Potential of On-demand Mobility and Real-time Trip Planning in Yokohama City





Group K from Nagoya University DIAO Xiaosu LIU Jianmeng JIANG Feng Othman El Mourabiti ZHU Shuyang

Basic Analysis on PP Data



	A01229	+ (*	j‰ g	5										
- 4	AE	AF	4.5	AE	AC	AT .	AE.	K.	RK KA	4.0	AP		20	13
11112	七谷	Valk	.8.6		18 20	11.2	1	9	290 新吉州	부장기		1	730	
11120	1.38	Sail	40.0		2931.	52.4	1	28	430 柳城	茶と切		0	197	
1191	自動中	Car	11.1	1.1	-289 34.,	11 1	1	1.5	2:10 大口	é.e.		1	1648	
1192	統進	1a .	441 N	6.5	131772	81.9	1	25	4/0 287-251	* 准治台		- T	974	
1.93	設置	Te i i	22 R		12584	24 4	1	8	-60 東戸康	现几		6	1001	
1.94	白紋草	Car	24.8	1	28782	2d. B	1	20	370 新祝石(平認務		1	238	
1.95	自動車	Car	12.9	1	2066	12.5	1	26	330 片倉町	白溪		1	289	
11.184	\$2.58	Jail	56.7	124	33918	54	1	46	430 病/可原	橫木町		L	21	
11.925	⊨始空	Sievele	2.9	194	873	4.3	1	1	. 40 柳浜	平泥板		- C	487	
11.98	自动中	Co	19-4	25	df 1.16.	12.4	1	1.5	2:10 大口	e.e.		1	1643	
1199	和神	8.11	73.4	25	70530	15.7	1	14	27.00 J 1784	法空下的不让		1	10.55	
L200	決減	Sail	42.6	1	17987	(9.4	1	52	270 # 비진 7	928		t	503	
120.	102.5	Valle	4.0	2.4	565	4	D	C .	0	0	0	с	0	
1202	白動庫	Car	21.2		6120	21.2	1	1	.50 愛草石田	木厚木		C	4996	
12013	**	Valk	6.9		6.52	2.5	D	G	0	0	0	0	0	
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1206	E9. 4	the sector	11.1	· · ·	22436	11	1	12	300 新亮色	Y 14176		1	5/281	
1207	決視	Ball	14.7	12	3005	11. E	1	2	130 授水町	规心		c	780	
1208	EROW	Car	9	1	2527	9	1	11	230 神菸川新町	EX.		1	238	
1209	5.00	Jail	51.6	64	12152	31. B	1	35	420 巨ノ 窓町	時南台		L	173	
1710	**	Valk	45.7		435.	14.3	1	17	350 元町・小笠6	き 白ノ米町		1	20.26	
1211	自幼主	Car	22.2		3537	12.2	1	11	3:00 日本大海の	H-41		1	633	
1212	鉄港	1.0.1	32/ 5	100	206.2	24.1	1	22	310 英美大学	金市 [一号		2	612	
1213	112	5.5	72/1	58	SOUTH 1	12	1	4	110 馬中港	元明 - 中羊神		H.	19641	
1214	24	Sail	22.2	1	7154	21.5	1	9	100 日美	48		1	1158	
1215	E IE M	Dicycle	4.1	1	945	1.9	1	L.	200 월 달린	授高		0	1048	
1216	15.4	I.u.	21.5		2096	10.2	.1	1	.80 元可·小学品	1 历室道		G	2145	
1212	松田	Jail	45.3	574	3047.	52. E	1	37	570 学 - 49	24		1	560	
1218	自幼主	Car	5.2	100	990	3.2	1	13	2:10 大口	白金		1	253	
1219	結准	1	281 4	10.5	172211	N. 3	1	10	210 第 向	3916 ()		10	878	
1220	新闻	3.00	39.2	1.5	1.90.90	21.4	1	27	320 17-15	· 東· 市		1	115	
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1725	2.3	Valk	38.9	100	5713	20	1	18	3.50 F 55	元町・小美社		1	.077	
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If there is a problem, there is demand.





