Lecture 1

Wednesday, August 11, 2021 11:01 AM

→ Conjunctive normal form, each clause has 3 literals

3CNF SAT : Satisfiability formula in 3CNF form

NP-hard a boolean formula with $\wedge, \vee, \neg$, we are interested in knowing if it an assignment of T/F values to variables which makes the formula TRUE

3-CNF max-SAT : Given a 3CNF formula find an assignment of T/F values to variables which maximises the no. of clauses satisfied.

NP-hard

$\phi = (x_1 \vee x_2 \vee \bar{x}_3) \wedge (\bar{x}_2 \vee \bar{x}_3) \wedge (\bar{x}_1 \vee \bar{x}_3)$

Given a formula ϕ with m clauses $\exists$ a polynomial time algorithm which finds a boolean assignment satisfying at least 7/8

assign each variable True/False with prob 1/2.] randomised independently a

Consider a clause $C = (x_i \vee x_j \vee x_k)$

Probability that the clause is not satisfied = $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 1/8$.

⇒ probability that the clause is satisfied = 7/8

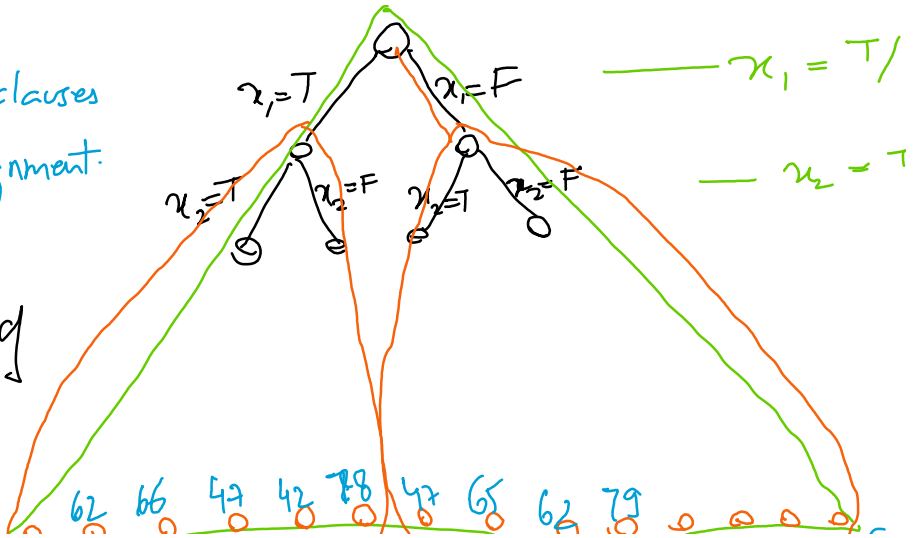
Expected no. of clauses satisfied in a random assignment = 7/8 m

Derandomize this algorithm.

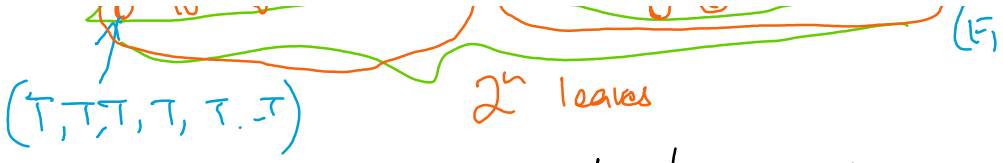
no. on each leaf is the no. of clauses satisfied in corresponding assignment.

Avg. of no's on leaves is 70

One of the two subtrees has avg of leaves ≥ 70. Suppose this corresponds to $x_1 = F$. We set



$x_1 = F$ and proceed.



At the first step we are looking at all assignment where $x_1 = T$ & comp

Avg. no. of clauses satisfied in these.

$(x_1 \vee x_2 \vee x_3)$ if $x_1 = T$ then clause is true & contri
if $x = F$ then clause is true with
& so contributes

$(x_2 \vee x_3 \vee x_4)$ Clause is true w.p.