ITWS Project on Worldwide COVID-19 Data Analysis using MATLAB

Data collected from below link

https://github.com/datasets/covid-19

Group Number: 8

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Reading the Data from Excel Sheet

```
worldData=readtable('worldwide-aggregated.xlsx')
```

worldData = 79×4 table

	Date	Confirmed	Recovered	Deaths
1	22-Jan-2020	555	28	17
2	23-Jan-2020	654	30	18
3	24-Jan-2020	941	36	26
4	25-Jan-2020	1434	39	42
5	26-Jan-2020	2118	52	56
6	27-Jan-2020	2927	61	82
7	28-Jan-2020	5578	107	131
8	29-Jan-2020	6166	126	133
9	30-Jan-2020	8234	143	171
10	31-Jan-2020	9927	222	213
11	01-Feb-2020	12038	284	259

	Date	Confirmed	Recovered	Deaths
12	02-Feb-2020	16787	472	362
13	03-Feb-2020	19881	623	426
14	04-Feb-2020	23892	852	492
15	05-Feb-2020	27635	1124	564
16	06-Feb-2020	30794	1487	634
17	07-Feb-2020	34391	2011	719
18	08-Feb-2020	37120	2616	806
19	09-Feb-2020	40150	3241	906
20	10-Feb-2020	42762	3943	1013
21	11-Feb-2020	44802	4680	1113
22	12-Feb-2020	45221	5144	1118
23	13-Feb-2020	60368	6289	1371
24	14-Feb-2020	66885	8052	1523
25	15-Feb-2020	69030	9387	1666
26	16-Feb-2020	71224	10850	1770
27	17-Feb-2020	73258	12568	1868
28	18-Feb-2020	75136	14337	2007
29	19-Feb-2020	75639	16105	2122
30	20-Feb-2020	76197	18161	2247
31	21-Feb-2020	76819	18872	2251
32	22-Feb-2020	78572	22868	2458
33	23-Feb-2020	78958	23377	2469
34	24-Feb-2020	79561	25210	2629
35	25-Feb-2020	80406	27880	2708
36	26-Feb-2020	81388	30349	2770
37	27-Feb-2020	82746	33242	2814
38	28-Feb-2020	84112	36675	2872
39	29-Feb-2020	86011	39745	2941
40	01-Mar-2020	88369	42679	2996
41	02-Mar-2020	90306	45565	3085
42	03-Mar-2020	92840	48191	3160
43	04-Mar-2020	95120	51133	3254
44	05-Mar-2020	97882	53759	3348

