



ARTIFICIAL INTELLIGENCE: CASE STUDIES

Dr. Andy Chun
andy.chun@gmail.com



OUR EXPERTISE

Enterprise optimization

- Scheduling, rostering, timetabling, allocation...

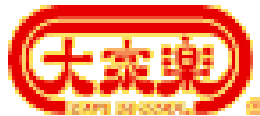
Business intelligence

- business rules, decision support

Knowledge management, data mining, text mining

Machine learning

AI CASE STUDIES

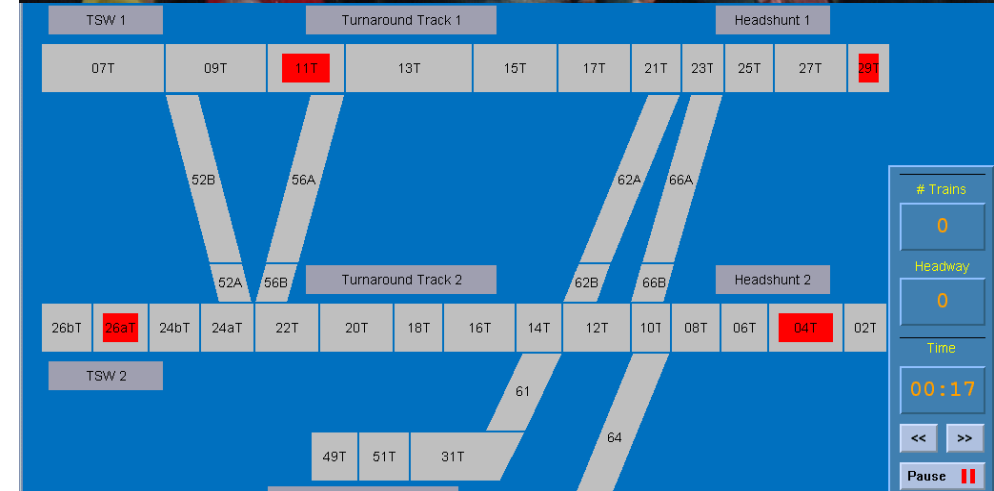


MTR: TRAIN DISPATCHING (1995)

Schedule dispatch of trains at TSW line

Complexity too difficult for humans

Increased number of tracks during rush hours

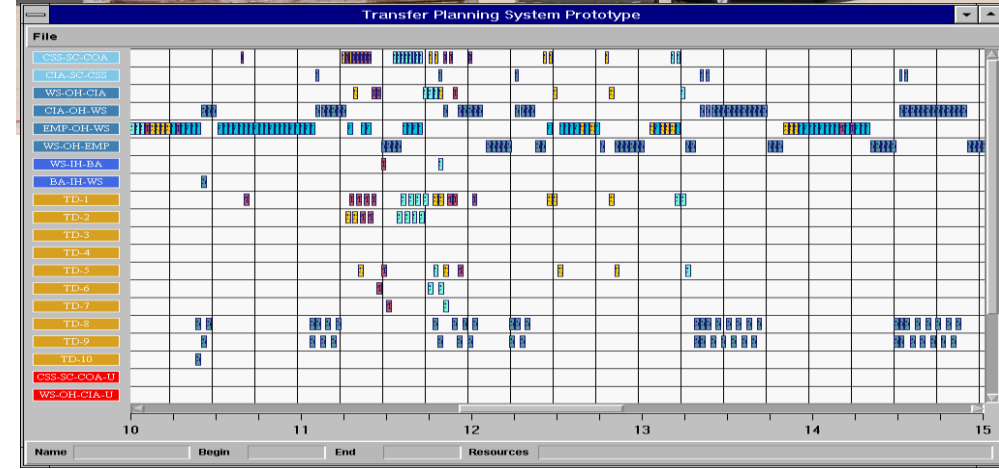


HACTL: RESOURCE ALLOCATION (1995)

Allocation of equipment, schedule ULD movement, allocation of work space, rostering of workers

Increased efficient and flexibility to cope with dynamic changes

Technology transfer



CAD: CHECK-IN COUNTER ALLOCATION (1996)

