

“Other” Data Models



SDSC SAN DIEGO
SUPERCOMPUTER CENTER

After this video you will be able to

- Describe how arrays can serve as a data model
- Explain why images can be modeled as vector arrays
- Specify a set of operations on scalar and vector arrays

Array as a Data Model

	0	1	2	3	4
0	10	77	18	21	4
1	23	16	31	19	62
2	28	47	37	93	20
3	93	99	58	42	47
4	39	42	54	84	74

- Array → Indexed relation
 - Table representation
 - Number of columns = number of dimensions + 1
 - Number of tuples = size of dimension 1 X size of dimension 2 X ...

Arrays of Vectors

	0	1	2	3	4
0	(10, 200, 68)	(77, 182, 83)	(18, 310, 56)	(21, 231, 78)	(4, 217, 75)
1	(23, 193, 35)	(16, 301, 74)	(31, 290, 84)	(19, 253, 49)	(62, 383, 49)
2	(28, 174, 56)	(47, 168, 90)	(37, 341, 57)	(93, 236, 83)	(20, 386, 50)
3	(93, 348, 67)	(99, 192, 79)	(58, 293, 82)	(42, 294, 74)	(47, 432, 45)
4	(39, 168, 90)	(42, 203, 75)	(54, 326, 53)	(84, 388, 94)	(74, 392, 44)

$A(3,2)$



Operations on Array of Vectors

- $\text{dim}(A)$ – number of dimensions of A
- $\text{size}(A, \text{dim})$ – size of a specific dimension
- $A(i, j)$ – value of the element at the (i, j) -th cell
- $A(i, j)[k]$ – value of the k -th element of the cell at $A(i, j)$
- $\text{length}(A(i, j))$ – vector-length of the vector at the (i, j) -th cell
- $\text{distance}(A(i, j), A(k, l), f)$ – vector distance between the values of two cells given the distance function f

	0	1
0	(10, 200, 68)	(77, 182, 83)
1	(23, 193, 35)	(16, 301, 74)

$A(1,1)[2]$ $A(1,1)$

The diagram illustrates the array structure. A 2x2 grid of cells is shown. The first row is indexed 0 and the second row is indexed 1. The first column is indexed 0 and the second column is indexed 1. The cell at row 1, column 1 contains the vector (16, 301, 74). A bracket on the right side of this cell indicates its length. An arrow points from the label $A(1,1)[2]$ to the third element (74) of the vector. Another arrow points from the label $A(1,1)$ to the entire vector (16, 301, 74).