Given the attached dataset, the following tasks are to be performed:

1. Identify which classification methodology can be used to build a prediction model which can predict the expected new infected and new death by Coronavirus in the future.

   Linear regression is the perfect classification methodology to predict a numeric prediction, it uses x = "Days" and y=" New Cases" or "New deaths" to build the model, after that we get to predict new cases or new deaths for a given day, for example:

- *This is a prediction of new cases for USA in the 25th day of the virus:*

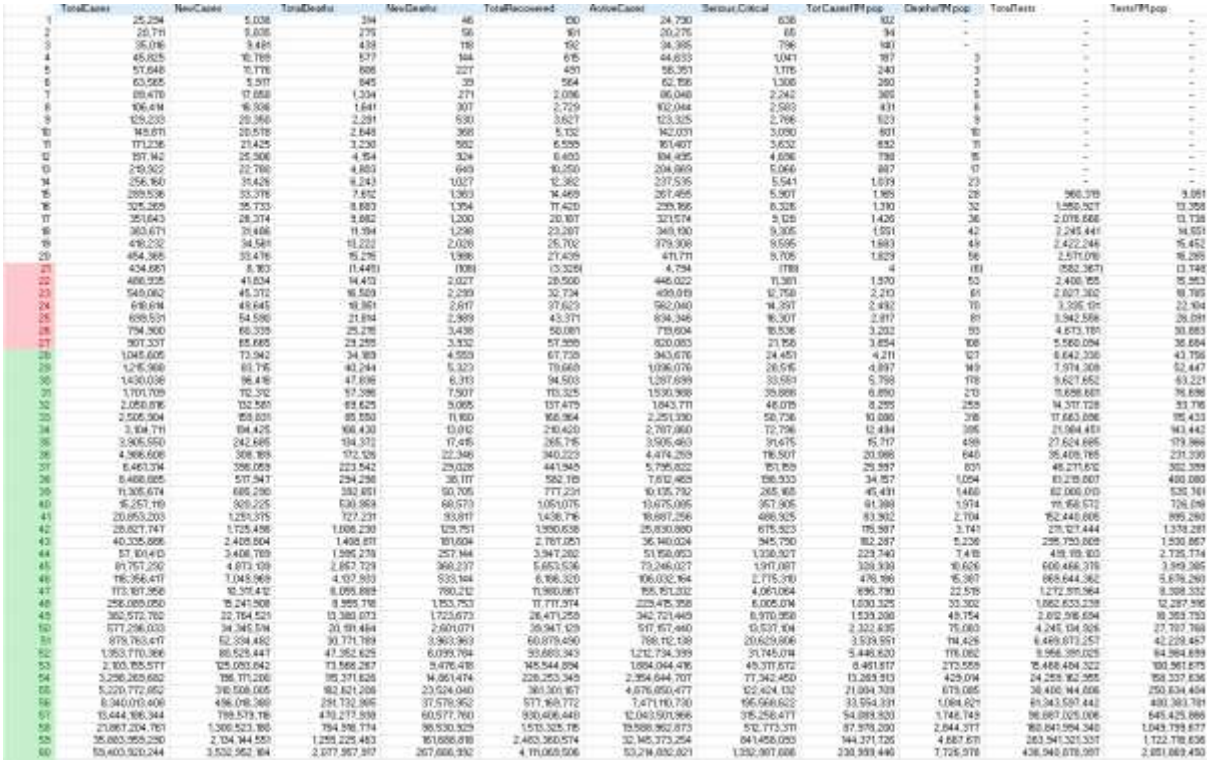
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	25
5594	4824	9339	10188	11122	5786	24793	16290	21853	19913	20297	24742	21903	34444	32284	34196	24774	30873	33331	34592	44444.18

2. Try to use the attached data to build the model from a different perspective (Saudi Arabia in one the week, Saudi Arabia in all days, North Americas countries (US, Canada) for one-week, North Americas countries (US, Canada) for all days, all world in one week, all world in all days)