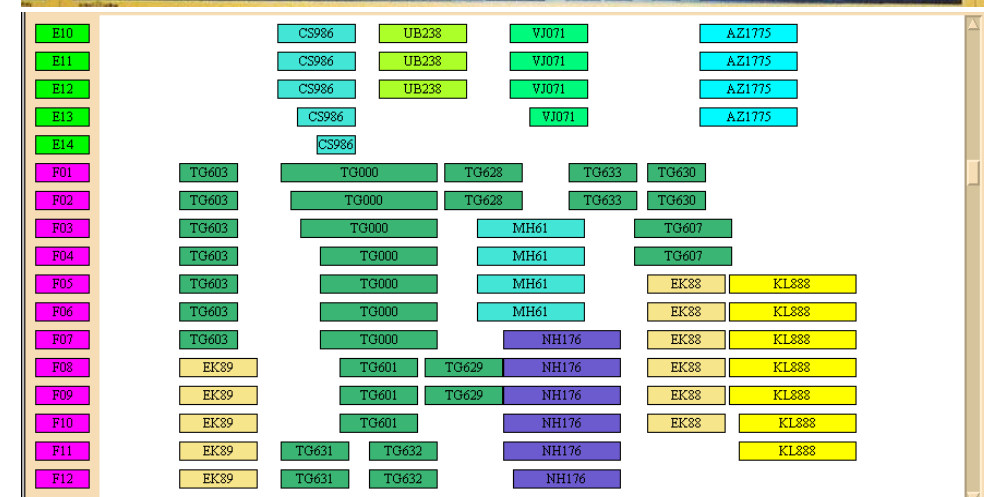
Combine simulation with constraint-based scheduling

Increase traffic, while maintaining service levels

+8,700 flights in 1996; +6,360 flights in 1997



AIRCRAFT		DEPARTURES		離港班機	
flight 班機	to 前往	scheduled 預定時間	check-in status 行李登記情況	embark 入關登機	
KA 41	SHANGHAI 上海	9.00	M	8.05	●●
NW 24	SEOUL 漢城	9.00	D	8.05	●●
CX 713	BANGKOK 曼谷	9.10	C	8.15	●●
CZ 302	GUANGZHOU 廣州	9.40	K	8.45	●●
CX 504	TOKYO 東京	10.00	C	9.05	●●
UA 830	TOKYO 東京	10.20	L	9.25	●●
CX 430	KAOHSIUNG 高雄	10.25	F	9.30	●●
CZ 3012	GUANGZHOU 廣州	10.25	K	9.30	●●
CX 450	TAIPEI 台北	10.30	C	9.35	●●
CX 901	MANILA 馬尼拉	10.40	F	9.45	●●



Yearly workforce forecasting, monthly roster of equipment operators

Support flexible shifts

Increased overall efficiency

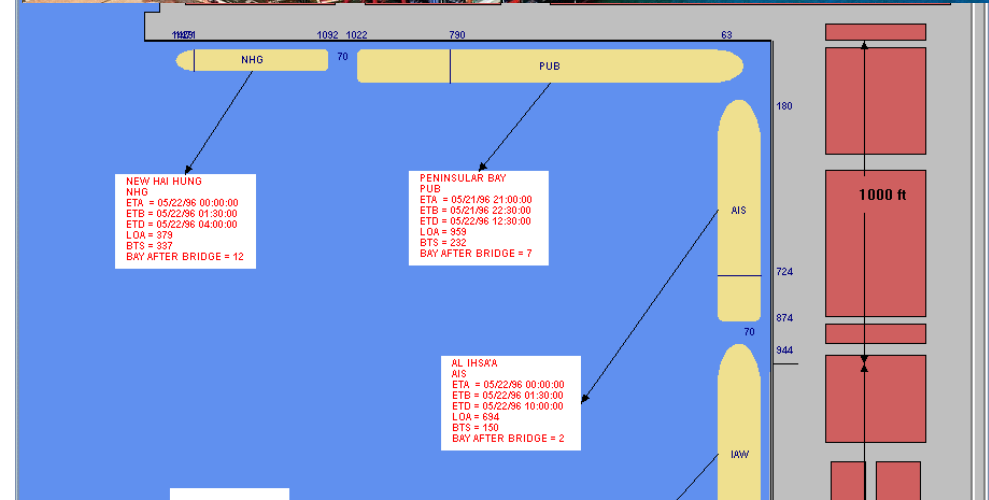
[illegible]

