generate by the online source code using the data for Italy as parameters. So, it might be safe to move out in Italy even for larger values of α, say 50. That would be more practical as the curve flattens out towards the end & the descent becomes extremely slow.

For Italy $I(t) = 0$ at $t = 910$

And $I(t) = 10$ at $t = 126$.

$\therefore \alpha = 10$ is a suitable value for Italy. The extended I curve for Italy generate using my implementation has also been attached.


Italy
Infected data
Recovered data
Death data
Susceptible
Infected
Recovered
100000
80000
60000
40000
20000
0
1/22/20
2/11/20
3/2/20
3/22/20
4/11/20
05/01/20
05/21/20
06/10/20



Extrapolated Plot for I(t) for Italy
500
400
300
200
100
0
I
0
200
400
600
800
1000
t