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Computational Optimisation and Learning (COL) Lab

Home

People

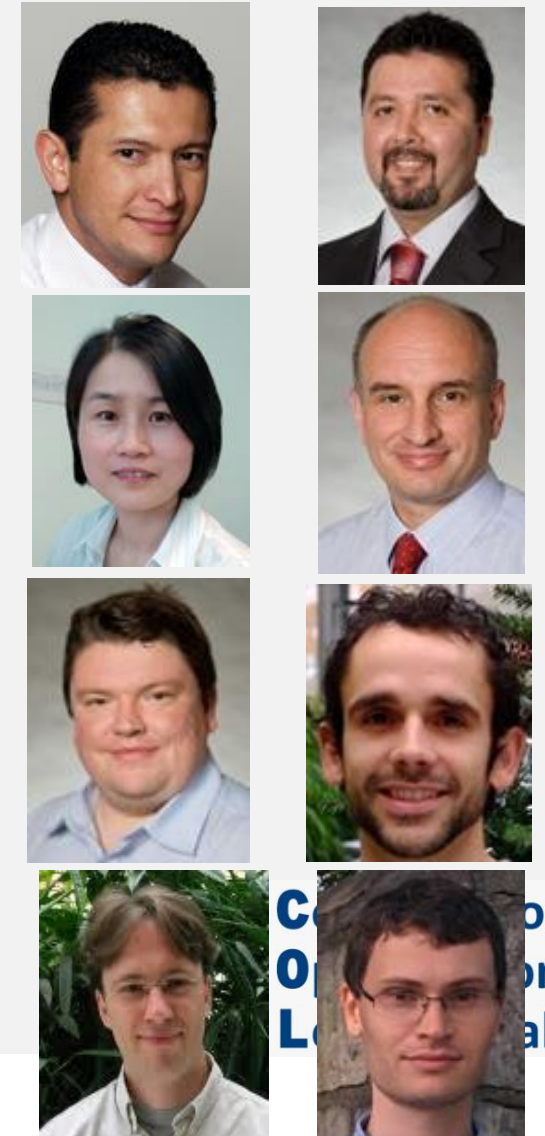
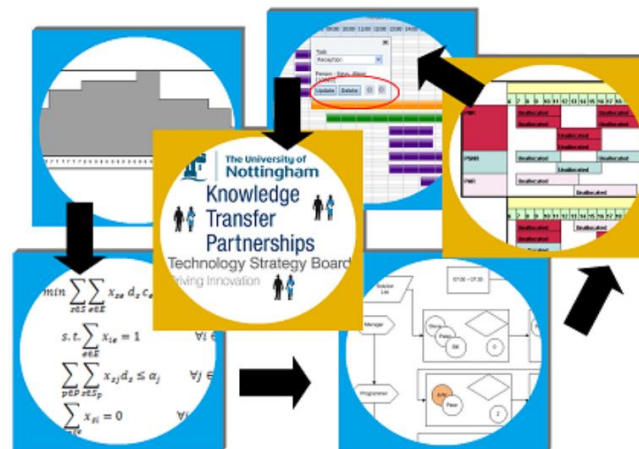
Projects