MTL: BERTH ALLOCATION & ROSTERING (1996)

Container vessel berth allocation, rostering for equipment operators

Increase number of vessel berthing, efficiency in manpower usage

Prototype in 1996

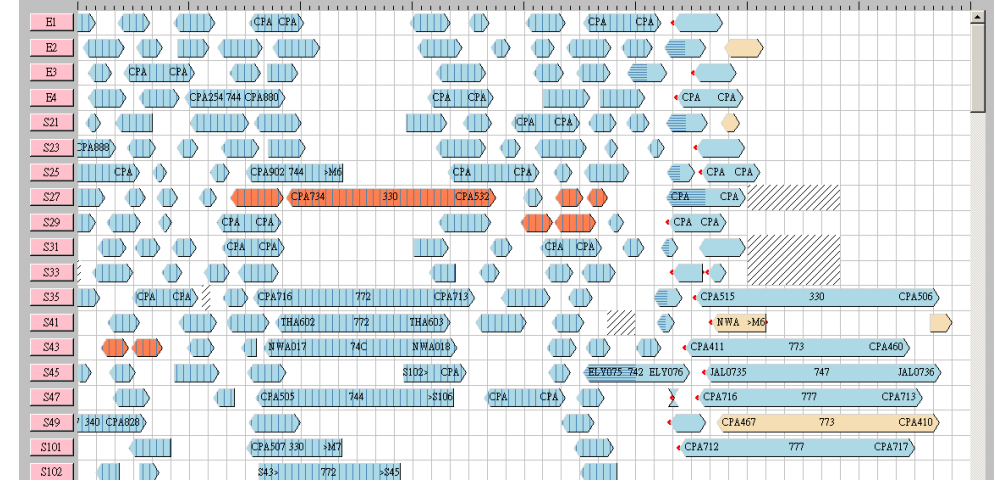


AA: STAND ALLOCATION (1998)

24x7 real-time stand allocation

Multi-user system used in control tower

In use for over a decade



HA: STAFF ROSTERING (1998)

Satisfy all HA and Labor regulations, ensure fairness,
cope with changes
in demand and availability

In use for over a decade



Duty Roster

Team 4D				Mon 06	Tue 07	Wed 08	Thu 09	Fri 10	Sat 11	Sun 12	Mon 13	Tue 14	Wed 15	Thu 16	Fri 17	Sat 18	Sun 19	Owing	
HKID	Name	Chinese Name	Rank															D	CO
C4889043	Wong Chuun		RN			A		A			N	LVE	A			N		0	0
C507549A	Houng Pk		RN	N	LVE				N								N	0	0
C5395060	Lau Mei Chen		RN	A				A			N				A			0	0
C5669713	Kwong Wai		RN		N	LVE				N		O	D	D	D			0	0
C6391549	Lam Chui Lin		RN	AL	AL	AL	AL	AL	HAL	O			N					0	0
C6603090	Chan Sui Yan		RN						N							N	LVE	0	0
D2640296	Lam Suk Kuem		WM															0	0
E7347646	Mok Choi Fan		NO	AL	AL	AL	AL	AL	HAL	O	AL	AL	AL	AL	AL	HAL	O	-1	0
E888226A	Lai Chi Kung		NO								N	O	DO	PH				0	0
E9384727	Mak Kai King		RN															1	0
E9701943	Lenug Chi		WM																
E9755237	Ho Ka Kwan		NO	D	D	D	D	D	HD	O	D	D	D	D	D	DO	O	0	0
G0225656	Lam Yuk Mei		WM	D	D	D	D	D	HD	O						N		0	0
G2689390	Cheung Tsi		RN	N								N						0	0
G390175A	Chow Kam Ling		NO			N								N				0	0
G6317854	Tsang Kam Fai		RN					N							N			0	0
G6644677	Wong Tsz Fin		RN				N	O	PH	PH		N					N	0	0
H3285393	Lam Wai Chu		RN			N												0	0
H3853766	Wong Wah		NO					N						N	LVE	LVE		0	0
K0204927	Chiu Ka Hon		RN		LVE		N				AL	AL	AL	AL	AL	HAL	O	0	0
K1242490	Lam Sze Kit		RN		N								N					0	0
K3495515	Ling Kwok Kee		EN						A									0	0
K4688252	Wong Yin Ian		RN							N					N	LVE	P		

