CIS 452 - Operating Systems Concepts

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Images taken from Silberschatz book

Predicting CPU Burst Duration

Shortest job first (SJF) scheduling requires scheduler to know the duration of future CPU bursts for all processes

Since scheduler cannot know this, it makes a best guess based on past behavior

Formula for new guess is based on most recent time t n and previous predictions T n

$$\tau_{n+1} = \alpha\, t_n + (1 - \alpha)\tau_n.$$

Previous predictions are themselves based on previous times, so this is based on the burst time history of a process

Parameter a controls how much we weight previous times vs most recent time

$$\tau_{n+1} = \alpha\, t_n + (1 - \alpha)\tau_n.$$

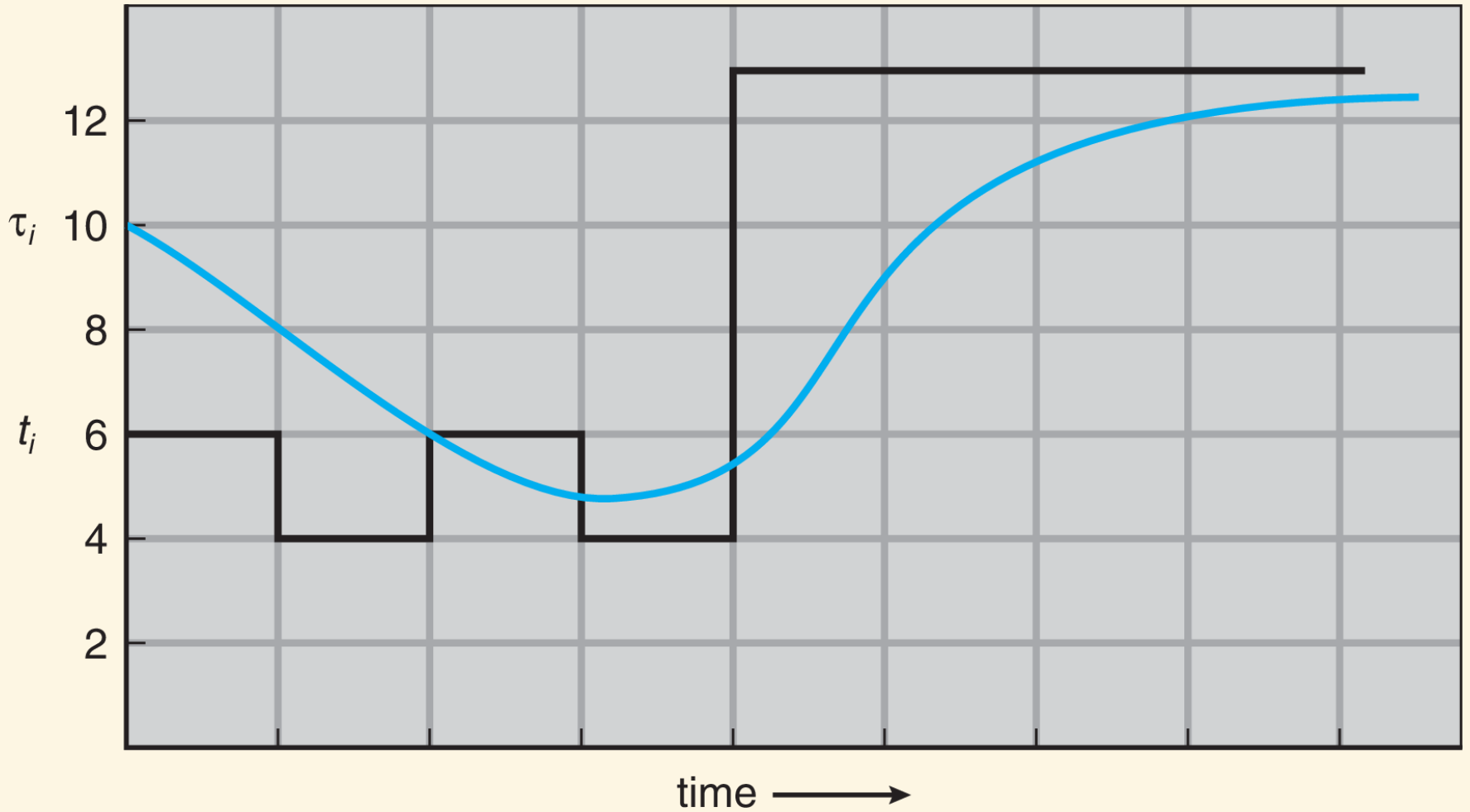
When a = `0`, most recent burst is ignored

When a = `1`, all past history is ignored

Commonly set a = `0.5`

Also need some initial guess `T0`. Common choices are

- overall system average
- a constant



CPU burst (t_i)		6	4	6	4	13	13	13	...
"guess" (τ_i)	10	8	6	6	5	9	11	12	...