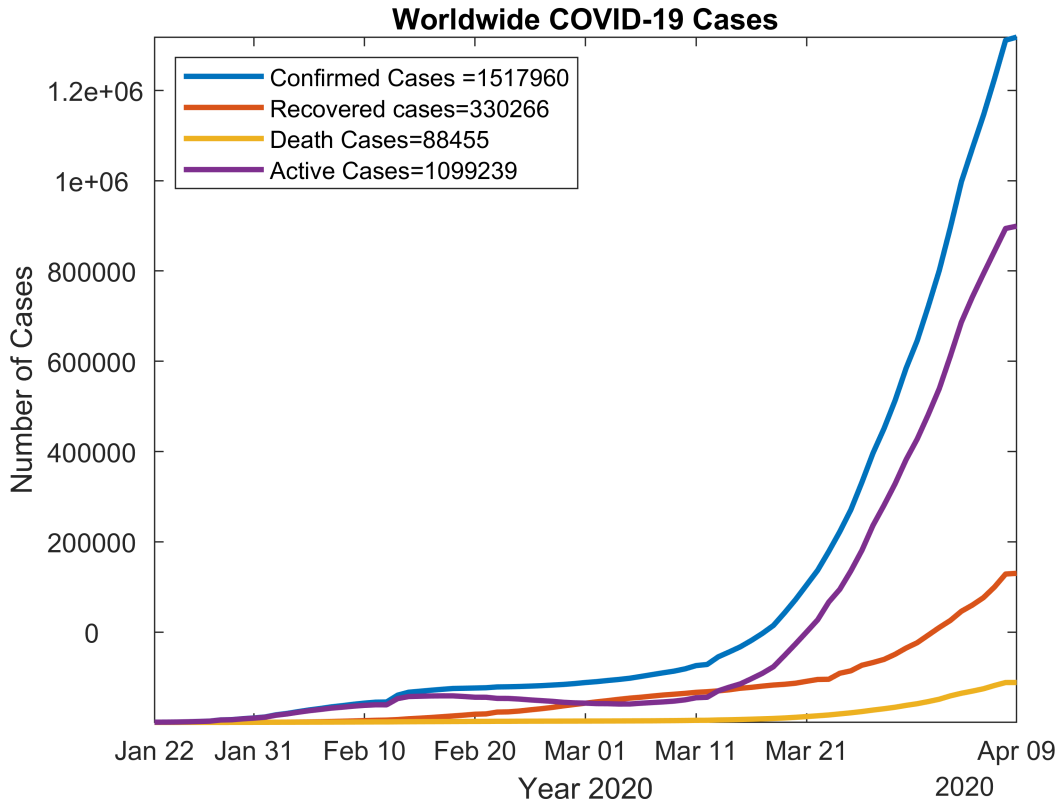
	Date	Confirmed	Recovered	Deaths
45	06-Mar-2020	101794	55797	3460
46	07-Mar-2020	105831	58280	3558
47	08-Mar-2020	109805	60616	3802
48	09-Mar-2020	113571	62416	3988
49	10-Mar-2020	118602	64325	4262
50	11-Mar-2020	125875	66639	4615
51	12-Mar-2020	128353	67956	4720
52	13-Mar-2020	145209	69883	5404
53	14-Mar-2020	156104	72254	5819
54	15-Mar-2020	167454	75664	6440
55	16-Mar-2020	181573	77711	7126
56	17-Mar-2020	197150	80431	7905
57	18-Mar-2020	214909	82802	8733
58	19-Mar-2020	242706	84449	9867
59	20-Mar-2020	272164	86851	11299
60	21-Mar-2020	304519	91094	12973
61	22-Mar-2020	337089	95111	14651
62	23-Mar-2020	378547	95557	16505
63	24-Mar-2020	422574	108879	18894
64	25-Mar-2020	471035	114228	21282
65	26-Mar-2020	531865	126662	24073
66	27-Mar-2020	596312	132676	27342
67	28-Mar-2020	650926	139555	30299
68	29-Mar-2020	712995	150881	33599
69	30-Mar-2020	784659	164783	37768
70	31-Mar-2020	845526	176504	41429
71	01-Apr-2020	921223	193355	46160
72	02-Apr-2020	1001069	210245	51378
73	03-Apr-2020	1095917	225796	58787
74	04-Apr-2020	1197405	246152	64606
75	05-Apr-2020	1272115	260012	69374
76	06-Apr-2020	1345101	276515	74565
77	07-Apr-2020	1426096	300054	81865

	Date	Confirmed	Recovered	Deaths
78	08-Apr-2020	1511104	328661	88338
79	09-Apr-2020	1517960	330266	88455

Above data is preview of table, total data is from 23-02-2020 to 09-04-2020

Plot current status of world

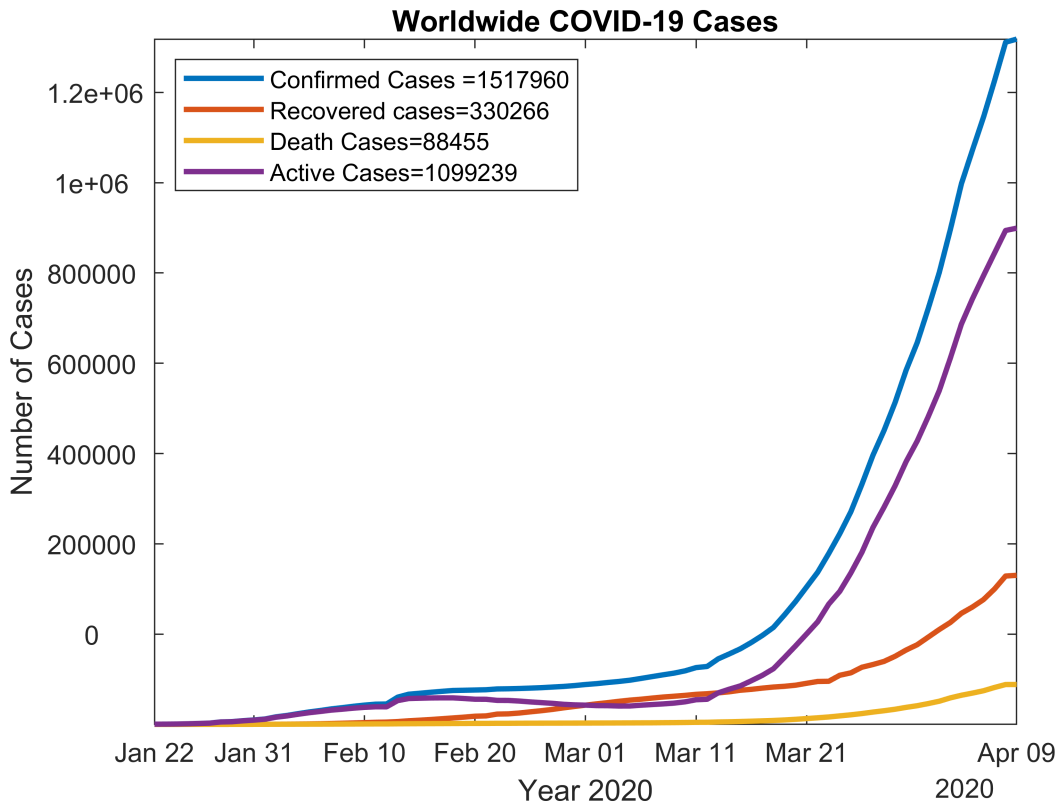
```
plot(worldData.Date,[worldData.Confirmed,worldData.Recovered,worldData.Deaths,worldData.active_
y_labels = get(gca, 'YTick');
set(gca, 'YTickLabel', y_labels);

legend(['Confirmed Cases ','=',num2str(worldData.Confirmed(end))],...
['Recovered cases','=',num2str(worldData.Recovered(end))],...
    ['Death Cases','=',num2str(worldData.Deaths(end))],...
    ['Active Cases','=',num2str(worldData.active_cases(end))], 'Location','northwest')
axis tight
xticks([worldData.Date(1) worldData.Date(10:10:(end-10))' worldData.Date(end)])
title('Worldwide COVID-19 Cases')
xlabel("Year 2020")
ylabel("Number of Cases")
```