KMB: BUS TIMETABLING (1998)

Timetabling requirements - service freq, travel times,
operational needs, bus types + driver duty
requirements - meal breaks, rest breaks, working
hours

Dead runs, interworkings, home depot constraint,
supplementary buses,

Prototype in 1998



Route No. : 2
Start From : ABEDEN
End At : AD.MTR

25 April, 1997

Single Both Overall

	0	1	2	3	4	5		0	1	2	3	4	5
Route no. : 1	6:00	6:10	6:20	6:30	6:40	6:50		6:30	6:40	6:50	7:00	7:10	7:20
AIRPTAIRPRT	7:00	7:10	7:20	7:30	7:40	7:50		7:30	7:40	7:50	8:00	8:10	8:20
AIRPTAIRPRT	8:00	8:10	8:20	8:30	8:40	8:50		8:30	8:40	8:50	9:00	9:10	9:20
Route no. : 2	9:00	9:10	9:20	9:30	9:40	9:50		9:30	9:40	9:50	10:00	10:10	10:20
ABEDENAD.MTR	10:00	10:10	10:20	10:30	10:40	10:50		10:30	10:40	10:50	11:00	11:10	11:20
AD.MTRABEDEN	11:30	11:40	11:50	12:00	12:10	12:20		12:00	12:10	12:20	12:30	12:40	12:50
Route no. : 3	12:30	12:40	12:50	13:00	13:10	13:20		13:30	13:40	13:50	14:00	14:10	14:20
ICSTORABELGAR	13:30	13:40	13:50	14:00	14:10	14:20		14:30	14:40	14:50	15:00	15:10	15:20
BEIGARICSTOR	14:30	14:40	14:50	15:00	15:10	15:20		15:30	15:40	15:50	16:00	16:10	16:20
Route no. : 4	15:30	15:40	15:50	16:00	16:10	16:20		16:30	16:40	16:50	17:00	17:10	17:20
	16:30	16:40	16:50	17:00	17:10	17:20		17:30	17:40	17:50	18:00	18:10	18:20
	17:30	17:40	17:50	18:00	18:10	18:20		18:30	18:40	18:50	19:00	19:10	19:20
	18:30	18:40	18:50	19:00	19:10	19:20		19:30	19:40	19:50	20:00	20:10	20:20
	19:30	19:40	19:50	20:00	20:10	20:20		20:30	20:40	20:50	21:00	21:10	21:20
	20:30	20:40	20:50	21:00	21:10	21:20		21:30	21:40	21:50	22:00	22:10	22:20
	21:30	21:40	21:50	22:00	22:10	22:20		22:30	22:40	22:50	23:00	23:10	23:20
	22:30	22:40	22:50	23:00	23:10	23:20		23:30	23:40	23:50	24:00	x	x
	23:30	23:40	23:50	24:00	x	x							
	17	17	17	17	16	16		17	17	17	17	16	16

CAFÉ DE CORAL: LUNCH BOX ORDERING (2000)

School lunch box order processing system;
interfaced to optical mark reader


Handle over 10,000 lunch box orders weekly

Produce production orders, delivery schedules, &
EIS reports



日期 2000年2月29日(星期一)

	編號	飯盒編號	飯盒名稱
▶	1	4501011	節瓜枝竹枝排骨
	2	4501021	生炒排骨飯
	3	4501041	西汁焗排骨飯
	4	4501071	豉椒排骨飯
	5	4501082	金沙骨意粉

