



BITS Pilani
Pilani Campus



CS F364 Design & Analysis of Algorithms

DIVIDE-AND-CONQUER

Exercise:

Search in a matrix whose elements are partially sorted

Search in a matrix

- Consider the following (trivial) extensions of search:
 - Find an element x in a matrix M .
 - Find an element x in a matrix M where elements are sorted row-major i.e.
 - elements within a row are ordered left to right and
 - last element of row j appears before first element of row $j+1$ in the given ordering
- Modify linear search and binary search algorithms for solving the above problems.



Search in a (partially sorted) matrix

- Problem:
 - Find an element x in a matrix M whose elements are partially sorted such that
 - elements in each row are sorted and
 - elements in each column are sorted.
- Exercise:
 - Design an algorithm using *divide-and-conquer*.



Search in a (partially sorted) matrix - Decomposition

- Consider multiple possible decompositions of the matrix:
 - e.g. Sub-matrices of size $N/2 * N/2$ given a square matrix of size $N*N$ where $N=2^k$ for some integer $k>0$.
 - e.g. Sub-matrix of size $(M-1)*(N-1)$ given a matrix of size $M*N$.
- For each possible decomposition:
 - Write down the recurrence relation for time complexity and solve it.
- What are the lessons learnt??