Key Countries Analysis

Top 8 countries who have maximum COVID-19 Patients (Confirmed, Recovered,Death and Active cases)

```
plot(worldData.Date,[worldData.Confirmed,worldData.Recovered,worldData.Deaths,worldData.active_
y_labels = get(gca, 'YTick');
set(gca, 'YTickLabel', y_labels);

legend(['Confirmed Cases ','=',num2str(worldData.Confirmed(end))],...
['Recovered cases','=',num2str(worldData.Recovered(end))],...
    ['Death Cases','=',num2str(worldData.Deaths(end))],...
    ['Active Cases','=',num2str(worldData.active_cases(end))], 'Location','northwest')
axis tight
xticks([worldData.Date(1) worldData.Date(10:10:(end-10))' worldData.Date(end)])
title('Worldwide COVID-19 Cases')

xlim([datetime(2020,1,22,0,0,0)...
      datetime(2020,4,9,0,0,0)])
ylim([17 1517960])
xlabel("Year 2020")
ylabel("Number of Cases")
```




```
disp("China, US, United_Kingdom, Italy, France, Germany, Spain and Iran")
```

```
China, US, United_Kingdom, Italy, France, Germany, Spain and Iran
```

Plot current confirmed cases of key countries

```
keyCountires=readtable('key-countries-pivoted.xlsx')
```

keyCountires = 78×9 table

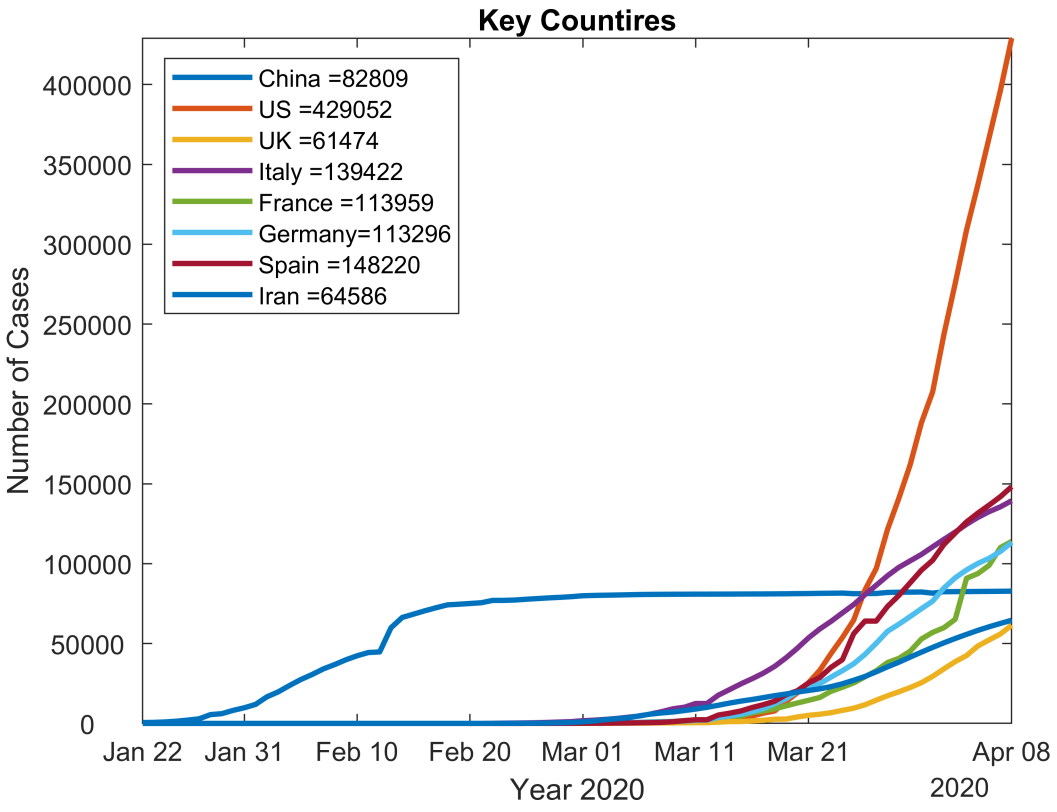
...