We can't force people to choose public transit, but situation like this only stop them from doing so.





Further analysis shows a serious problem. Arduous effort is needed just to get to the rail station. People who choose RAIL

AccessTime+EgressTime: 9014 min Time on the train: 15000 min Total Time: 24014 min Rail Users **Percentage of trip time:** 38%

People who choose CAR, but if they choose RAIL

AccessTime+EgressTime: 18016 min Time on the train: 17061 min Total Time: 35077 min Rail Users **Percentage of trip time:** 51%

Do these people choose CAR instead of RAIL because of this reason?

Out Time 9014 min On Time 15000 min





Our assumption: Is Out-of-Rail time truly a factor that hinders people choosing subway? needs to be justified by Behavior Choice Model.



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	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]	[,9]	[,10]
[1,]	-3170.40057	125172.965	470.042408	199.305959	1571.51271	561.105364	-22.968689	-128.484638	34.985669	2378.91047
[2,]	125172.96541	-12810325.721	-23276.373332	-8983.089466	-68747.94818	-30388.884915	9348.878534	6476.105057	-5491.031499	-101647.53970
[3,]	470.04241	-23276.373	-124.651602	-37.338029	-280.23441	-124.651602	12.305465	8.266092	5.431568	-380.99625
[4,]	199.30596	-8983.089	-37.338029	-49.514259	-132.64253	-49.514259	4.643494	3.340156	3.315351	-164.78792
[5,]	1571.51271	-68747.948	-280.234411	-132.642528	-1036.83544	-355.330272	40.231818	29.096657	-18.966712	-1247.97788
[6,]	561.10536	-30388.885	-124.651602	-49.514259	-355.33027	-167.948888	20.846440	14.929931	7.446854	-445.39959
[7,]	-22.96869	9348.879	12.305465	4.643494	40.23182	20.846440	-136.291861	42.890871	7.870258	27.21688
[8,]	-128.48464	6476.105	8.266092	3.340156	29.09666	14.929931	42.890871	-124.213395	9.756270	14.70525
[9,]	34.98567	-5491.031	5.431568	3.315351	-18.96671	7.446854	7.870258	9.756270	-39.149165	-15.45108
[10,]	2378.91047	-101647.540	-380.996253	-164.787920	-1247.97788	-445.399587	27.216881	14.705248	-15.451075	-2018.44573
<pre>> ## > prin [1] -2 > ## > prin [1] -2 > ##rl > prin [1] 0 > ## 2 > prin [1] 0 > ## 2 </pre>	L(0) nt(L0) 2135.675 LL nt(LL) 1290.569 ho-square nt((L0-LL)/L0) .395709 adjusted rho-s nt((L0-(LL-ler .3910267 stimated param) square ngth(b)))/LO) meter values								
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[1]	-0.9699224705	-0.0008018488	0.2884625992	1.2186737348	3 -1.287317406	1 1.517737008	38 -0.413028	3893 0.7339	555264 -0.1344	4197676 -0.8018
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MNL model:+

 $V_{car} = \beta_1 t_{car} + \beta_2 c_{car}$ $V_{rail} = \beta_{10}tt + \beta_2 c_{rail} + \beta_3 g + \beta_4 p + \beta_5 ot_{rail} + \beta_6 e^{i\beta}$ $V_{bike} = \beta_1 t_{bike} + \beta_{7^{+}}$ $V_{walk} = \beta_1 t_{walk} + \beta_{8^{*'}}$ $V_{bus} = \beta_{10}tb + \beta_2c_{bus} + \beta_5ot_{bus} + \beta_{9^{*}}$

- t: total travel time+
- c: travel cost₽
- g: gender+
- p: purpose+
- ot: out of vehicle time.
- tt: time on train-
- tb: time on buse