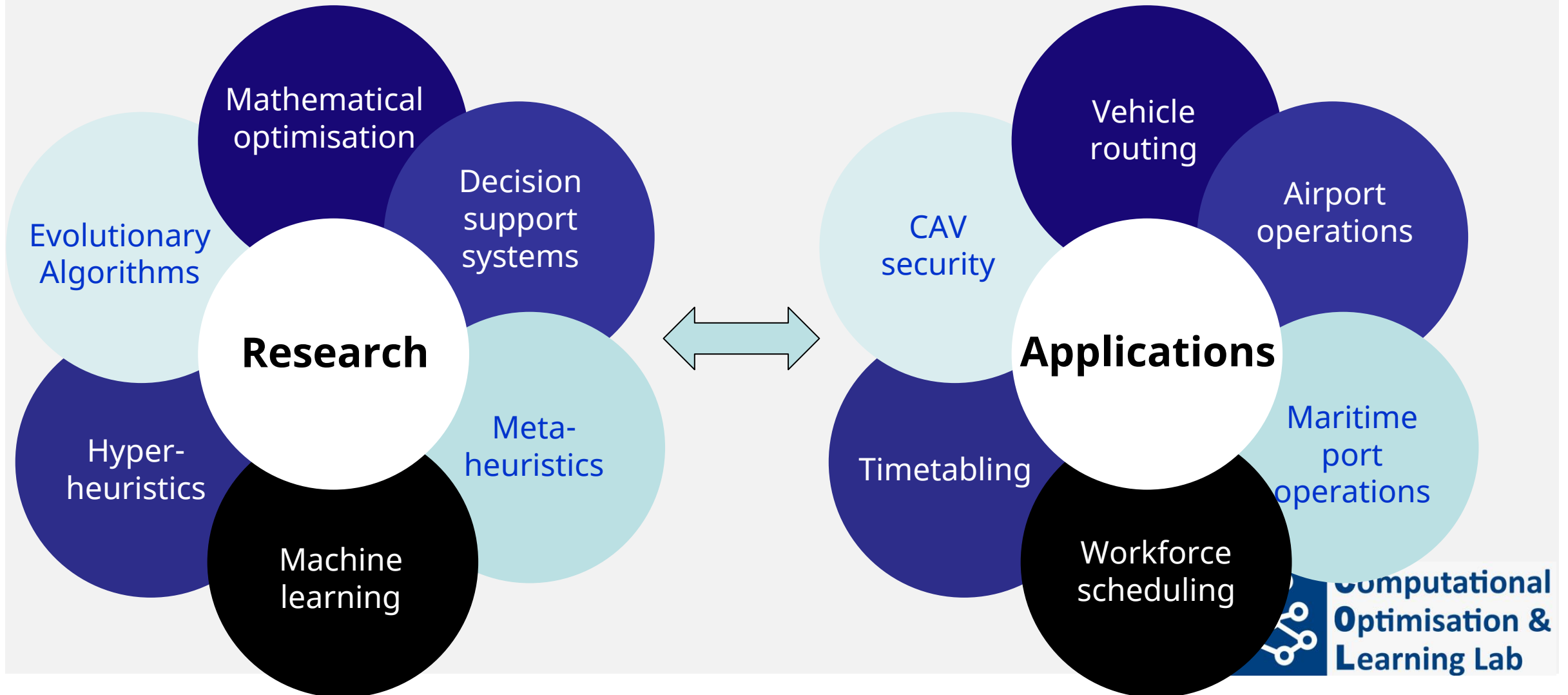
ComputerPhile Videos

School of Computer Science

About the Computational Optimisation and Learning (COL) Lab

The Computational Optimisation and Learning (COL) Lab was launched in the summer of 2019. We are a group of academics, researchers and PhD