$$\tau_{n+1} = \alpha\, t_n + (1 - \alpha)\tau_n.$$

This is called an **exponential average** because it exponentially decreases the importance of past behavior

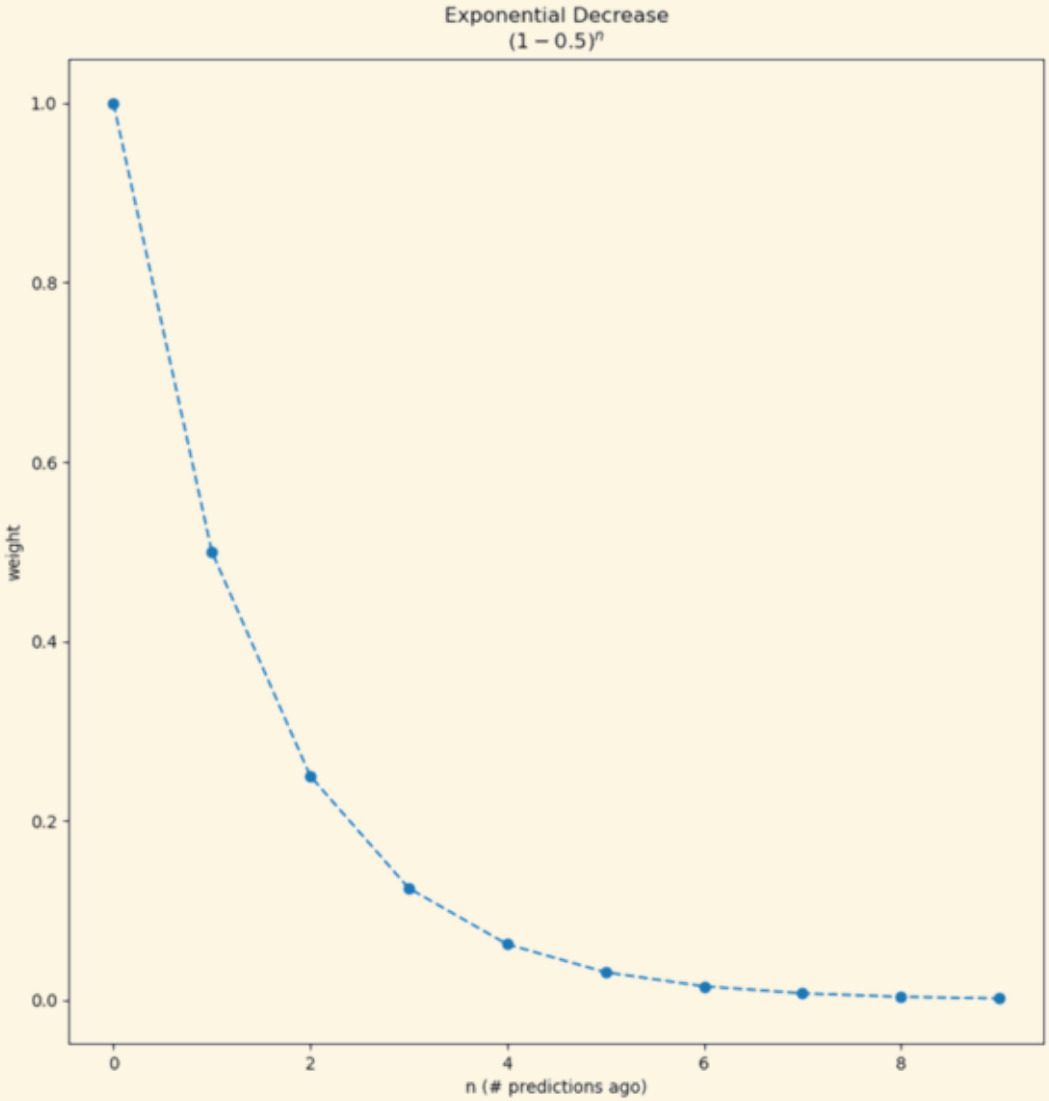
Recent behavior is considered relevant, but beyond a certain point old information is practically ignored

Parameter a determines how quickly the decrease happens

Why is this called "exponential"?

$$\tau_{n+1} = \alpha\, t_n + (1 - \alpha)\tau_n.$$

$$\tau_{n+1} = \alpha t_n + (1 - \alpha)\alpha t_{n-1} + \cdots + (1-\alpha)^j \alpha t_{n-j} + \cdots + (1-\alpha)^{n+1}\tau_0.$$


Exponential Decrease
$(1-0.5)^n$
1.0
0.8
0.6
0.4
0.2
0.0
weight
0
2
4
6
8
n (# predictions ago)

Keep in mind the big picture

We use the past history of CPU burst durations to predict future CPU burst durations according to an exponential average

We need these future predictions for our SJF scheduling algorithm