

# “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

	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>0</b>	10	77	18	21	4
<b>1</b>	23	16	31	19	62
<b>2</b>	28	47	37	93	20
<b>3</b>	93	99	58	42	47
<b>4</b>	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 represents the array. The columns are indexed 0 and 1, and the rows are indexed 0 and 1. Each cell contains a 3-element vector. An arrow points from the label  $A(1,1)[2]$  to the third element (74) of the vector in the cell at row 1, column 1. Another arrow points from the label  $A(1,1)$  to the entire vector (16, 301, 74) in the same cell. A blue bracket is drawn next to the vector in the cell at row 1, column 1, indicating its length.