Scheduling jobs

Sunday, 15 January 2023 5:32 PM

→ n jobs to be scheduled on a single machine

→ Each job j must be processed for p_j units of time

→ Job j may begin no earlier than release date r_j.

→ Due date d_j

Lateness $L_j = C_j - d_j$ where C_j is time at which we complete processing

Objective :- Schedule jobs to minimize the maximum lateness $L_{max} = \max_{j=1,\dots,n} L_j$

☹ NP-Hard !!

Lower Bound :-

Let S denote subset of jobs,

$$r(S) = \min_{j \in S} r_j$$

$$p(S) = \sum_{j \in S} p_j$$

$$d(S) = \max_{j \in S} d_j$$

$$L^*_{max} \geq r(S) + p(S) - d(S)$$

Proof ??

Greedy Strategy :- A job j is available at time t if its release date $r_j \leq t$.

At each moment that the machine is idle, start processing next an available with earliest due date. The EDD rule.

Claim :- EDD is 2-approximation for our objective. (Release dates with negative due dates)

Proof !!