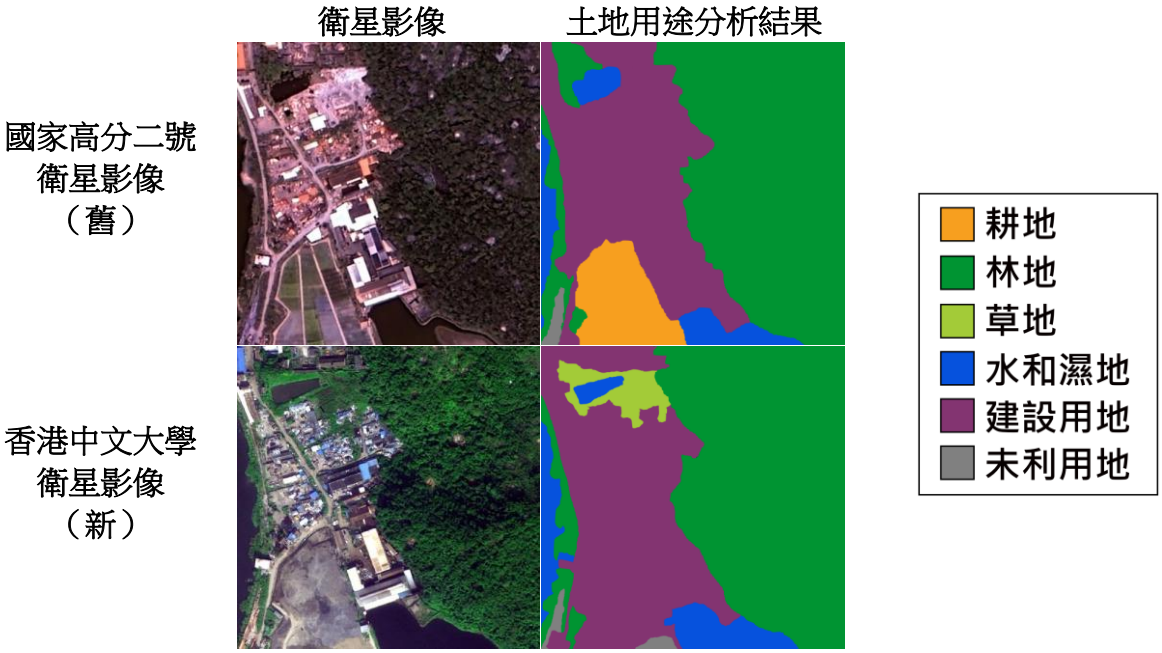
暢想未來發展

過去數十年，全球許多地區在各種因素的影響下，經歷了快速發展。分析和監測不同地方的發展變化，對於土地規劃和未來城市設計至關重要。

許多時候，我們可以透過衛星影像進行數據分析。在以下例子中，我們先對國家高分二號衛星在多年前獲取的一幅區域衛星影像進行分析（第一列），得出該區域的土地用途分佈。然後，我們再以香港中文大學衛星於相應區域獲取最新衛星影像並進行土地用途分析（第二列）。透過對比新舊衛星影像的分析結果，我們可以研究該區域在近年的發展變化。



請完成以下任務：

1. 附件 1 顯示的數據為我們透過收集某個不具名的區域過往數十年間的衛星影像並進行分析所得出的結果。請建立數學模型，預測這個區域土地用途的變化趨勢，並就所建立的數學模型作出評價。