 **Asia Pacific Catering**

飯盒訂單處理系統

使用者名稱(U)

密碼(P)

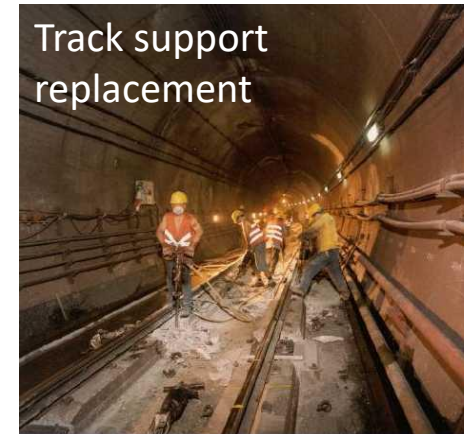
MTR: ENGINEERING WORKS (2004)

Engineering Works and Traffic Management System
(ETMS)

Over 1,000 engineering tasks, at over 50 stations

Increased capacity for engineering tasks by 200%

2005 APICT Award - Best Industrial Application – 1st
Prize



IMMD: APPLIES (2005)

Application and Investigation Easy System (**APPLIES**)

>100 types of application forms, >4 million submissions yearly

Time consuming to process, need thorough knowledge of HK laws and regulations, need experience to make discretionary judgment on “special” cases

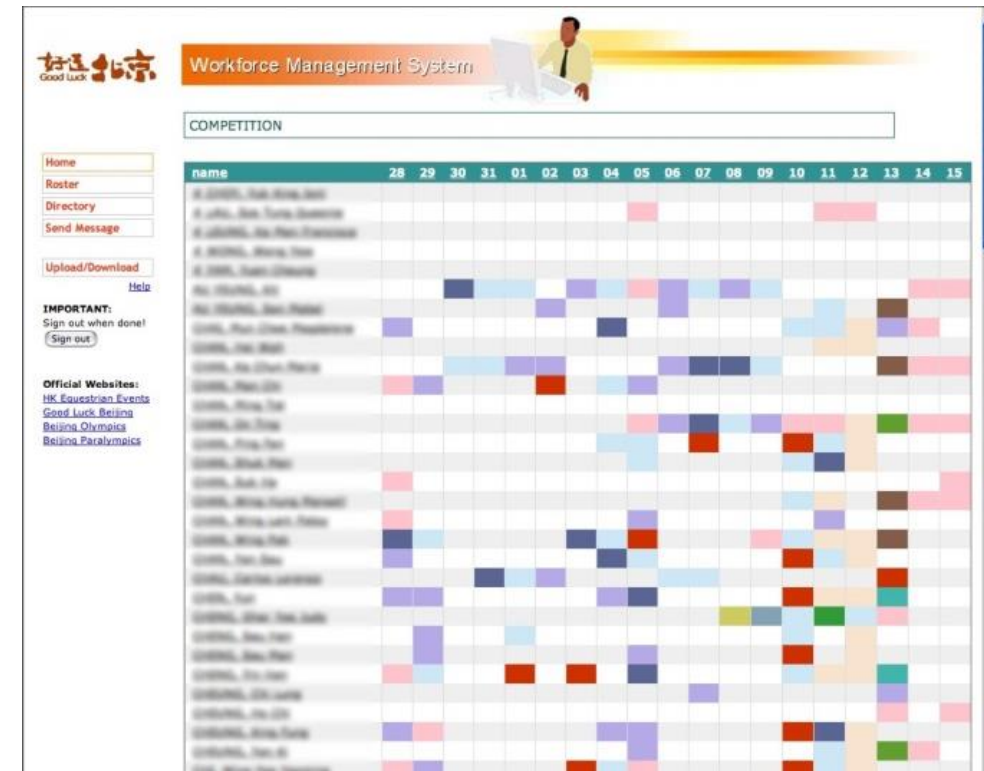


OLYMPICS: VOLUNTEER ROSTERING (2007)