	Date	China	US	United_Kingdom	Italy	France	Germany
1	22-Jan-2020	548	1	0	0	0	0
2	23-Jan-2020	643	1	0	0	0	0
3	24-Jan-2020	920	2	0	0	2	0
4	25-Jan-2020	1406	2	0	0	3	0
5	26-Jan-2020	2075	5	0	0	3	0
6	27-Jan-2020	2877	5	0	0	3	1
7	28-Jan-2020	5509	5	0	0	4	4
8	29-Jan-2020	6087	5	0	0	5	4
9	30-Jan-2020	8141	5	0	0	5	4
10	31-Jan-2020	9802	7	2	2	5	5
11	01-Feb-2020	11891	8	2	2	6	8
12	02-Feb-2020	16630	8	2	2	6	10
13	03-Feb-2020	19716	11	2	2	6	12
14	04-Feb-2020	23707	11	2	2	6	12
15	05-Feb-2020	27440	11	2	2	6	12
16	06-Feb-2020	30587	11	2	2	6	12
17	07-Feb-2020	34110	11	3	3	6	13
18	08-Feb-2020	36814	11	3	3	11	13
19	09-Feb-2020	39829	11	3	3	11	14
20	10-Feb-2020	42354	11	8	3	11	14
21	11-Feb-2020	44386	12	8	3	11	16
22	12-Feb-2020	44759	12	9	3	11	16
23	13-Feb-2020	59895	13	9	3	11	16
24	14-Feb-2020	66358	13	9	3	11	16
25	15-Feb-2020	68413	13	9	3	12	16
26	16-Feb-2020	70513	13	9	3	12	16
27	17-Feb-2020	72434	13	9	3	12	16
28	18-Feb-2020	74211	13	9	3	12	16
29	19-Feb-2020	74619	13	9	3	12	16
30	20-Feb-2020	75077	13	9	3	12	16
31	21-Feb-2020	75550	15	9	20	12	16

	Date	China	US	United_Kingdom	Italy	France	Germany
32	22-Feb-2020	77001	15	9	62	12	16
33	23-Feb-2020	77022	15	9	155	12	16
34	24-Feb-2020	77241	51	13	229	12	16
35	25-Feb-2020	77754	51	13	322	14	17
36	26-Feb-2020	78166	57	13	453	18	27
37	27-Feb-2020	78600	58	15	655	38	46
38	28-Feb-2020	78928	60	20	888	57	48
39	29-Feb-2020	79356	68	23	1128	100	79
40	01-Mar-2020	79932	74	36	1694	130	130
41	02-Mar-2020	80136	98	40	2036	191	159
42	03-Mar-2020	80261	118	51	2502	204	196
43	04-Mar-2020	80386	149	86	3089	288	262
44	05-Mar-2020	80537	217	116	3858	380	482
45	06-Mar-2020	80690	262	164	4636	656	670
46	07-Mar-2020	80770	402	207	5883	959	799
47	08-Mar-2020	80823	518	274	7375	1136	1040
48	09-Mar-2020	80860	583	322	9172	1219	1176
49	10-Mar-2020	80887	959	384	10149	1794	1457
50	11-Mar-2020	80921	1281	459	12462	2293	1908
51	12-Mar-2020	80932	1663	459	12462	2293	2078
52	13-Mar-2020	80945	2179	802	17660	3681	3675
53	14-Mar-2020	80977	2727	1144	21157	4496	4585
54	15-Mar-2020	81003	3499	1145	24747	4532	5795
55	16-Mar-2020	81033	4632	1551	27980	6683	7272
56	17-Mar-2020	81058	6421	1960	31506	7715	9257
57	18-Mar-2020	81102	7783	2642	35713	9124	12327
58	19-Mar-2020	81156	13677	2716	41035	10970	15320
59	20-Mar-2020	81250	19100	4014	47021	12758	19848
60	21-Mar-2020	81305	25489	5067	53578	14463	22213
61	22-Mar-2020	81435	33276	5745	59138	16243	24873
62	23-Mar-2020	81498	43847	6726	63927	20123	29056
63	24-Mar-2020	81591	53740	8164	69176	22622	32986
64	25-Mar-2020	81218	64675	9529	74386	25342	37323