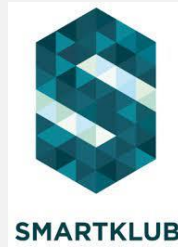


COL Lab – Partners & Collaborators



The University of
Nottingham

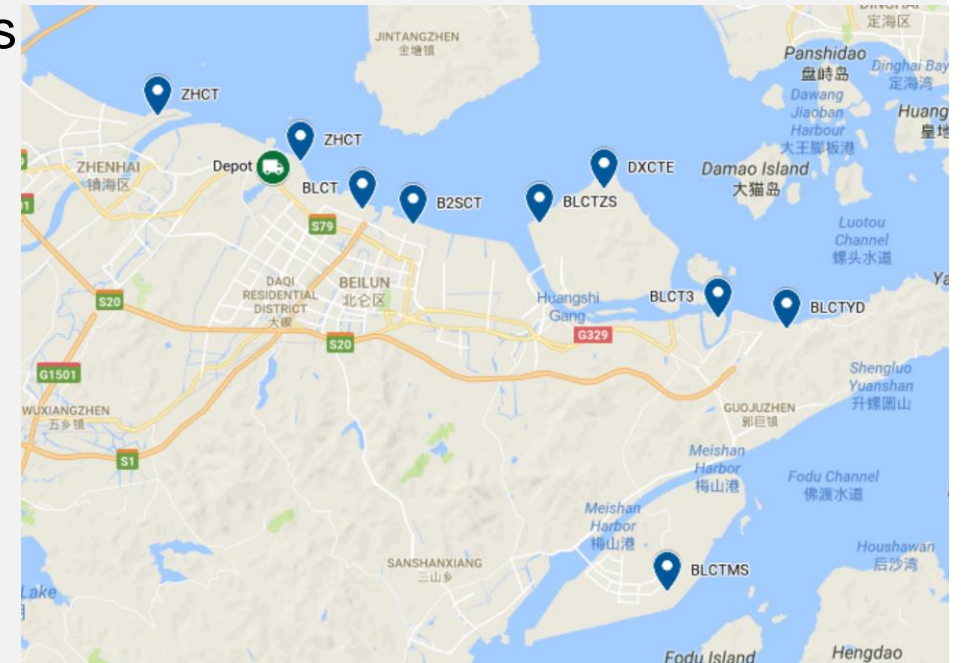
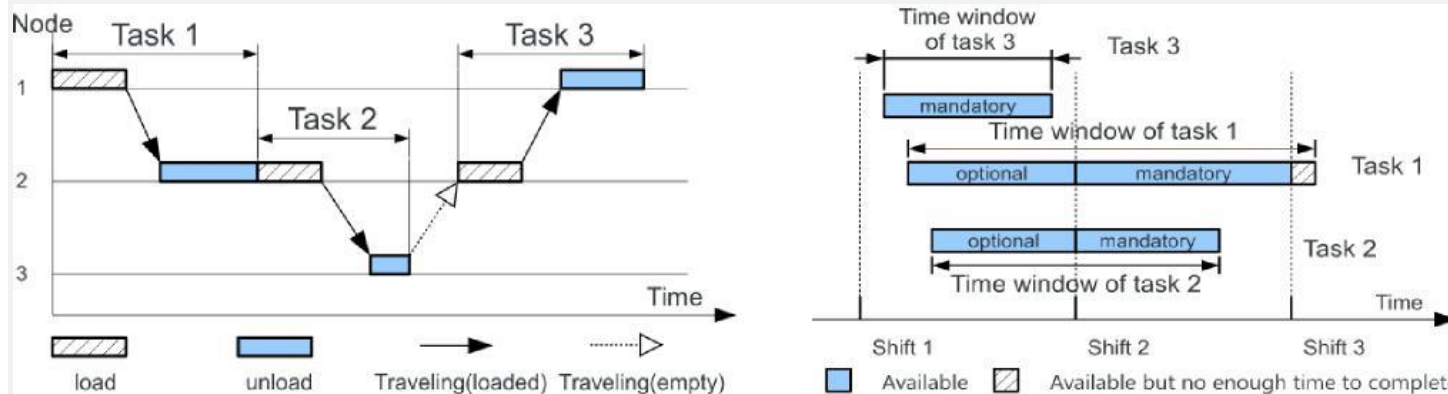
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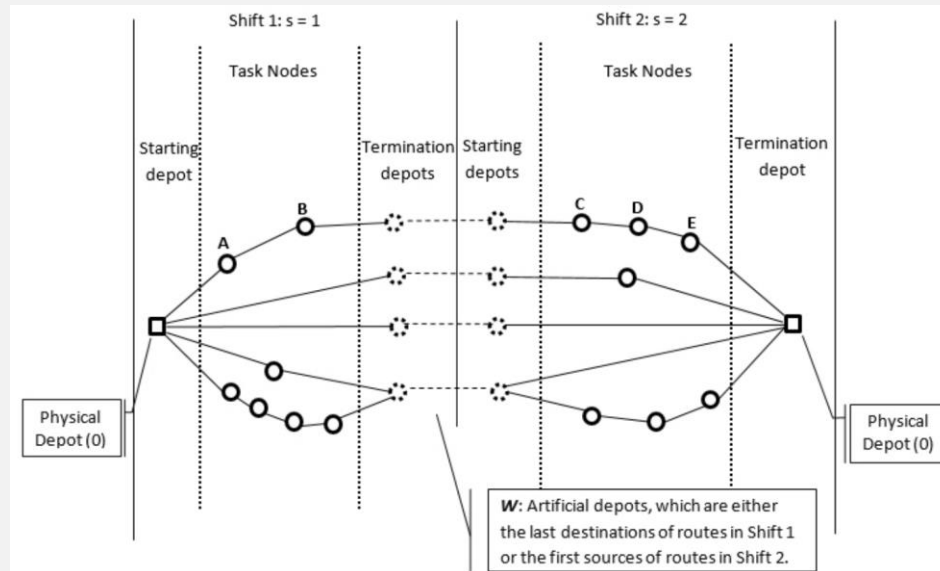
- Maritime Port Operations Optimisation / Management at Ningbo Port, China
 - Container terminal operations – complex system
 - Large fleet routing optimisation