   Saudi Arabia:
   One-week: Green
   All days: Yellow

	TotalCases	NewCases	TotalDeaths	NewDeaths	TotalRecovered	ActiveCases	Serious,Critical	Tot Cases/1M pop	Tot Deaths/1M pop
1	344	70			8	336		10	
2	392	48			16	376		11	
3	511	119			17	494		15	
4	562	51			19	543		16	
5	767	205	1	1	28	738		22	0.03
6	900	133	2	1	29	869		26	0.06
7	1,012	112	3	1	33	976	6	29	0.09
8	1,203	99	4	1	37	1,162	6	35	0.1
9	1,299	96	8	4	66	1,225	12	37	0.2
10	1,453	154	8		115	1,330	12	42	0.2
11	1,563	110	10	2	165	1,388	31	45	0.3
12	1,720	157	16	6	264	1,440	31	49	0.5
13	1,885	165	21	5	328	1,536	31	54	0.6
14	2,039	154	25	4	351	1,663	41	59	0.7
15	2,179	140	29	4	420	1,730	41	63	0.8
16	2,402	223	34	5	488	1,880	41	69	1
17	2,605	203	38	4	551	2,016	41	75	1
18	2,795	190	41	3	615	2,139	41	80	1
19	2,932	137	41		631	2,260	41	84	1
20	2,973	195	45	5	600	2,332	53	85	1
21	3,119	201	48	6	638	2,439	56	90	1
22	3,266	207	51	6	676	2,545	59	94	1
23	3,413	213	55	6	714	2,651	63	98	1
24	3,560	219	58	7	751	2,758	66	102	2
25	3,707	225	61	7	789	2,864	70	106	2
26	3,854	231	65	7	827	2,970	73	111	2
27	4,001	237	68	7	865	3,077	76	115	2
28	4,148	243	71	8	903	3,183	80	119	2
29	4,295	249	74	8	941	3,290	83	123	2
30	4,442	255	78	8	979	3,396	87	128	2
31	4,589	261	81	9	1,017	3,502	90	132	2
32	4,736	267	84	9	1,055	3,609	93	136	2
33	4,883	273	88	9	1,093	3,715	97	140	2
34	5,030	279	91	9	1,131	3,821	100	144	2
35	5,176	284	94	10	1,169	3,928	104	149	2
36	5,323	290	97	10	1,207	4,034	107	153	3
37	5,470	296	101	10	1,245	4,140	110	157	3
38	5,617	302	104	11	1,283	4,247	114	161	3
39	5,764	308	107	11	1,321	4,353	117	166	3
40	5,911	314	110	11	1,359	4,460	121	170	3
41	6,058	320	114	11	1,397	4,566	124	174	3
42	6,205	326	117	12	1,435	4,672	127	178	3
43	6,352	332	120	12	1,473	4,779	131	182	3
44	6,499	338	124	12	1,511	4,885	134	187	3
45	6,646	344	127	12	1,549	4,991	138	191	3
46	6,793	350	130	13	1,587	5,098	141	195	3
47	6,940	356	133	13	1,625	5,204	144	199	3
48	7,086	362	137	13	1,663	5,311	148	203	4
49	7,233	368	140	14	1,700	5,417	151	208	4
50	7,380	374	143	14	1,738	5,523	154	212	4

North America:
One-week: Red
All-Days: Green



3. Explain in detail your finding and justify your method.
   We find that according to our prediction, all increases with time in both North America and Saudi Arabia with the exception of the total death per 1m pop in Saudi Arabia being relatively stable and controlled.

4. If you can use more than one model, choosing the best model, and justify your chosen model using the validation techniques (hold out or 10x cross validation)
   The validation techniques lack a class for application.

5. Measure the accuracy of the used model.

   Total Cases: 43%
   New Cases: 56%
   Total Deaths: 12%
   New Deaths: 17%
   Total Recovered: 26%
   Active Cases: 48%
   Serious: 32%

6. Using the clustering methodologies, grouped the county into three levels of risk (High, Medium, Low) using the mean for one round only,

We used the k-means clustering method to group the countries into three groups (high, medium, low), the grouping was placed on the ground of "Total cases" of the last day "8th" of the given data:

- *Our initial clustering explained:*

Initial explained
high > 50000
medium >= 5000
low < 5000

- *Note:*

NOTE:
high = C1
medium = C2
low = C3

- *The grouping using k-means in full details:*

Country,Other	8	initial cluster	avg c=	D(P,high)	D(P,medium)	D(P,low)	min	1st
USA	434927	high	144492	290435	422845	434329	290435	high
Italy	139422	high		5070	127340	138824	5070	high
China	81802	high		62690	69720	81204	62690	high
Spain	148220	high		3728	136138	147622	3728	high
Germany	113296	high		31196	101214	112698	31196	high
France	112950	high		31542	100868	112352	31542	high
Iran	64586	high		79906	52504	63988	52504	medium
UK	60733	high		83759	48651	60135	48651	medium
Switzerland	23280	medium	12081.61905	121212	11198	22682	11198	medium
Netherlands	20549	medium		123943	8467	19951	8467	medium
Belgium	23403	medium		121089	11321	22805	11321	medium
S. Korea	10384	medium		134108	1698	9786	1698	medium
Turkey	38226	medium		106266	26144	37628	26144	medium
Austria	12942	medium		131550	860	12344	860	medium
Canada	19438	medium		125054	7356	18840	7356	medium
Portugal	13141	medium		131351	1059	12543	1059	medium
Norway	6042	medium		138450	6040	5444	5444	low
Brazil	16188	medium		128304	4106	15590	4106	medium
Israel	9404	medium		135088	2678	8806	2678	medium
Australia	6052	medium		138440	6030	5454	5454	low
Sweden	8419	medium		136073	3663	7821	3663	medium
Czechia	5312	medium		139180	6770	4714	4714	low
Ireland	6074	medium		138418	6008	5476	5476	low
Malaysia	4119			140373	7963	3521	3521	low
Denmark	5402	medium		139090	6680	4804	4804	low
Chile	5546	medium		138946	6536	4948	4948	low
Luxembourg	3034	low	598.3756906	141458	9048	2436	2436	low
Ecuador	4450	low		140042	7632	3852	3852	low
Japan	4667	low		139825	7415	4069	4069	low
Poland	5205	medium		139287	6877	4607	4607	low
Romania	4761	low		139731	7321	4163	4163	low
Pakistan	4263	low		140229	7819	3665	3665	low
Russia	8672	medium		135820	3410	8074	3410	medium
Philippines	3870	low		140622	8212	3272	3272	low
Thailand	2369	low		142123	9713	1771	1771	low

Saudi Arabia	2932	low	141560	9150	2334	2334	low
Indonesia	2956	low	141536	9126	2358	2358	low
South Africa	1845	low	142647	10237	1247	1247	low
Finland	2487	low	142005	9595	1889	1889	low
Greece	1884	low	142608	10198	1286	1286	low
India	5916	medium	138576	6166	5318	5318	low
Iceland	1616	low	142876	10466	1018	1018	low
Panama	2528	low	141964	9554	1930	1930	low
Dominican Republic	2111	low	142381	9971	1513	1513	low
Peru	4342	low	140150	7740	3744	3744	low
Mexico	2785	low	141707	9297	2187	2187	low
Singapore	1623	low	142869	10459	1025	1025	low
Argentina	1795	low	142697	10287	1197	1197	low
Serbia	2666	low	141826	9416	2068	2068	low
Slovenia	1091	low	143401	10991	493	493	low
Croatia	1343	low	143149	10739	745	745	low
Diamond Princess	712	low	143780	11370	114	114	low
Colombia	2054	low	142438	10028	1456	1456	low
Estonia	1185	low	143307	10897	587	587	low
Hong Kong	961	low	143531	11121	363	363	low
Qatar	2210	low	142282	9872	1612	1612	low
Egypt	1560	low	142932	10522	962	962	low
UAE	2659	low	141833	9423	2061	2061	low
Iraq	1202	low	143290	10880	604	604	low
New Zealand	1210	low	143282	10872	612	612	low
Algeria	1572	low	142920	10510	974	974	low
Bahrain	823	low	143669	11259	225	225	low
Morocco	1275	low	143217	10807	677	677	low
Ukraine	1668	low	142824	10414	1070	1070	low
Lithuania	912	low	143580	11170	314	314	low
Lebanon	576	low	143916	11506	22	22	low
Armenia	881	low	143611	11201	283	283	low
Hungary	895	low	143597	11187	297	297	low