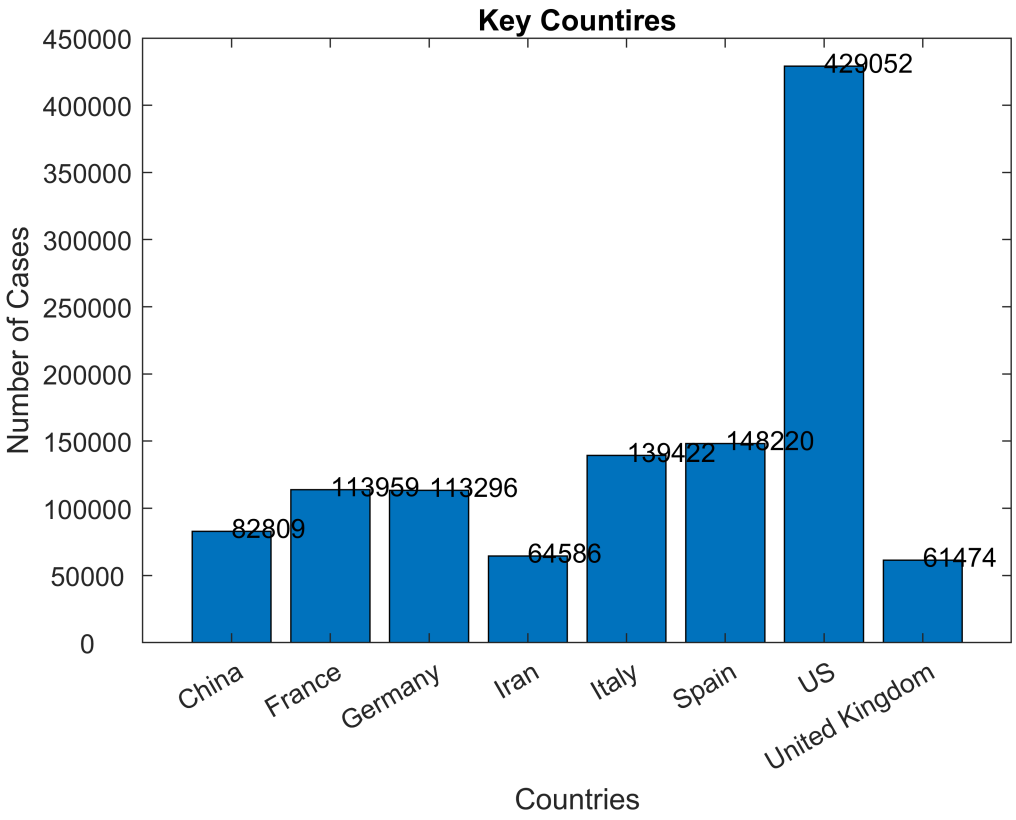
	Date	China	US	United_Kingdom	Italy	France	Germany
65	26-Mar-2020	81285	83545	11658	80589	29155	43211
66	27-Mar-2020	81340	96968	14543	86498	32964	50178
67	28-Mar-2020	81999	121478	17312	92472	38105	57695
68	29-Mar-2020	82122	140886	19780	97689	40708	62095
69	30-Mar-2020	82198	161807	22453	101739	45170	66885
70	31-Mar-2020	82279	188172	25481	105792	52827	71808
71	01-Apr-2020	81554	207613	29474	110574	56989	76544
72	02-Apr-2020	82432	243616	34173	115242	59929	84794
73	03-Apr-2020	82511	275586	38689	119827	65202	91159
74	04-Apr-2020	82543	308850	42477	124632	90848	96092
75	05-Apr-2020	82602	337072	48436	128948	93773	100123
76	06-Apr-2020	82665	366667	52279	132547	98963	103374
77	07-Apr-2020	82718	396223	55949	135586	110065	107663
78	08-Apr-2020	82809	429052	61474	139422	113959	113296

```
plot(keyCountires.Date,[keyCountires.China,keyCountires.US,...
    keyCountires.United_Kingdom,keyCountires.Italy,...
    keyCountires.France,keyCountires.Germany,...
    keyCountires.Spain,keyCountires.Iran],...
    'LineWidth',2)
y_labels = get(gca, 'YTick');
set(gca, 'YTickLabel', y_labels)
xticks([keyCountires.Date(1) keyCountires.Date(10:10:(end-10))' keyCountires.Date(end)])
axis tight

legend(['China ','=',num2str(keyCountires.China(end))],...
    [ 'US ','=',num2str(keyCountires.US(end))],...
    [ 'UK ','=',num2str(keyCountires.United_Kingdom(end))],...
    [ 'Italy ','=',num2str(keyCountires.Italy(end))],...
    [ 'France ','=',num2str(keyCountires.France(end))],...
    [ 'Germany','=',num2str(keyCountires.Germany(end))],...
    [ 'Spain ','=',num2str(keyCountires.Spain(end))],...
    [ 'Iran ','=',num2str(keyCountires.Iran(end))], 'Location','northwest')
title('Key Countires')
xlabel("Year 2020")
ylabel("Number of Cases")
```