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[,1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]	[,9]	[,10]	[,11]
-2700.824887	92584.676	406.715198	178.249971	1355.286275	478.226479	-3.936069	-132.796047	24.257037	2014.339164	-43.750082
92584.676081	-7314886.662	-18421.627609	-7560.094025	-56353.653462	-23710.944140	7950.766121	5240.697714	-3566.707209	-76453.244640	16469.788809
406.715198	-18421.628	-107.510433	-33.877677	-247.965904	-107.510433	11.228104	7.267826	5.241042	-328.399893	28.760531
178.249971	-7560.094	-33.877677	-44.707966	-124.459590	-44.707965	4.438584	3.094052	3.316458	-145.453933	-17.924634
1355.286275	-56353.653	-247.965904	-124.459590	-974.491928	-310.084465	37.350114	24.229430	-8.800355	-1062.233294	261.077212
478.226479	-23710.944	-107.510433	-44.707966	-310.084466	-141.298949	18.332619	12.166687	8.116223	-376.917615	74.895249
-3.936069	7950.766	11.228104	4.438584	37.350114	18.332619	-140.662654	55.419522	6.133162	21.523648	-17.180576
-132.796047	5240.698	7.267826	3.094052	24.229430	12.166687	55.419522	-127.025311	8.125244	11.461167	-7.394286
24.257037	-3566.707	5.241042	3.316458	-8.800355	8.116223	6.133162	8.125244	-29.431119	-8.134845	39.833690
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-43.750082	16469.789	28,760531	-17.924634	261.077212	74.895249	-17.180576	-7.394286	39,833690	101.988992	-502.398273
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\\ 406.715198 -18421.628 -107.510433 -33.877677 \\ 178.249971 -7560.094 -33.877677 -44.707966 \\ 1355.286275 -56353.653 -247.965904 -124.459590 \\ 478.226479 -23710.944 -107.510433 -44.707966 \\ -3.936069 7950.766 11.228104 4.438584 \\ -132.796047 5240.698 7.267826 3.094052 \\ 24.257037 -3566.707 5.241042 3.316458 \\ 2014.339164 -76453.245 -328.399893 -145.453933 \\ -43.750082 16469.789 28.760531 -17.924634 $	$ \begin{bmatrix} ,1 \end{bmatrix} [,2] [,3] [,4] [,5] \\ -2700.824887 92584.676 406.715198 178.249971 1355.286275 \\ 92584.676081 -7314886.662 -18421.627609 -7560.094025 -56353.653462 \\ 406.715198 -18421.628 -107.510433 -33.877677 -247.965904 \\ 178.249971 -7560.094 -33.877677 -44.707966 -124.459590 \\ 1355.286275 -56353.653 -247.965904 -124.459590 -974.491928 \\ 478.226479 -23710.944 -107.510433 -44.707966 -310.084466 \\ -3.936069 7950.766 11.228104 4.438584 37.350114 \\ -132.796047 5240.698 7.267826 3.094052 24.229430 \\ 24.257037 -3566.707 5.241042 3.316458 -8.800355 \\ 2014.339164 -76453.245 -328.399893 -145.453933 -1062.233294 \\ -43.750082 16469.789 28.760531 -17.924634 261.077212 \\ \end{bmatrix} $	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{bmatrix} 1, 1 \\ 2, 2 \\ 2, 3 \\ 2, 5 \\ 3, 5 \\ 4, 6 \\ 7, 6 \\ 8, 7 \\ 5, 2 \\ 8, 7 \\ 8, 7 \\ 5, 2 \\ 1, 5 \\ 5, 4 \\ 1, 2 \\ 2 \\ 7 \\ 7 \\ 7 \\ 7 \\ 8, 8 \\ 7 \\ 5, 2 \\ 1, 5 \\ 7 \\ 7 \\ 7 \\ 7 \\ 8, 8 \\ 7 \\ 5, 2 \\ 1, 5 \\ 7 \\ 7 \\ 7 \\ 7 \\ 8, 8 \\ 7 \\ 5, 4 \\ 1, 2 \\ 1, 1 \\ 8, 3 \\ 2 \\ 1, 1 \\ 1, 1 \\ 1, 2 \\ 1, 1 \\ 1, 1 \\ 1, 2 \\ 1, 1 \\$	$ \begin{bmatrix} 1,1 \end{bmatrix} \begin{bmatrix} 2,2 \end{bmatrix} \begin{bmatrix} 3,3 \end{bmatrix} \begin{bmatrix} 4,4 \end{bmatrix} \begin{bmatrix} 5,5 \end{bmatrix} \begin{bmatrix} 6,6 \end{bmatrix} \begin{bmatrix} 7,7 \end{bmatrix} \begin{bmatrix} 8,8 \end{bmatrix} \\ -2700.824887 92584.676 406.715198 178.249971 1355.286275 478.226479 -3.936069 -132.796047 \\ 92584.676081 -7314886.662 -18421.627609 -7560.094025 -56353.653462 -23710.944140 7950.766121 5240.697114 \\ 406.715198 -18421.628 -107.510433 -33.877677 -247.965904 -107.510433 11.228104 7.267826 \\ 178.249971 -7560.094 -33.877677 -44.707966 -124.459590 -44.707966 4.438584 3.094052 \\ 1355.286275 -56353.653 -247.965904 -124.459590 -974.491928 -310.084466 37.350114 24.229430 \\ 478.226479 -23710.944 -107.510433 -44.707966 -310.084466 -141.298949 18.332619 12.166687 \\ -3.936069 7950.766 11.228104 4.438584 37.350114 18.332619 -140.662654 55.419522 \\ -132.796047 5240.698 7.267826 3.094052 24.229430 12.166687 55.419522 -127.025311 \\ 24.257037 -3566.707 5.241042 3.316458 -8.800355 8.116223 6.133162 8.125244 \\ 2014.339164 -76453.245 -328.399893 -145.453933 -1062.233294 -376.917615 21.523648 11.461167 \\ -43.750082 16469.789 28.760531 -17.924634 261.077212 74.895249 -17.180576 -7.394286 \end{bmatrix}$	$ \begin{bmatrix} 1, 1 \end{bmatrix} \begin{bmatrix} 2, 2 \end{bmatrix} \begin{bmatrix} 3, 3 \end{bmatrix} \begin{bmatrix} 4, 1 \end{bmatrix} \begin{bmatrix} 5, 5 \end{bmatrix} \begin{bmatrix} 6, 6 \end{bmatrix} \begin{bmatrix} 7, 7 \end{bmatrix} \begin{bmatrix} 8, 8 \end{bmatrix} \begin{bmatrix} 9, 9 \end{bmatrix} \\ -2700.824887 92584.676 406.715198 178.249971 1355.286275 478.226479 -3.936069 -132.796047 24.257037 \\ 92584.676081 -7314886.662 -18421.627609 -7560.094025 -56353.653462 -23710.944140 7950.766121 5240.697714 -3566.707209 \\ 406.715198 -18421.628 -107.510433 -33.877677 -247.965904 -107.510433 11.228104 7.267826 5.241042 \\ 178.249971 -7560.094 -33.877677 -44.707966 -124.459590 -44.707965 4.438584 3.094052 3.316458 \\ 1355.286275 -56353.653 -247.965904 -124.459590 -974.491928 -310.084465 37.350114 24.229430 -8.800355 \\ 478.226479 -23710.944 -107.510433 -44.707966 -310.084466 -141.298949 18.32619 12.166687 8.116223 \\ -3.936069 7950.766 11.228104 4.438584 37.350114 18.332619 -140.662654 55.419522 6.133162 \\ -132.796047 5240.698 7.267826 3.094052 24.229430 12.166687 55.419522 -127.025311 8.125244 \\ 24.257037 -3566.707 5.241042 3.316458 -8.800355 8.116223 6.133162 8.125244 -29.431119 \\ 2014.339164 -76453.245 -328.399893 -145.453933 -1062.233294 -376.917615 21.523648 11.461167 -8.134845 \\ -43.750082 16469.789 28.760531 -17.924634 261.077212 74.895249 -17.180576 -7.394286 39.833690 \\ \end{bmatrix}$	[,1][,2][,3][,4][,5][,6][,7][,8][,9][,10]-2700.82488792584.676406.715198178.2499711355.286275478.226479-3.936069-132.79604724.2570372014.33916492584.676081-7314886.662-18421.627609-7560.094025-56353.653462-23710.9441407950.7661215240.697714-3556.707209-76453.244640406.715198-18421.628-107.510433-33.877677-247.965904-107.51043311.2281047.2678265.241042-328.399893178.249971-7560.094-33.877677-44.707966-124.459590-44.7079654.4385843.0940523.316458-145.4539331355.286275-56353.653-247.965904-124.459590-974.491928-310.08446637.35011424.229430-8.800355-1062.23294478.226479-23710.944-107.510433-44.707966-310.084466-141.29894918.33261912.1666878.116223-376.917615-3.9360697950.76611.2281044.43858437.35011418.332619-140.6626545.4195226.13316221.523648-132.7960475240.6987.2678263.09405224.22943012.1666875.419522-12.1281044.43858437.35011418.332619-140.6626545.4195226.13316221.523648-132.7960475240.6987.2678263.09405224.22943012.1666875.419522-12.41616724.257037-3566.7075.2410423.316458 <t< td=""></t<>