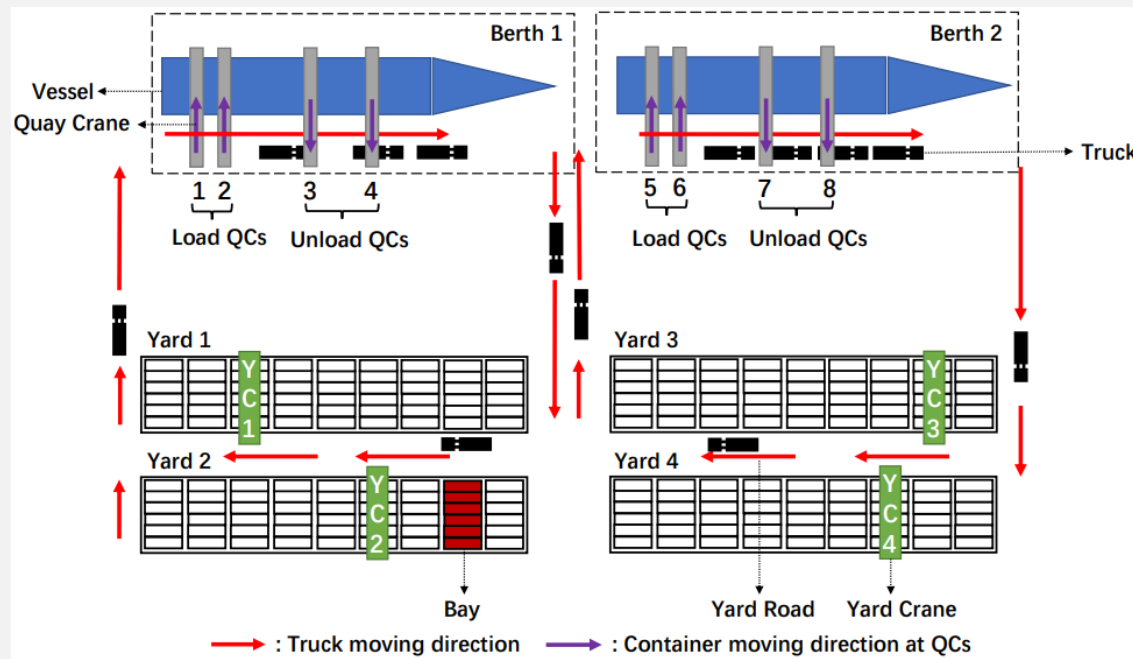
- Large **fleet routing** at Ningbo Port, China
 - Short-haul multi-shift commodity routing from the depot to all demands in a network
- Constraints: capacity, time window, pick-ups, etc.
- Objectives
 - The lowest cost
 - Reduce environmental impact, e.g. rate of empty loads
- **AI automated scheduling algorithms**



- **Extended new problem model** with inland dry ports
 - Mixed shift types with non-linear driver costs
 - Bi-objective optimization
- **AI optimisation algorithms** (hybrid variable neighbourhood search, hyper-heuristics)



- **Dynamic container truck dispatching**
 - Transport containers between vessels and yards, following traffic directions and safety rules
 - Objective: minimize total QC's idle time
- **AI auto-generated heuristics / dispatching policies**