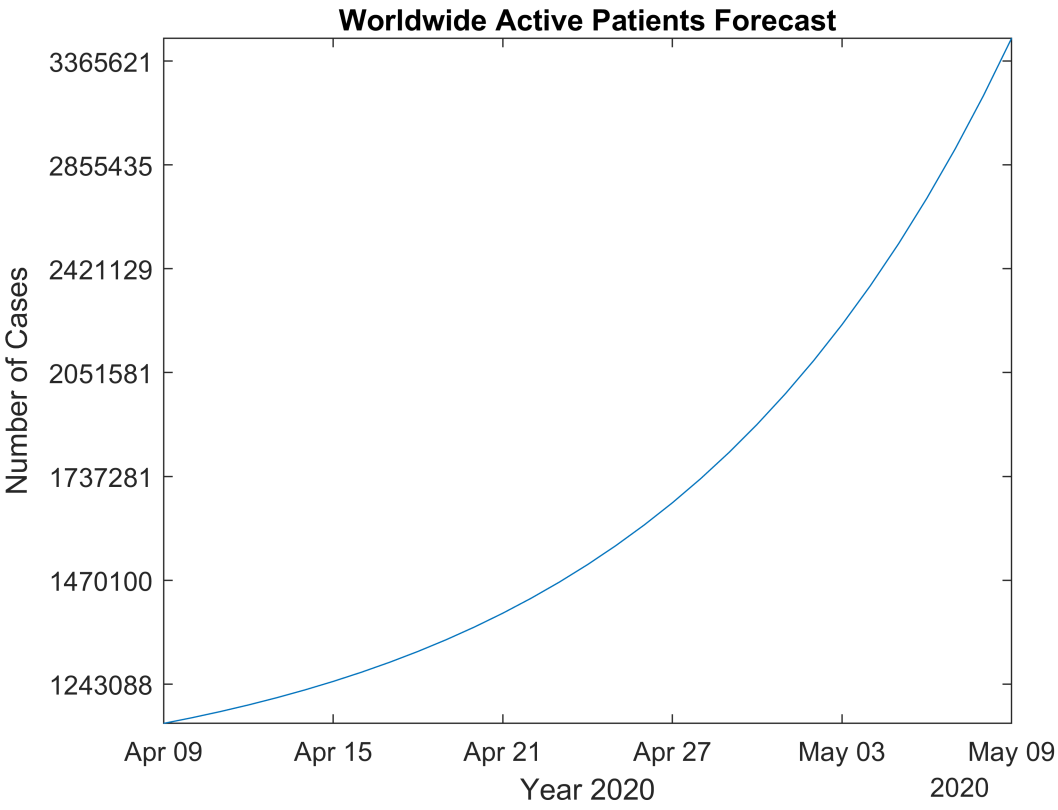
Bar plot of key countires

```
Key_Countries=categorical({'China','US','United Kingdom','Italy',...
    'France','Germany','Spain','Iran'});
bar(Key_Countries,[keyCountires.China(end),keyCountires.US(end),...
keyCountires.United_Kingdom(end),...
    keyCountires.Italy(end),...
    keyCountires.France(end),keyCountires.Germany(end),...
keyCountires.Spain(end),keyCountires.Iran(end)])
text(Key_Countries,[keyCountires.China(end),...
keyCountires.US(end),keyCountires.United_Kingdom(end),...
    keyCountires.Italy(end),...
    keyCountires.France(end),keyCountires.Germany(end)...
,keyCountires.Spain(end),keyCountires.Iran(end)]+3000,...
   string( ceil([keyCountires.China(end),keyCountires.US(end),keyCountires.United_Kingdom(end),
    keyCountires.Italy(end),...
    keyCountires.France(end),keyCountires.Germany(end),...
keyCountires.Spain(end),keyCountires.Iran(end)])))
y_labels = get(gca, 'YTick');
set(gca, 'YTickLabel', y_labels)
axis 'auto x'
title('Key Countires')
xlabel("Countries")
ylabel("Number of Cases")
```