2. 請建立數學模型來選出一個中國在農業方面最具發展潛力的地區，並解釋你的觀點。

請列出你所收集的資料。資料要準確並列出來源，論證亦要合乎邏輯。建模過程中所設立的所有假設均需清晰列出。

附件 1

某個不具名區域於過往數十年間的各種土地用途類型（耕地、林地、草地、水和濕地、建設用地、未利用地）的總面積數據。（單位：平方公里）

年份	耕地	林地	草地	水和濕地	建設用地	未利用地
1985	124344.7	6299.71	5137.17	2215.11	16715.44	2387.92
1986	124126.1	6352.181	5067.103	2230.035	16935.22	2389.334
1987	123896.8	6389.885	4997.979	2289.733	17142.59	2383.05
1988	123667.4	6427.589	4928.855	2349.431	17349.97	2376.766
1989	123438	6465.293	4859.731	2409.129	17557.34	2370.482
1990	123197.8	6488.23	4791.55	2513.6	17752.3	2356.5
1991	122729.8	6508.967	4685.036	2575.969	18273.09	2327.122
1992	122258.2	6540.859	4574.124	2622.942	18798.11	2305.757
1993	121786.6	6572.593	4463.054	2669.6	19322.83	2285.334
1994	121315	6604.327	4352.298	2716.416	19847.86	2264.125
1995	120843.4	6636.218	4241.229	2763.389	20372.57	2243.231
1996	120371.7	6667.952	4130.316	2810.205	20897.44	2222.337
1997	119900.3	6699.844	4019.404	2857.021	21422.31	2201.128
1998	119428.7	6731.735	3908.491	2903.994	21947.18	2179.92
1999	118957.1	6763.469	3797.578	2950.809	22472.21	2158.868
2000	118484.8	6802.43	3676.14	3016.32	22999.44	2120.85
2001	117898.5	6812.642	3610.001	3150.955	23508.92	2118.965
2002	117316.2	6801.33	3547.632	3314.182	24044	2076.705
2003	116733.6	6790.019	3485.106	3477.251	24579.39	2034.602
2004	116151.4	6778.865	3422.738	3640.478	25114.79	1991.714
2005	115569	6767.711	3360.212	3803.548	25649.87	1949.611
2006	114986.5	6756.243	3297.843	3966.618	26185.27	1907.508
2007	114404.3	6745.089	3235.475	4129.845	26720.51	1864.777
2008	113821.8	6733.62	3173.106	4293.072	27255.91	1822.517
2009	113239.4	6722.466	3110.58	4456.142	27791.15	1780.257
2010	112640.7	6692.46	3047.74	4665.87	28325.13	1728.1
2011	112067.3	6755.771	2985.057	4749.919	28946.93	1595.036
2012	111494.3	6880.823	2894.725	4788.722	29580.67	1460.716
2013	110918.9	7018.757	2801.879	4824.698	30211.74	1324.039
2014	110343.9	7154.805	2709.504	4861.145	30843.44	1187.205
2015	109772.7	7272.159	2620.742	4901.363	31478.6	1054.455
2016	109201.3	7389.513	2531.981	4941.423	32113.91	921.8628
2017	108629.9	7507.024	2443.219	4981.641	32749.22	788.9562
2018	108058.6	7624.377	2354.458	5021.702	33384.38	656.5209
2019	107487.2	7741.731	2265.696	5061.919	34019.69	523.7714
2020	106922.3	7870.71	2152.27	5090.04	34671.97	392.75

