For every function $S: N \to N$, the time complexity class NSPACE(s) is set of all languages that can be decided by multi~~ple~~ tape nondeterministic TM with worst case bounded above by O(s).

We can use these complexity classes to define the non-deterministic analogue of SPACE.

$$NPSPACE = \bigcup_{K \geq 1} NSPACE(n^K)$$

Savitch theorem that any nondeterministic TM can be simulated by a deterministic turing m/c with at most a quadratic increase in the amount of space required.

Savitch theorem for every $S: N \to N$.

$$NSPACE(s(n)) \subseteq SPACE(s(n)^2)$$

$$PSPACE = NPSPACE$$

Savitch Theorem

- We can consider the space complexity analogue of the P Vs NP problem by considering the space cost of non-determinis turing machines.

Nondeterministic ~~tape~~ Space complexity

The space cost of nondeterministic TM M on i/p x is the max^m no. of distinct tape cells that are visited by M's tape head before M halts, with the max^m taken over all possible computational paths.

The (worst-case) space cost of nondeterministic TM M is the function $S: N \to N$ where $S(n)$ is maximum space cost of M on any i/p x of length $|x| = n$.