- Landside: storage yard, yard crane
- Seaside: berth, quay crane

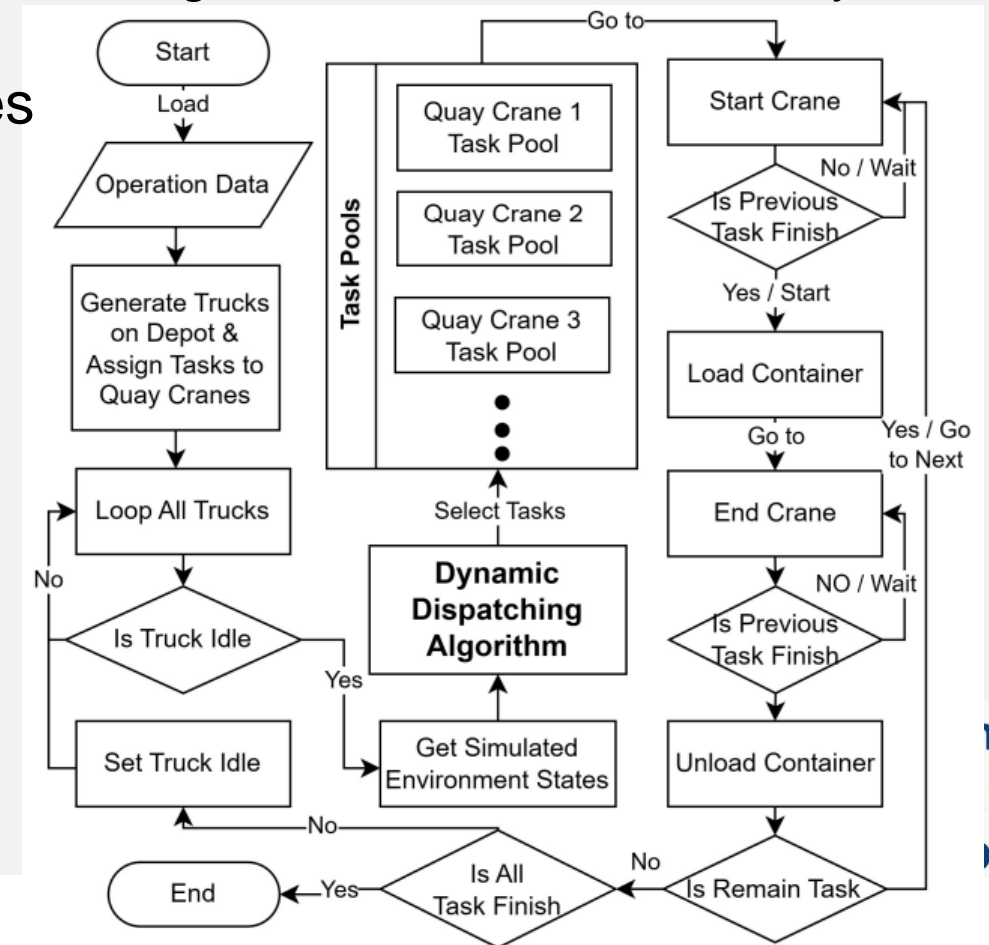


Fig. 5. Event-based Port Simulator Flow Chart

- **Real2Sim simulation**
 - AnyLogic: model the real container terminal environment
 - Infeasible / unsafe to train AI generated dispatching policies in real environment

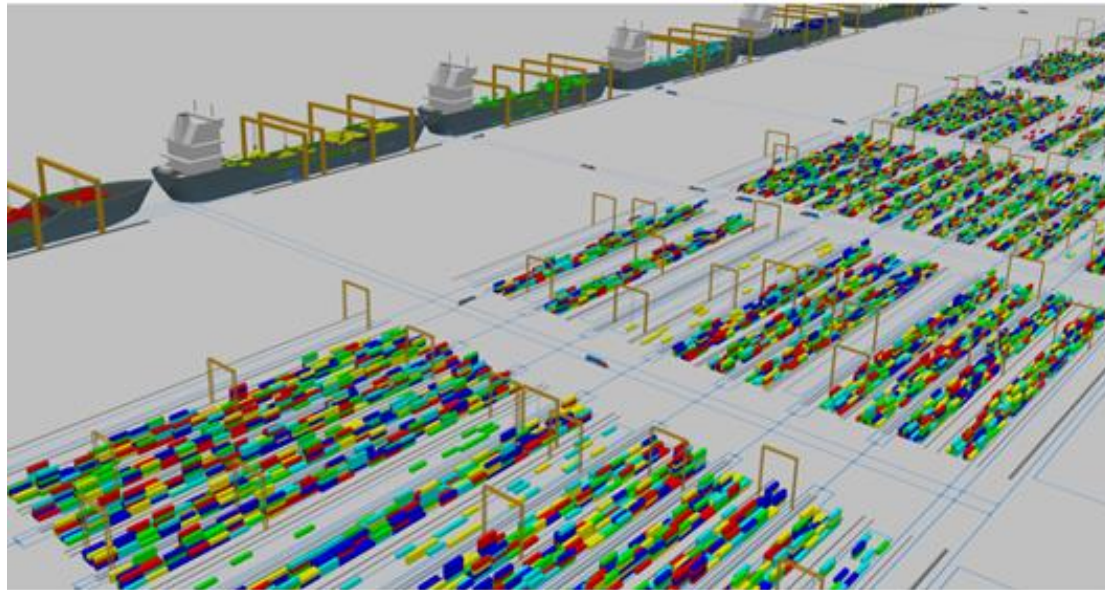


Figure 4: A screenshot of the container terminal simulation environment.