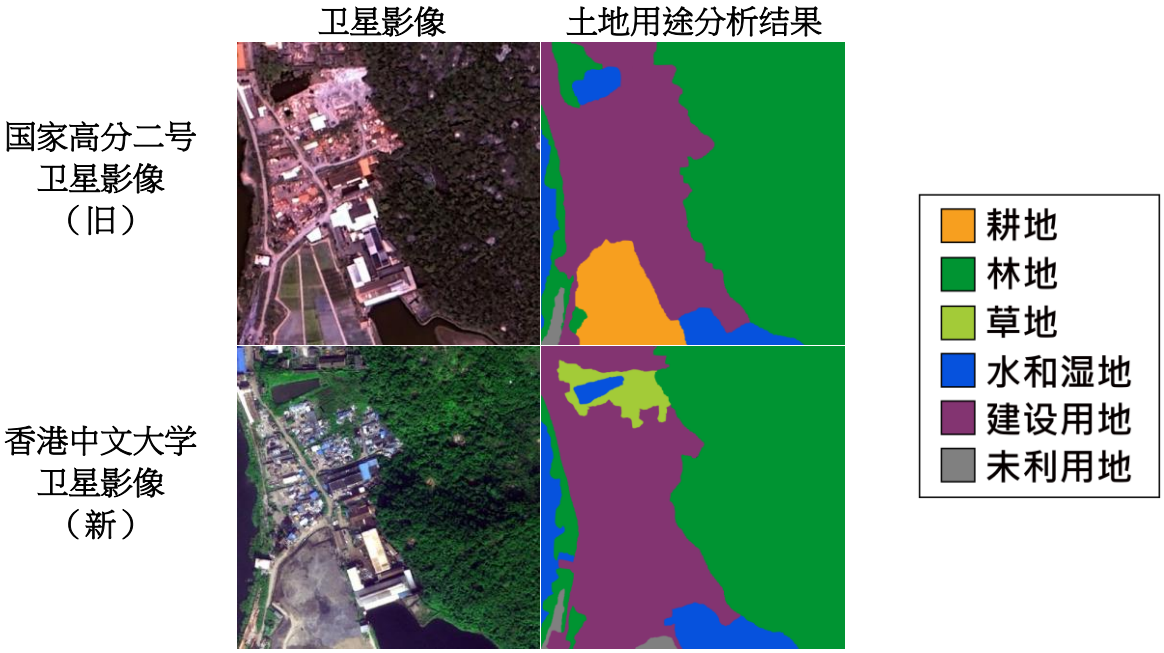
數據集可於以下連結下載：

https://www.math.cuhk.edu.hk/app/mathmodel/files/hsmmc2425_appendix1_tc.xlsx

畅想未来发展

过去数十年，全球许多地区在各种因素的影响下，经历了快速发展。 分析和监测不同地方的发展变化，对于土地规划和未来城市设计至关重要。

许多时候，我们可以通过卫星影像进行数据分析。 在以下例子中，我们先对国家高分二号卫星在多年前获取的一幅区域卫星影像进行分析（第一列），得出该区域的土地用途分布。 然后，我们再以香港中文大学卫星于相应区域获取最新卫星影像并进行土地用途分析（第二列）。 透过对比新旧卫星影像的分析结果，我们可以研究该区域在近年的发展变化。



请完成以下任务：

1. 附件 1 显示的数据为我们通过收集某个不具名的区域过往数十年间的卫星影像并进行分析所得出的结果。 请建立数学模型，预测这个区域土地用途的变化趋势，并就所建立的数学模型作出评价。

2. 请建立数学模型来选出一个中国在农业方面最具发展潜力的地区，并解释你的观点。

请列出你所收集的资料。 资料要准确并列出来源，论证亦要合乎逻辑。 建模过程中所设立的所有假设均需清晰列出。

附件 1

某个不具名区域于过往数十年间的各种土地用途类型（耕地、林地、草地、水和湿地、建设用地、未利用地）的总面积数据。（单位：平方公里）

年份	耕地	林地	草地	水和湿地	建设用地	未利用地
1985	124344.7	6299.71	5137.17	2215.11	16715.44	2387.92
1986	124126.1	6352.181	5067.103	2230.035	16935.22	2389.334
1987	123896.8	6389.885	4997.979	2289.733	17142.59	2383.05
1988	123667.4	6427.589	4928.855	2349.431	17349.97	2376.766
1989	123438	6465.293	4859.731	2409.129	17557.34	2370.482
1990	123197.8	6488.23	4791.55	2513.6	17752.3	2356.5
1991	122729.8	6508.967	4685.036	2575.969	18273.09	2327.122
1992	122258.2	6540.859	4574.124	2622.942	18798.11	2305.757
1993	121786.6	6572.593	4463.054	2669.6	19322.83	2285.334
1994	121315	6604.327	4352.298	2716.416	19847.86	2264.125
1995	120843.4	6636.218	4241.229	2763.389	20372.57	2243.231
1996	120371.7	6667.952	4130.316	2810.205	20897.44	2222.337
1997	119900.3	6699.844	4019.404	2857.021	21422.31	2201.128
1998	119428.7	6731.735	3908.491	2903.994	21947.18	2179.92
1999	118957.1	6763.469	3797.578	2950.809	22472.21	2158.868
2000	118484.8	6802.43	3676.14	3016.32	22999.44	2120.85
2001	117898.5	6812.642	3610.001	3150.955	23508.92	2118.965
2002	117316.2	6801.33	3547.632	3314.182	24044	2076.705
2003	116733.6	6790.019	3485.106	3477.251	24579.39	2034.602
2004	116151.4	6778.865	3422.738	3640.478	25114.79	1991.714
2005	115569	6767.711	3360.212	3803.548	25649.87	1949.611
2006	114986.5	6756.243	3297.843	3966.618	26185.27	1907.508
2007	114404.3	6745.089	3235.475	4129.845	26720.51	1864.777
2008	113821.8	6733.62	3173.106	4293.072	27255.91	1822.517
2009	113239.4	6722.466	3110.58	4456.142	27791.15	1780.257
2010	112640.7	6692.46	3047.74	4665.87	28325.13	1728.1
2011	112067.3	6755.771	2985.057	4749.919	28946.93	1595.036
2012	111494.3	6880.823	2894.725	4788.722	29580.67	1460.716
2013	110918.9	7018.757	2801.879	4824.698	30211.74	1324.039
2014	110343.9	7154.805	2709.504	4861.145	30843.44	1187.205
2015	109772.7	7272.159	2620.742	4901.363	31478.6	1054.455
2016	109201.3	7389.513	2531.981	4941.423	32113.91	921.8628
2017	108629.9	7507.024	2443.219	4981.641	32749.22	788.9562
2018	108058.6	7624.377	2354.458	5021.702	33384.38	656.5209
2019	107487.2	7741.731	2265.696	5061.919	34019.69	523.7714
2020	106922.3	7870.71	2152.27	5090.04	34671.97	392.75