> ## L(0) > print(L0) [1] -2175.421 > ## LL print(LL) [1] -1409.738 > ##rho-square > print((L0-LL)/L0) [1] 0.3519699 > ## adjusted rho-square > print((L0-(LL-length(b)))/L0) [1] 0.3469134 > ##estimated parameter values > print(b) [1] -1.306337015 0.003179789 0.562993164 1.463465591 -1.019869099 0.227758436 0.267544050 1.785151617 -1.050930137 -1.338185311 0.867502482 > ## t-statistic > print(tval) [1] -9.6735084 3.9280577 2.3560146 5.2467972 -8.4935720 0.7008534 2.4886310 10.8205765 -3.2812674 -10.4133017 7.5460593

Another NL model is conducted. 2 model results are compared.

NL model:

 $U_{car} = V_{car} + V_{pr} + \varepsilon_{car} + \varepsilon_{pr^{*'}}$ $U_{walk} = V_{walk} + V_{pr} + \varepsilon_{walk} + \varepsilon_{pr^{*'}}$ $U_{bike} = V_{bike} + V_{pr} + \varepsilon_{bike} + \varepsilon_{pr^{*}}$ $U_{bus} = V_{bus} + V_{pt} + \varepsilon_{bus} + \varepsilon_{pt^{*}}$ $U_{rail} = V_{rail} + V_{pt} + \varepsilon_{rail} + \varepsilon_{pt^{*'}}$

t: total travel time+ c: travel cost₽ g: gender+ p: purpose+ ot: out of vehicle time tt: time on traine tb: time on buse

c.	MNL model.	NL mo
L0.	-2135.6+	-2175
LLe	-1290.5+	-1409
Adjusted rho square₽	0.391÷	0.347
Scale parameter.	1.0	0.868



A Case Study-Policy Proposal.

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Suitable size.

Frequent and punctual service.

Trackable bus.

Smart route based on real time demand.

Shared vehicle, thus environment friendly.

Pay-as-you-go based.

A Case Study-Implement Locations.

A Case Study-Implement Locations.

A Case Study-Simulation of Mode Share.

Before

After