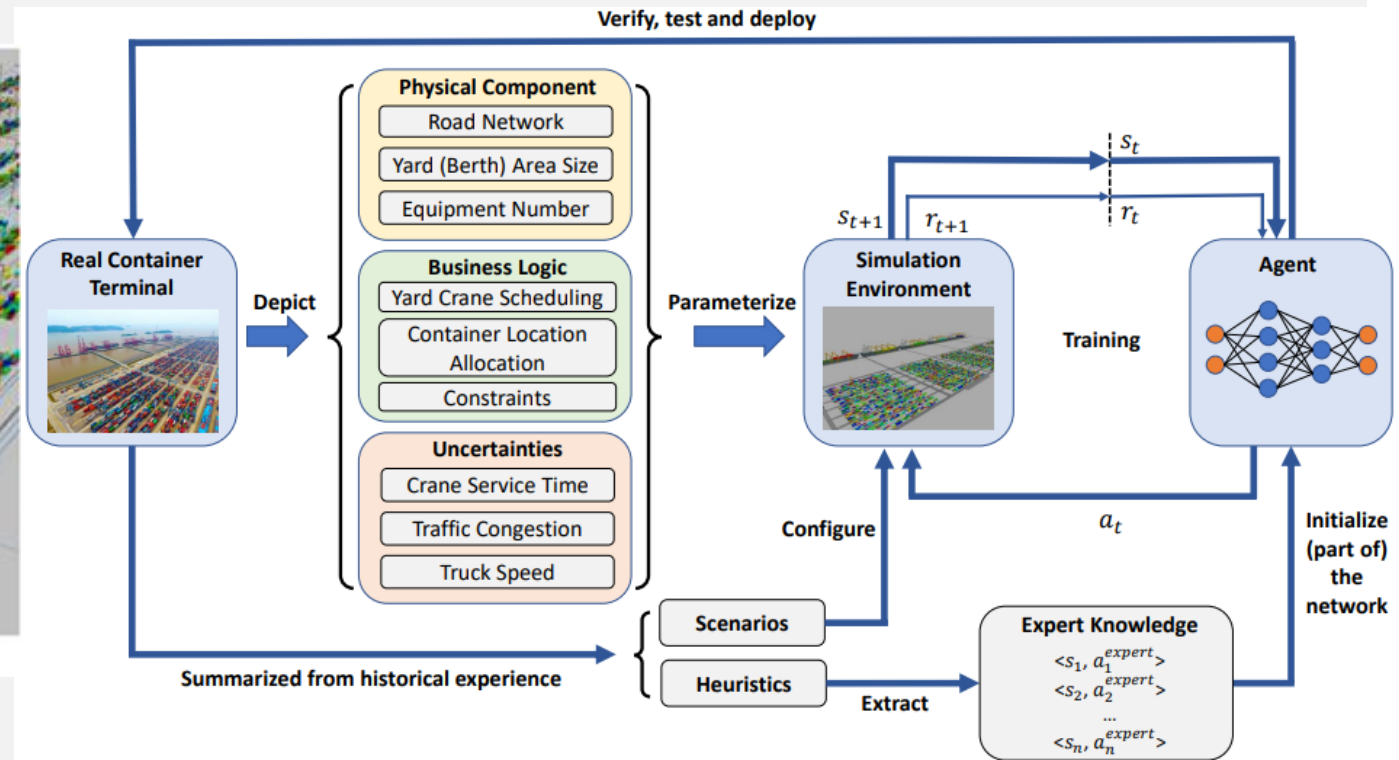
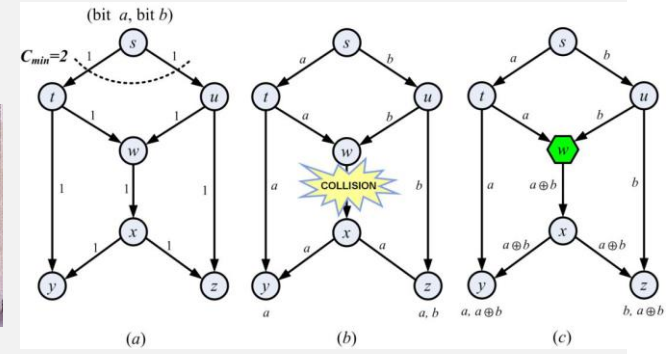
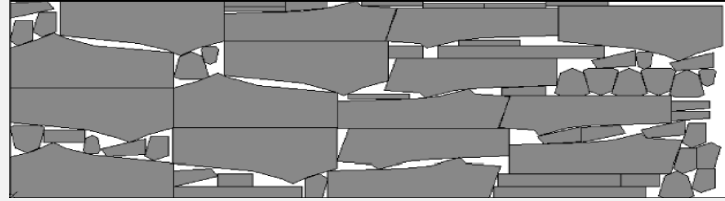
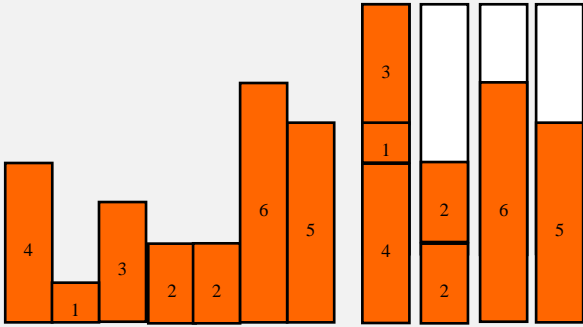


