Wrap up

Lecture 26
Tuesday, April 30, 2019
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFAs
6. Non-regularity (fooling sets)
7. Context free grammars
8. Turing machines
9. Halting/undecidability
What did we learn?

1. Induction
What did we learn?

1. Induction
2. Strings & Languages
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFA
7. Context free grammars.
8. Turing machines.
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFAs.
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. **DFA**s
5. **NFA**s.
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFAs.
7. Context free grammars.
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFAs.
7. Context free grammars.
8. Turing machines.
What did we learn?

1. Induction
2. Strings & Languages
3. Regular expressions
4. DFAs
5. NFAs.
7. Context free grammars.
8. Turing machines.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
3. Deterministic median selection in linear time / QuickSelect.
4. Dynamic programming.
5. Graphs / directed graphs.
6. BFS / DFS.
7. Strong connectivity in linear time.
8. DAG: topological sorting.
10. Greedy algorithms.
11. MST. 

Chan, Har-Peled, Hassanieh (UIUC)
What did we learn II?

1. Recursion.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
3. Deterministic median selection in linear time/ QuickSelect.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,…
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,…
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
6. BFS/DFS.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication, ...
3. Deterministic median selection in linear time / QuickSelect.
4. Dynamic programming.
5. Graphs / directed graphs.
6. BFS / DFS.
7. Strong connectivity in linear time.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
6. BFS/DFS.
7. Strong connectivity in linear time.
8. **DAG**: topological sorting.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication, ...
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
6. BFS/DFS.
7. Strong connectivity in linear time.
8. **DAG**: topological sorting.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication, ...
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
6. BFS/DFS.
7. Strong connectivity in linear time.
8. **DAG**: topological sorting.
10. Greedy algorithms.
What did we learn II?

1. Recursion.
2. Divide and conquer: sorting, n-digit multiplication,...
3. Deterministic median selection in linear time/ QuickSelect.
4. Dynamic programming.
5. Graphs/directed graphs.
6. BFS/DFS.
7. Strong connectivity in linear time.
8. **DAG**: topological sorting.
10. Greedy algorithms.
11. **MST**.
What did we learn III?

- Undecidability.
- Reductions.
- Polynomial time reductions.
- $P \text{ v.s. } NP$.
- NP-Completeness.
- SAT/3SAT/CSAT.
- Independent Set/Clique/Vertex Cover /Hamiltonian Path/Hamiltonian Cycle, etc.
What did we learn III?

1. Undecidability.
What did we learn III?

1. Undecidability.
2. Reductions.
What did we learn III?

1. Undecidability.
2. Reductions.
3. Polynomial time reductions.
What did we learn III?

1. Undecidability.
2. Reductions.
3. Polynomial time reductions.
4. $P$ v.s. $NP$. 

NP-Completeness
SAT/3SAT/CSAT.
Independent Set/Clique/Vertex Cover/Hamiltonian Path/Hamiltonian Cycle, etc.
What did we learn III?

1. Undecidability.
2. Reductions.
3. Polynomial time reductions.
4. $P$ v.s. $NP$.
5. $NP$-Completeness
What did we learn III?

1. Undecidability.
2. Reductions.
3. Polynomial time reductions.
4. P v.s. NP.
5. NP-Completeness
6. SAT/3SAT/CSAT.
What did we learn III?

1. Undecidability.
2. Reductions.
3. Polynomial time reductions.
4. P v.s. NP.
5. NP-Completeness
6. SAT/3SAT/CSAT.
7. Independent Set/Clique/Vertex Cover /Hamiltonian Path/Hamiltonian Cycle, etc.
What is next?
What is next?

Life...
What is next?