SD Curs 1

26 Feb 2025

Notare :

1/3 examen de laborator

2/3 examen final rezume

\+ bonus seminar ?

Condiții promovare

Nota finala ≥ 5

1. Suport Curs
2. Notațiile O, Ω, Θ, o, ω

Suport Curs : „Introduction to Algorithmics" Carmen LRS

1. Notațiile O, o, Ω, ω, Θ

2. Recurențe : Teorema Master

3. Algoritmi probabilistici

   Analiza Quick Sort

4. Heap Sort + Arbore liniar de căutare

5. Metode de sortare liniare + limite inferioare pt. sortare

6 + 7. Range Minimum Queries (Standford)

8. Găsirea medianei în $O(n)$

9. Tabele de dispersie (Hash tables)

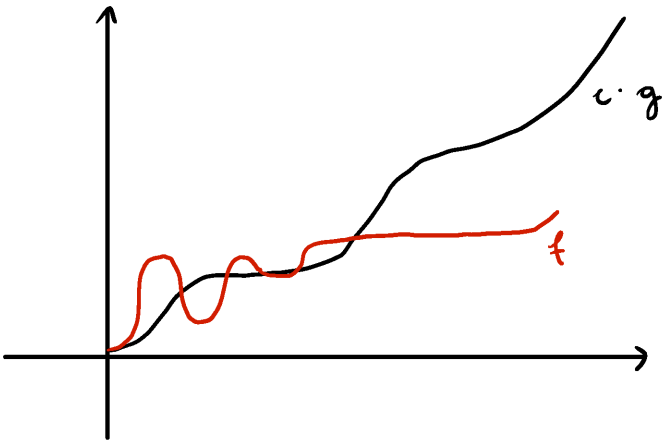
10. Coduri Huffman

11 + 12 + 13. Suffix trees + Arrays

14. Recapitulare

Notațiile O, o, Ω, ω, Θ

O: **Def** Spunem că $f \in O(g)$ dacă $\exists\, n_0, c > 0$ a.î. $\forall\, n \geq n_0$ avem $f(n) \leq c \cdot g(n)$



ex 1

a) $n \in O(n^2)$

Dem.

Fie $n_0 = 1$, $c = 1$ $\quad \forall\, n \geq n_0 \quad n \leq 1 \cdot n^2$

$\Rightarrow n \in O(n^2)$ ✓

b) $100\, n^2 \in O(n^3)$

$c = 100$, $n_0 = 1$ $\Rightarrow 100\, n^2 \leq 100\, n^2$ ✓

c) $2^{n+1} \in O(2^n)$

↳ $2 \cdot 2^n \in O(2^n)$

d) $2^{2n} \notin O(2^n)$

P_n. prin. r.a. că $2^{2n} \in O(2^n)$

$\overset{\text{def}}{\Rightarrow}$ $\exists\, n_0, c > 0$ a.î. $\forall\, n \geq n_0$ $2^{2n} \leq c \cdot 2^n$

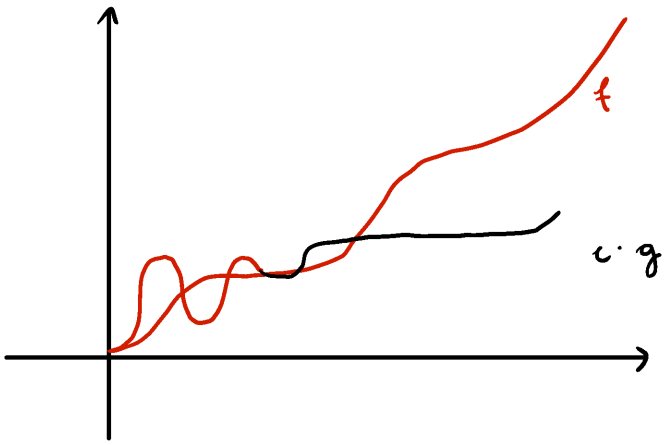
$2^{2n} \leq c \cdot 2^n \quad | : 2^n$

$2^n \leq c$

2^n nu e const. — c constantă

$\Rightarrow$ FALS!

[Ω: Def Spunem că $f \in \Omega(g)$ dacă $\exists\, n_0, c > 0$ a.î. $\forall\, n \geq n_0$ avem $f(n) \geq c \cdot g(n)$



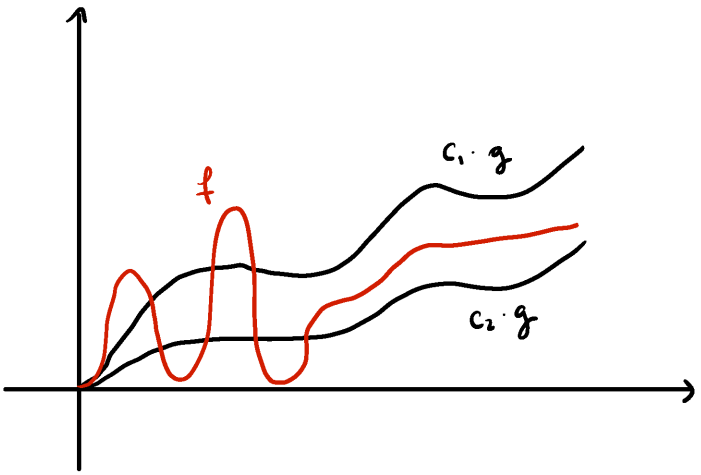
Exemple

$n^3 \in \Omega(n^2)$

$n \log n \in \Omega(n)$

$n \in \Omega(100\, n)$

Θ: Def Spunem că $f \in \Theta(g)$ dacă $\exists\, n_0, c_1, c_2 > 0$ a.î. $\forall n \geq n_0$ avem $c_2 \cdot g(n) \leq f(n) \leq c_1 \cdot g(n)$



Exemple

- $n^2 \notin \Theta(n^3)$
- $10\,n \in \Theta(n)$

o: Def Spunem că $f \in o(g)$ dacă $\forall c > 0$ $\exists\, n_0 > 0$ a.î. $\forall n \geq n_0$ avem $f(n) < c \cdot g(n)$

Exemple

- $n \notin o(100\,n)$
- $n \in o(n^2)$

Fie c fixat

Alegem n_c a.î. $\forall n \geq n_c$ avem $n < c \cdot n^2$

$$n_c = \left[\frac{1}{c}\right] + 1$$

$$\Rightarrow \quad n < \underbrace{c \cdot n}_{>1} \cdot n$$

ω: Def Spunem că $f \in \omega(g)$ dacă $\forall c > 0$ $\exists\, n_0 > 0$ a.î. $\forall n \geq n_0$ avem $f(n) > c \cdot g(n)$