

# Greedy algorithms 2

Abhiram Ranade

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**Which do we pick?** Try to prove the correctness of each. Pick the one for which you can get a proof!

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**Algorithm:** Schedule jobs in order of increasing deadline.

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Can show that fetch without miss does not help.

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**Implication:** There exists an optimal solution in which FF is used at all steps.

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Will ensure invariant  $C[t] - C^*[t] = E^*[1] - E[1]$  for  $t = 2..T - 1$ .

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Action of FF1 for  $t = 2..T - 1$ : What can happen at  $t$ ?

$r[T] = E[1]$  cannot happen before  $r[T] = E^*[1]$  (FF property)

$r[t] \neq E[1], E^*[1], E^*[t] \neq E[1]$  : OPT evicted something that was in both caches. We make FF1 do the same.  $E[t] = E^*[t]$ .

Invariant maintained

Event 1 happens at time  $T$ :  $\Rightarrow$  Eviction for OPT.

$$r[T] \notin C^*[T - 1] = C[T - 1] + E[1] - E^*[1]$$

$r[T] \neq E^*[1] \Rightarrow$  Eviction needed also with FF1.

FF1 evicts  $E^*[1]$  :  $E[T] = E^*[1]$

Caches now same!

Event 2 happens at time  $T$ : OPT fetches  $E^*[1]$

$E^*[T] = E[1] \Rightarrow E[T] = "-"$ , FF1 fetches nothing.

Caches same!

$E^*[T] \neq E[1] \Rightarrow E[T] = E^*[T]$ , FF1 fetches  $E[1]$

Caches same!