CS218
Design and Analysis of Algorithms

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Logistics

- **Class**: Mon 8:30, Tue 9:30, Thu 10:35. LA001.

- **Office hours**: Fri 4-5 pm. CC315

- Tutorials: will schedule

- Slides, exercises etc. on course webpage
  https://www.cse.iitb.ac.in/~rgurjar/CS218-2024/

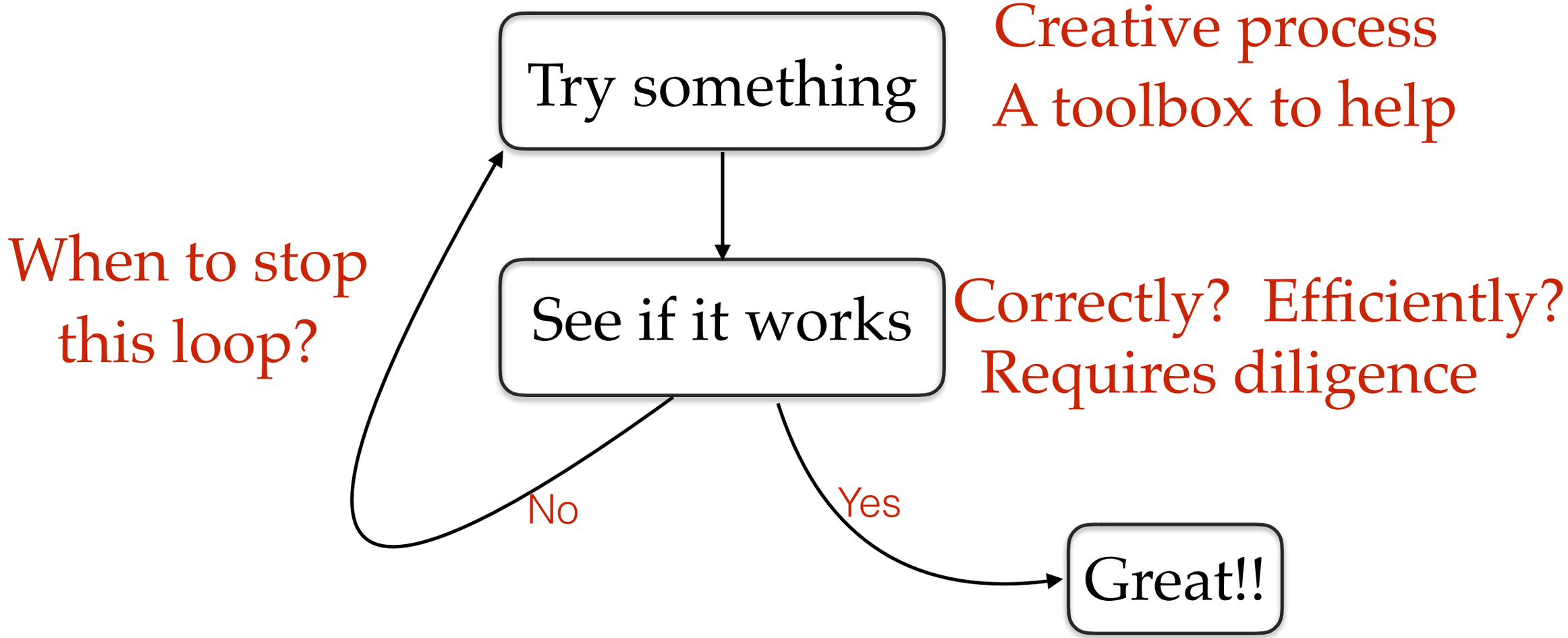
- Announcements, doubts/discussions/exercises: Piazza.
  http://piazza.com/iit_bombay/spring2024/cs218
  Access code: cs218

Grading

- 3 Programming assignments - 5+5+5 %
- 2 quizzes- 10+10% (Jan 31, Mar 27, 8:30-9:30 AM)
- Midsem - 25 %
- Endsem - 40 %

Objectives

- How to design algorithms.



Algorithm's correctness

- How to argue that an algorithm is **not** correct: show bad examples
- Arguing algorithm's correctness
  - **Correctness by confidence**: I came up with it, so it must be correct
  - **Correctness by examples**: because it works for my f examples
  - **Correctness by authority**: It's just obvious

- Formal proofs of correctness, whenever needed
- How to communicate/represent an algorithm

What will you learn

✦ **Principles of designing and analyzing algorithms:**

- Basic principles like induction/recursion.
- Divide and Conquer,
- Dynamic Programming,
- Greedy Algorithms.

✦**Beyond the basics:**

- Bipartite Matching
- Network Flow and applications.
- Reductions.

✦**Complexity:**

- Polynomial time and the Complexity classes NP, co-NP.
- NP-hardness.

✦**Advanced topics:**

- Randomized algorithms
- Approximation algorithms

✦**Miscellaneous:**

- How QR codes work?

References

- Kleinberg, Tardos (amazing book, freely available)
- Prof. Sundar's course notes