Used in the “Good Luck Beijing” games

Ensure adequate staff level for all functions

Constraints – max hr, skill sets, vicinity, availability, home division



EPD: INFO RETRIEVAL SYSTEM (2010)

Legislative Council's Finance Committee

- Public Works Subcommittee - Information Retrieval System (PWSC-IRS)

Text-mining, environmental-specific search



PWSC IRS Environmental Protection Department
The Government of the Hong Kong Special Administrative Region

SEARCH DICTIONARY ANALYZE UPLOAD LOGOUT Admin Person (admin)

Keywords: cityu Search

Year: Any Ref: Doc Type: Any Language: Any Page: 1

Search: Query: cityu [Page 1/1]

PWSC(2008-09)26 (09)26.doc [PWSC Paper] - [View as HTML](#)
HEAD 708 - CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT Universities City University of Hong Kong 23E) - Student hostel, phase 4 (700 places) Members are invited to recommend to Finance...
[Related](#) [2008](#) [Similar item](#) [Similar item](#)

PWSC75/08-09 pwsc20090408.pdf [PWSC Minutes] - [View as HTML](#)
立法會 Legislative Council LC Paper No. PWSC75/08-09 (These minutes have been seen by the Administration) Ref : CB1/F/2/2 Public Works Subcommittee of the Finance Committee of the Legislat...
[Related](#) [2009](#) [Similar item](#) [Similar item](#)

PWSC(2007-08)44 (07)44.doc [PWSC Paper] - [View as HTML](#)
HEAD 708 - CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT Universities City University of Hong Kong 20E) - Multi-media Building - stage 2 Members are invited to recommend to Finance Committee ...
[Related](#) [2007](#) [Similar item](#) [Similar item](#)

PWSC(2001-02)49 (01)49.doc [PWSC Paper] - [View as HTML](#)

MTR: ENGINEERING WORKS (2013)

Support all railway lines – 10 heavy rail, and 12 light rail lines

- >2,600 weekly works; >10,000 maintenance personnel
- >3,000 users (MTR staff and contractors)

2014 HKICT Award – Best Business Application (Grand Award)



MTR: FARE CALCULATOR (2017)

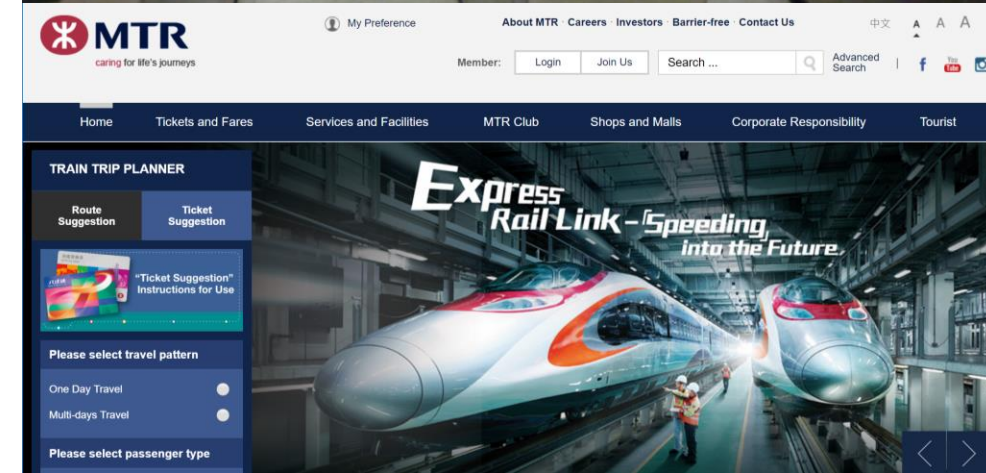
Suggest cheapest combination of different fare schemes and discount promotions

Based on customer daily travel patterns and time

MTR has complicated fare scheme structure, such as Octopus, City Saver, Day Pass, Monthly Pass Extra, etc. plus various discount promotions

It is not uncommon for a single trip to have several applicable promotional discounts

Used AI to encode knowledge and constraints for fare schemes and promotions





AI has been improving the
quality of life for millions of
Hong Kong citizens daily!

THANK YOU!