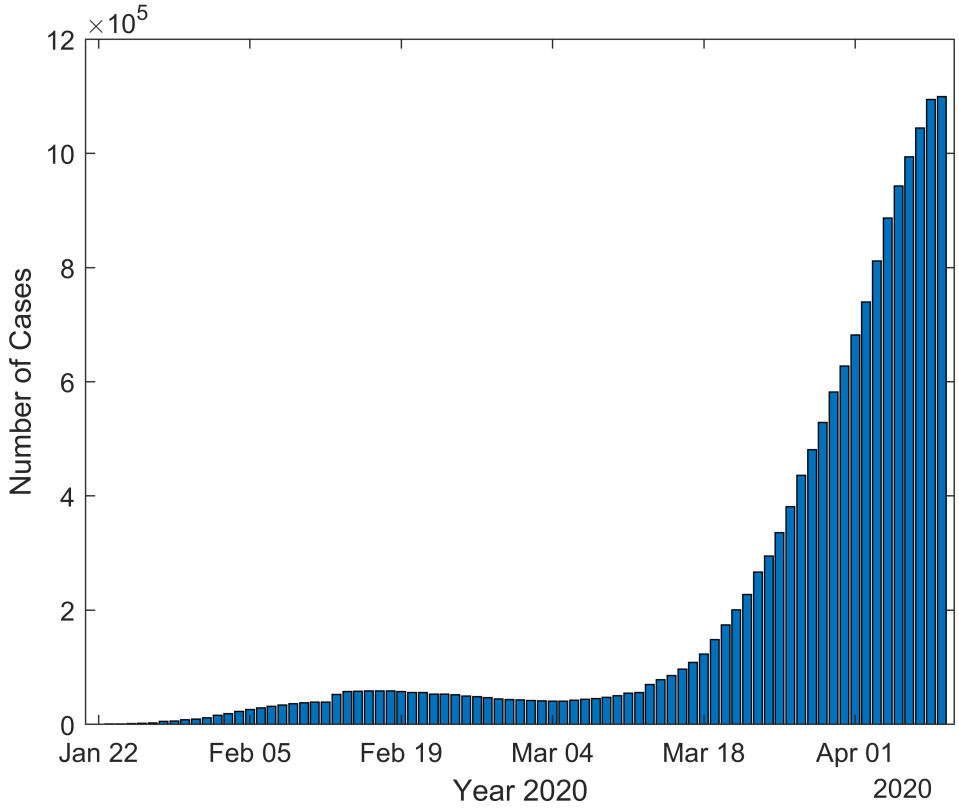
Forecasting Worldwide for next one month using Nonlinear Least Squre Method

```
t=[1:length(worldData.Date)]';

[xData, yData] = prepareCurveData( t, worldData.active_cases );

ft = fittype( 'exp2' );
opts = fitoptions( 'Method', 'NonlinearLeastSquares' );
opts.Display = 'Off';
opts.StartPoint = [-111133.257565926 0.0441743219546307 96590.5673106364 0.0490456238054553];

[fitresult, gof] = fit( xData, yData, ft, opts );

pred=fitresult(t(end):t(end)+30);
datee=worldData.Date(end):worldData.Date(end)+day(30);
plot(datee',ceil(pred))


axis tight
yticklabels(num2str([ceil(pred(1:2:end));ceil(pred(end))]))
title('Worldwide Active Patients Forecast')
xlabel("Year 2020")
ylabel("Number of Cases")
```