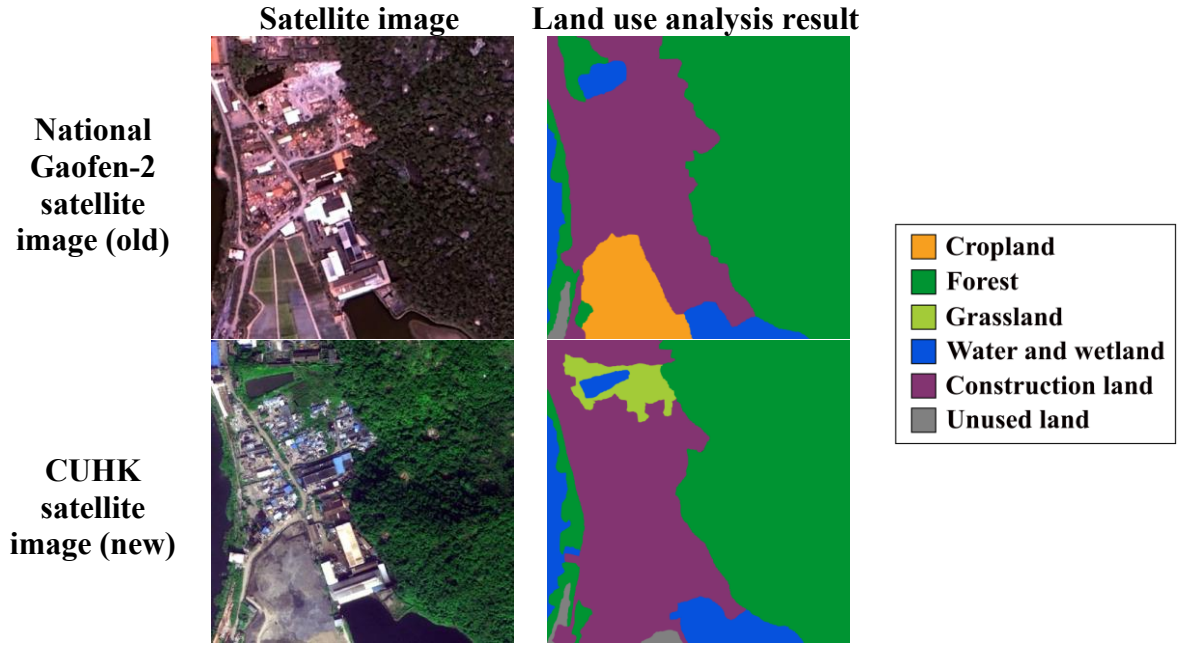
数据集可于以下连结下载：

https://www.math.cuhk.edu.hk/app/mathmodel/files/hsmmc2425_appendix1_sc.xlsx

Imagining Future Development

Over the past several decades, many regions in the world have undergone rapid development in response to various factors. It is important to analyse and detect the change in their development over the years for urban planning and the future city design.