Latvia	577	low	143915	11505	21	21	low
Bulgaria	593	low	143899	11489	5	5	low
Andorra	564	low	143928	11518	34	34	low
Bosnia and Herzegovina	804	low	143688	11278	206	206	low
Botswana	6	low	144486	12076	592	592	low
Costa Rica	502	low	143990	11580	96	96	low
Slovakia	682	low	143810	11400	84	84	low
Tunisia	628	low	143864	11454	30	30	low
Uruguay	456	low	144036	11626	142	142	low
Taiwan	379	low	144113	11703	219	219	low
Kazakhstan	727	low	143765	11355	129	129	low
Moldova	1174	low	143318	10908	576	576	low
Jordan	358	low	144134	11724	240	240	low
North Macedonia	617	low	143875	11465	19	19	low
Kuwait	855	low	143637	11227	257	257	low
San Marino	308	low	144184	11774	290	290	low
Burkina Faso	414	low	144078	11668	184	184	low
Cyprus	526	low	143966	11556	72	72	low
Albania	400	low	144092	11682	198	198	low
Azerbaijan	822	low	143670	11260	224	224	low
Vietnam	251	low	144241	11831	347	347	low
Western Sahara	4	low	144488	12078	594	594	low
Réunion	362	low	144130	11720	236	236	low
Oman	419	low	144073	11663	179	179	low
Ivory Coast	384	low	144108	11698	214	214	low
Faeroe Islands	184	low	144308	11898	414	414	low
Ghana	313	low	144179	11769	285	285	low
Malta	299	low	144193	11783	299	299	low

Uzbekistan	545	low	143947	11537	53	53	low
Senegal	244	low	144248	11838	354	354	low
Cuba	457	low	144035	11625	141	141	low
Cameroon	730	low	143762	11352	132	132	low
Brunei	135	low	144357	11947	463	463	low
Afghanistan	444	low	144048	11638	154	154	low
Venezuela	167	low	144325	11915	431	431	low
Sri Lanka	189	low	144303	11893	409	409	low
Nigeria	276	low	144216	11806	322	322	low
Honduras	312	low	144180	11770	286	286	low
Palestine	263	low	144229	11819	335	335	low
Channel Islands	351	low	144141	11731	247	247	low
Mauritius	273	low	144219	11809	325	325	low
Guadeloupe	141	low	144351	11941	457	457	low
Cambodia	117	low	144375	11965	481	481	low
Belarus	1066	low	143426	11016	468	468	low
Martinique	154	low	144338	11928	444	444	low
Georgia	211	low	144281	11871	387	387	low
Montenegro	248	low	144244	11834	350	350	low
Kyrgyzstan	270	low	144222	11812	328	328	low
Bolivia	210	low	144282	11872	388	388	low
DRC	180	low	144312	11902	418	418	low
Trinidad and Tobago	107	low	144385	11975	491	491	low
Rwanda	110	low	144382	11972	488	488	low
Gibraltar	120	low	144372	11962	478	478	low
Mayotte	184	low	144308	11898	414	414	low
Paraguay	119	low	144373	11963	479	479	low
Liechtenstein	78	low	144414	12004	520	520	low
Aruba	77	low	144415	12005	521	521	low

Bangladesh	218	low	144274	11864	380	380	low
Monaco	81	low	144411	12001	517	517	low
French Guiana	83	low	144409	11999	515	515	low
Kenya	179	low	144313	11903	419	419	low
Isle of Man	158	low	144334	11924	440	440	low
Madagascar	93	low	144399	11989	505	505	low
Malawi	8	low	144484	12074	590	590	low
Macao	45	low	144447	12037	553	553	low
Guatemala	87	low	144405	11995	511	511	low
Uganda	53	low	144439	12029	545	545	low
Barbados	63	low	144429	12019	535	535	low
Jamaica	63	low	144429	12019	535	535	low
French Polynesia	51	low	144441	12031	547	547	low
Zambia	39	low	144453	12043	559	559	low
Togo	70	low	144422	12012	528	528	low
El Salvador	93	low	144399	11989	505	505	low
Bermuda	39	low	144453	12043	559	559	low
Ethiopia	55	low	144437	12027	543	543	low
Congo	45	low	144447	12037	553	553	low
Mali	59	low	144433	12023	539	539	low
Djibouti	135	low	144357	11947	463	463	low
Niger	342	low	144150	11740	256	256	low
Maldives	19	low	144473	12063	579	579	low
Guinea	164	low	144328	11918	434	434	low
New Caledonia	18	low	144474	12064	580	580	low
Haiti	27	low	144465	12055	571	571	low
Tanzania	25	low	144467	12057	573	573	low
Bahamas	40	low	144452	12042	558	558	low
Equatorial Guinea	18	low	144474	12064	580	580	low
Mongolia	16	low	144476	12066	582	582	low
Cayman Islands	45	low	144447	12037	553	553	low