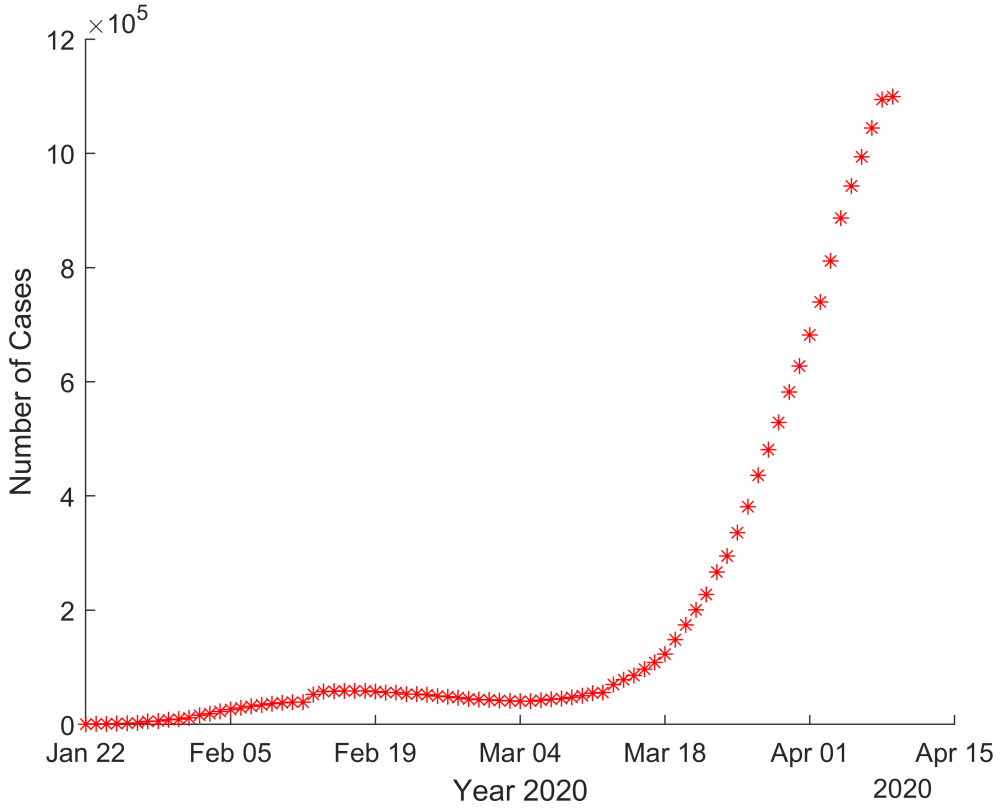


Other Visualization

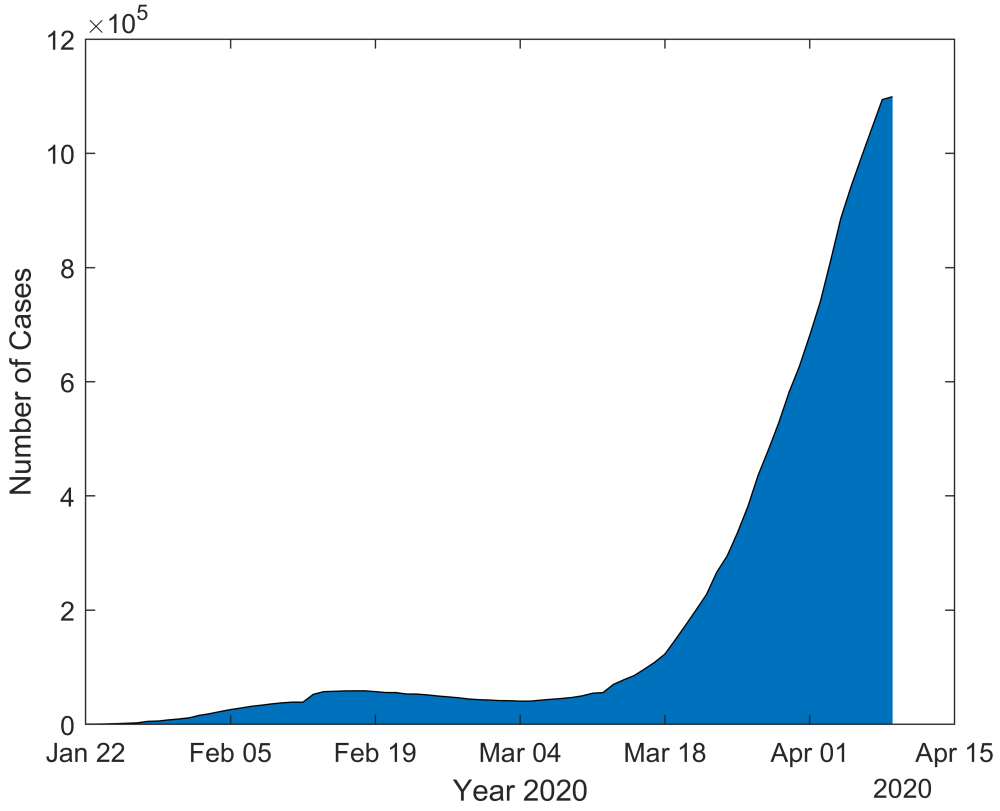
```
bar(worldData.Date,worldData.active_cases,'DisplayName','worldData.active_cases')
xlabel("Year 2020")
ylabel("Number of Cases")
```




```
scatter(worldData.Date,worldData.active_cases,"red","*")
xlabel("Year 2020")
ylabel("Number of Cases")
```




```
area(worldData.Date,worldData.active_cases,'DisplayName','worldData.active_cases')
xlabel("Year 2020")
ylabel("Number of Cases")
```



As per above figure you can see till 9th May 2020 total COVID-19 patients are showing 14440000, but all countries are taking proper action to fight against corona so lets hope this graph will fall down.