



Applied Optimization:

Scheduling for Better Outcomes

Ho Chin Kuan, Ph.D.



Optimization

- Finding the best solution subject to a set of constraints
 - Finance: investment portfolio selection
 - Traffic signaling network.
 - Life sciences
 - Communication networks design
 - Scheduling

Scheduling in the real-world (1)

- Paper bag factory
 - Production process: printing logo, gluing side of bag, sewing one/both ends of the bag.
 - Each stage involves a number of machines.
 - Production order indicates quantity of specific bag that has to be produced and shipped by a committed date.
 - Multiple production order.

Scheduling in the real-world (2)

- Semiconductor manufacturing
 - Process: wafer fabrication, wafer probe, assembly & packaging, final testing.
 - Scheduler objective: Meet as many committed shipping dates as possible, while maximizing throughput (by maximizing equipment utilization).

Scheduling in the real-world (3)

- Airport gate assignments
 - Dozens of gates and hundreds of planes arriving and departing daily (with certain schedule).
 - Gates are not all identical (neither are the planes).
 - Scheduler has to assign plane to gates in such a way that it is physically feasible, while optimizing a set of objectives (minimal delays, minimal work for airline personnel).

Challenges

- Intractable problems (can solve, but requires huge amount of resources)
- Making it real-time
- Making it efficient