



# DATA STRUCTURES AND ITS APPLICATIONS

---

**Prof. Vandana M L**

Department of Computer Science and Engineering

# DATA STRUCTURES AND ITS APPLICATIONS

---

## Multilist Representation

**Prof. Vandana M L**

Department of Computer Science and Engineering

# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix

---



Matrix ??

Two Dimensional data

1 1 3 0 4

1 3 5 1 0

9 0 5 1 0

Sparse Matrix??

More zero elements than non zero elements

0 0 3 0 0

0 0 5 1 0

0 0 0 0 0

- 2D Matrix
  - results in lot of memory wastage as non zero elements are also stored
- Triple Notation
  - Array representation
- Multilist Representation
  - Linked representation hence size can be changed dynamically

# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix Representation: Triple Notation

In triple notation sparse matrix is represented as an array of tuple values.  
Each tuple consists of  
<rowno columnno Value>

The first block in array block holds information regarding  
<total no of rows, total no of columns ,value>

2	0	0	0
4	0	0	3
0	0	0	0
8	0	0	1
0	0	6	0



**Triple Notation**

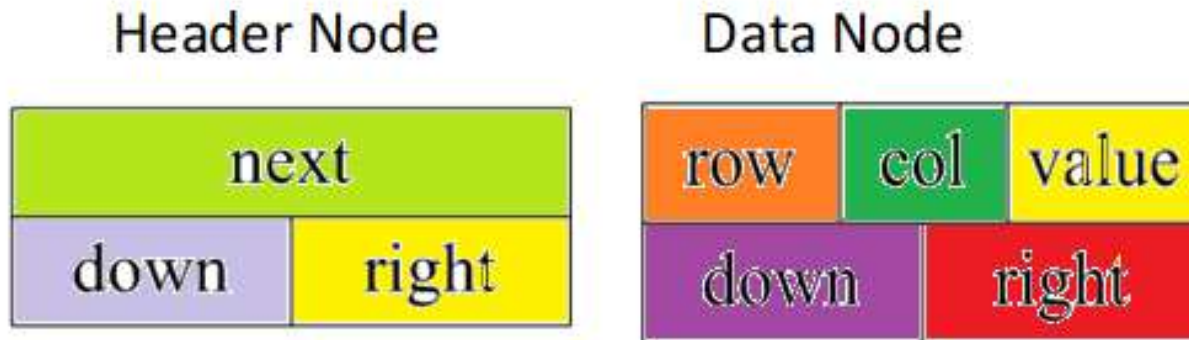
Row No	Column No	Value
5	4	6
0	0	2
1	0	4
1	3	3
3	0	8
3	3	1
4	2	6

# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix Representation: Linked representation

### Node Structure

Two types of nodes are used



# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix Representation: Linked representation



### Node Structure Definition

```
#define MAX_SIZE 50 /* size of largest
matrix */
typedef enum {head, entry} tagfield;
typedef struct matrixNode * matrixPointer;
typedef struct entryNode {
int row;
int col;
int value; };

typedef struct matrixNode {
    matrixPointer down;
    matrixPointer right;
    tagfield tag;
    union
    {
        matrixPointer next;
        entryNode entry;
    } u;
};
```

# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix Representation: Linked representation



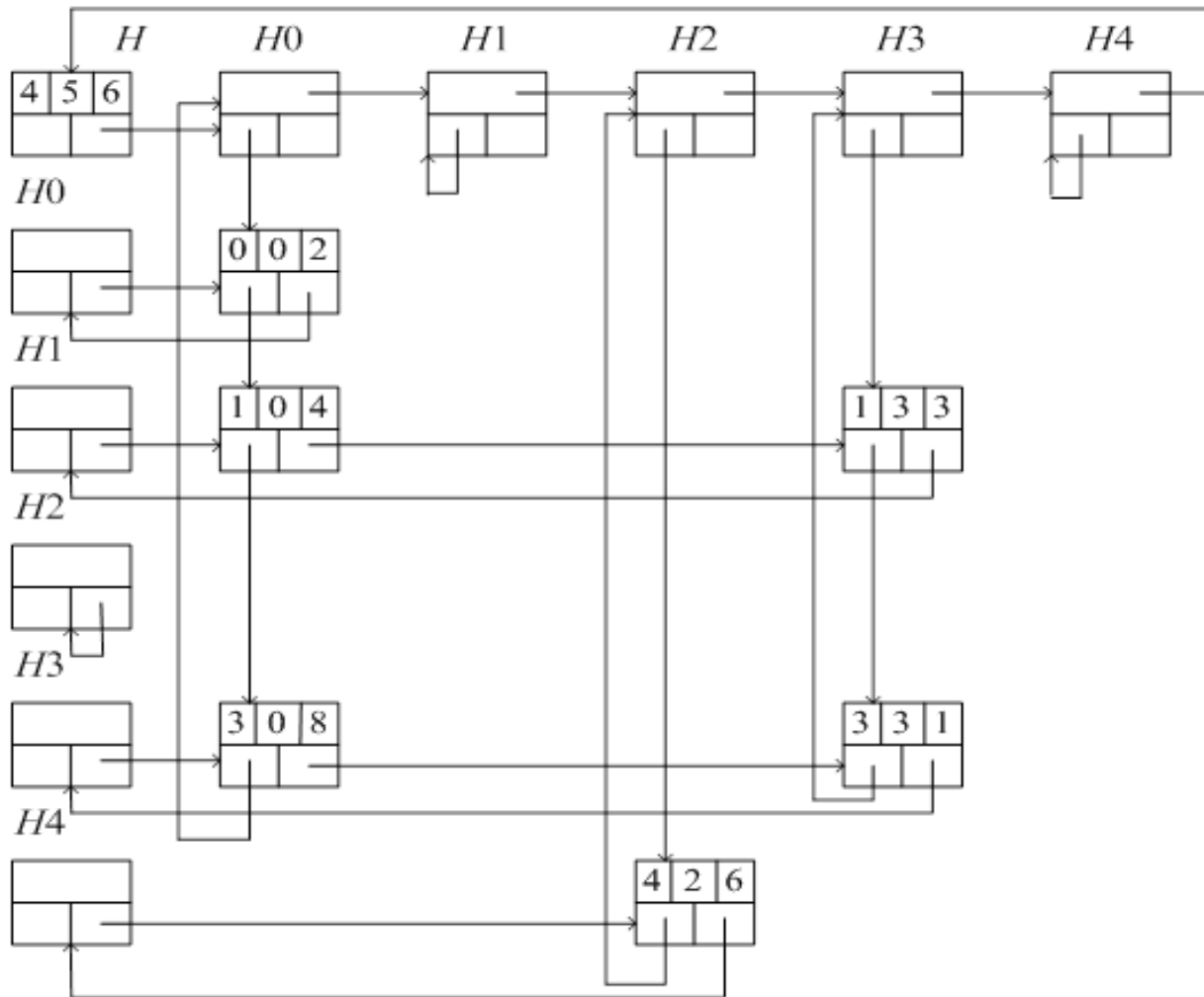
### Example

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$$



# DATA STRUCTURES AND ITS APPLICATIONS

## Sparse Matrix Representation: Linked representation



Sparse matrix representation

- Triple
- Linked Representation

Concepts can be applied to implement the following operations

- Create\_SparseMatrix()
- Transpose\_of\_SparseMatrix()
- Add\_SparseMatrices()
- Multiple\_SparseMatrices()



**Prof. Vandana M L**

Department of Computer Science and Engineering

---

**[vandanamd@pes.edu](mailto:vandanamd@pes.edu)**