Eritrea	33	low	144459	12049	565	565	low
Saint Martin	32	low	144460	12050	566	566	low
Dominica	15	low	144477	12067	583	583	low
Namibia	16	low	144476	12066	582	582	low
Greenland	11	low	144481	12071	587	587	low
Myanmar	22	low	144470	12060	576	576	low
Eswatini	12	low	144480	12070	586	586	low
Grenada	12	low	144480	12070	586	586	low
Syria	19	low	144473	12063	579	579	low
Saint Lucia	14	low	144478	12068	584	584	low
Suriname	10	low	144482	12072	588	588	low
Curaçao	14	low	144478	12068	584	584	low
Seychelles	11	low	144481	12071	587	587	low
Sierra Leone	7	low	144485	12075	591	591	low
Mozambique	17	low	144475	12065	581	581	low
Laos	15	low	144477	12067	583	583	low
Guyana	37	low	144455	12045	561	561	low
Libya	21	low	144471	12061	577	577	low
Gabon	34	low	144458	12048	564	564	low
Antigua and Barbuda	19	low	144473	12063	579	579	low
Zimbabwe	11	low	144481	12071	587	587	low
Angola	19	low	144473	12063	579	579	low
Benin	26	low	144466	12056	572	572	low
Cabo Verde	7	low	144485	12075	591	591	low
Vatican City	8	low	144484	12074	590	590	low
Sint Maarten	40	low	144452	12042	558	558	low
Sudan	14	low	144478	12068	584	584	low
Fiji	15	low	144477	12067	583	583	low
Montserrat	9	low	144483	12073	589	589	low
St. Barth	6	low	144486	12076	592	592	low

Nepal	9	low	144483	12073	589	589	low
Mauritania	6	low	144486	12076	592	592	low
Nicaragua	6	low	144486	12076	592	592	low
Turks and Caicos	8	low	144484	12074	590	590	low
Gambia	4	low	144488	12078	594	594	low
Bhutan	5	low	144487	12077	593	593	low
CAR	8	low	144484	12074	590	590	low
Liberia	31	low	144461	12051	567	567	low
Chad	10	low	144482	12072	588	588	low
Somalia	12	low	144480	12070	586	586	low
Anguilla	3	low	144489	12079	595	595	low
Guinea-Bissau	33	low	144459	12049	565	565	low
Belize	8	low	144484	12074	590	590	low
Saint Kitts and Nevis	11	low	144481	12071	587	587	low
MS Zaandam	9	low	144483	12073	589	589	low
St. Vincent Grenadines	8	low	144484	12074	590	590	low
British Virgin Islands	3	low	144489	12079	595	595	low
Burundi	3	low	144489	12079	595	595	low
Caribbean Netherlands	2	low	144490	12080	596	596	low
Falkland Islands	5	low	144487	12077	593	593	low
Papua New Guinea	2	low	144490	12080	596	596	low
Saint Pierre Miquelon	1	low	144491	12081	597	597	low
South Sudan	2	low	144490	12080	596	596	low
Timor-Leste	1	low	144491	12081	597	597	low

7. After you cluster the data, chooses two different countries from each level, and build a dendrogram to cluster the country into groups using a single link.

- *Countries chosen from each group for dendrogram are as follows:*
  High: Italy, China
  Medium: Turkey, Canada
  Low: Mexico, Cyprus

- *Total cases for each country, and distance matrix:*

High			Medium			Low	
italy	china		Turkey	Canada		Mexico	Cyprus
139422	81802		38226	19438		2785	526

	italy	china	turkey	canada	mexico	cyprus
italy	0					
china	57620	0				
turkey	101196	43576	0			
canada	119984	62364	18788	0		
mexico	136637	79017	35441	16653	0	
cyprus	138896	81276	37700	18912	2259	0

- *Dendrogram:*