In many cases, we can perform data analysis through satellite images. In the following example, we first analyze a regional satellite image acquired by the National Gaofen-2 satellite several years ago (the first row) to obtain the land use distribution of the region. Then, we use the latest satellite image acquired by the CUHK satellite in the corresponding region and conduct land use analysis (the second row). By comparing the land use analysis results of the two satellite images, we can analyse the recent development and changes of the region.



You are asked to complete the following tasks:

1. The data shown in Appendix 1 are the results obtained by analysing satellite images of an unnamed area over the past several decades. Please develop mathematical model(s) to predict the trend of land use change in this area. Also, evaluate your mathematical model(s).

2. Please develop mathematical model(s) to select a region in China with the greatest potential for agricultural development and explain your point of view.

State the data you have collected clearly. Your data must be accurate, with sources cited, and your argument must be logical and sound. State clearly all the assumption(s) you need in your modelling process.

Appendix 1

The data of the total area of different land use types (cropland, forest, grassland, water and wetland, construction land, and unused land) of an unnamed area over the past several decades. (Unit: km^2)

Year	Cropland	Forest land	Grassland	Water and wetland	Construction land	Unused land
1985	124344.7	6299.71	5137.17	2215.11	16715.44	2387.92
1986	124126.1	6352.181	5067.103	2230.035	16935.22	2389.334
1987	123896.8	6389.885	4997.979	2289.733	17142.59	2383.05
1988	123667.4	6427.589	4928.855	2349.431	17349.97	2376.766
1989	123438	6465.293	4859.731	2409.129	17557.34	2370.482
1990	123197.8	6488.23	4791.55	2513.6	17752.3	2356.5
1991	122729.8	6508.967	4685.036	2575.969	18273.09	2327.122
1992	122258.2	6540.859	4574.124	2622.942	18798.11	2305.757
1993	121786.6	6572.593	4463.054	2669.6	19322.83	2285.334
1994	121315	6604.327	4352.298	2716.416	19847.86	2264.125
1995	120843.4	6636.218	4241.229	2763.389	20372.57	2243.231
1996	120371.7	6667.952	4130.316	2810.205	20897.44	2222.337
1997	119900.3	6699.844	4019.404	2857.021	21422.31	2201.128
1998	119428.7	6731.735	3908.491	2903.994	21947.18	2179.92
1999	118957.1	6763.469	3797.578	2950.809	22472.21	2158.868
2000	118484.8	6802.43	3676.14	3016.32	22999.44	2120.85
2001	117898.5	6812.642	3610.001	3150.955	23508.92	2118.965
2002	117316.2	6801.33	3547.632	3314.182	24044	2076.705
2003	116733.6	6790.019	3485.106	3477.251	24579.39	2034.602
2004	116151.4	6778.865	3422.738	3640.478	25114.79	1991.714
2005	115569	6767.711	3360.212	3803.548	25649.87	1949.611
2006	114986.5	6756.243	3297.843	3966.618	26185.27	1907.508
2007	114404.3	6745.089	3235.475	4129.845	26720.51	1864.777
2008	113821.8	6733.62	3173.106	4293.072	27255.91	1822.517
2009	113239.4	6722.466	3110.58	4456.142	27791.15	1780.257
2010	112640.7	6692.46	3047.74	4665.87	28325.13	1728.1
2011	112067.3	6755.771	2985.057	4749.919	28946.93	1595.036
2012	111494.3	6880.823	2894.725	4788.722	29580.67	1460.716
2013	110918.9	7018.757	2801.879	4824.698	30211.74	1324.039
2014	110343.9	7154.805	2709.504	4861.145	30843.44	1187.205
2015	109772.7	7272.159	2620.742	4901.363	31478.6	1054.455
2016	109201.3	7389.513	2531.981	4941.423	32113.91	921.8628
2017	108629.9	7507.024	2443.219	4981.641	32749.22	788.9562
2018	108058.6	7624.377	2354.458	5021.702	33384.38	656.5209
2019	107487.2	7741.731	2265.696	5061.919	34019.69	523.7714
2020	106922.3	7870.71	2152.27	5090.04	34671.97	392.75

The dataset can be downloaded at the following link:

https://www.math.cuhk.edu.hk/app/mathmodel/files/hsmmc2425_appendix1_en.xlsx