Figure 3: The Real2Sim framework of the proposed reinforcement learning environment.

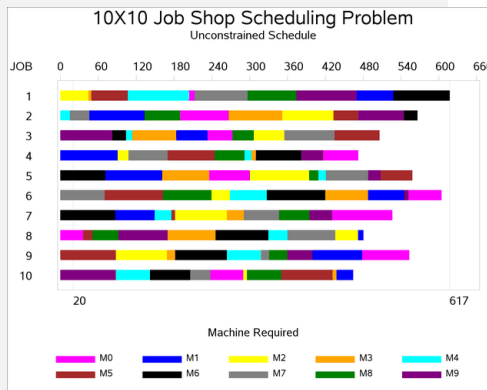
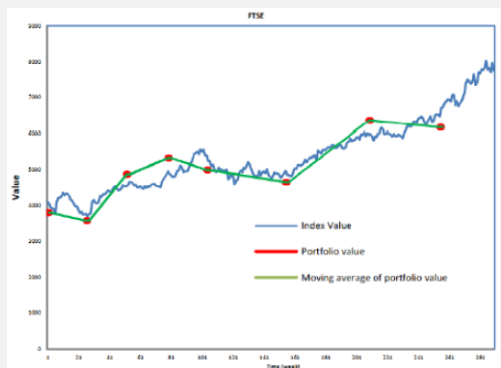
- **REF 2021**
 - UoN: research power 7th in the UK
 - Computer Science: research environment 100% “world leading”
- **Eight research groups/labs**
 - Computational Optimisation and Learning (COL)
 - Cyber-physical Health and Assistive Robotics Technologies (CHART)
 - Computer Vision Lab (CVL)
 - Cyber Security (CybSec)
 - Functional Programming (FP) Lab
 - Intelligent Modelling and Analysis (IMA)
 - Lab for Uncertainty in Data and Decision Making (LUCID)
 - Mixed Reality Laboratory (MRL)
- **Horizon Digital Economy Research Institute (HORIZON)**
- Particularly strong on artificial intelligence, HCI, ethics and responsibility, often in a multidisciplinary context



COL Lab – Applications



December	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1A	D	E	E	E	L								S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
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C	D	D	D	D				L	L	L	L	L	L	L	L	L	L	L	L			L	L	L	L	E	E	E	L
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		Total Penalty 176 Unassigned Shifts 0																											



Programme: Computer Science 12 month PG (Session start) Full time/1	Weeks: 1-18 w1 - w/c Mon 25/09/2017-w18 - w/c Mon 22/01/2018	4045 MSc Computer Science
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