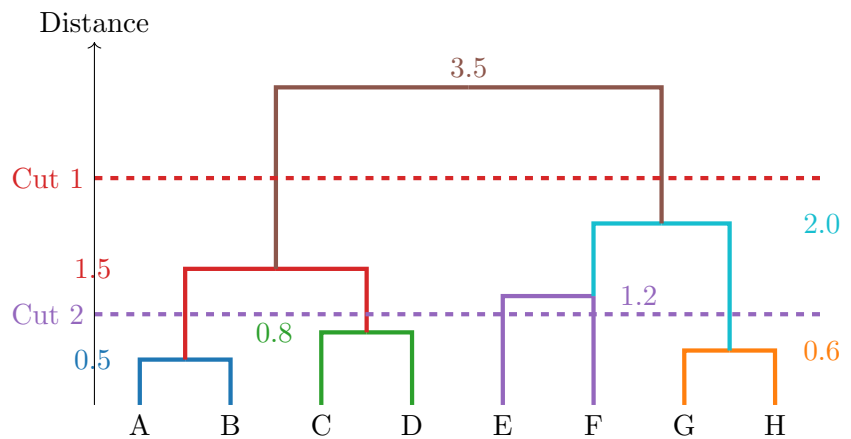


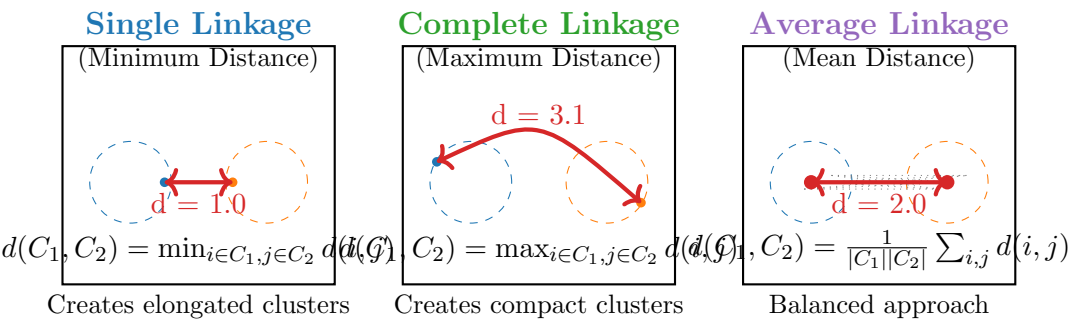
# Advanced Discovery: Hierarchical Clustering

## Building the Tree of Relationships

### The Dendrogram: A Family Tree of Data

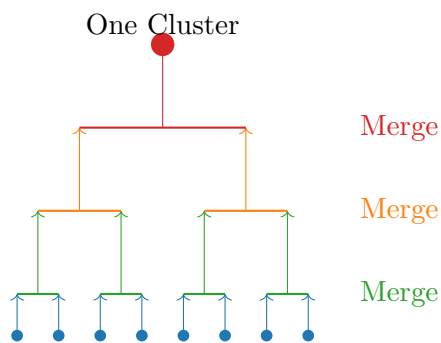


### Three Linkage Methods: Different Stories

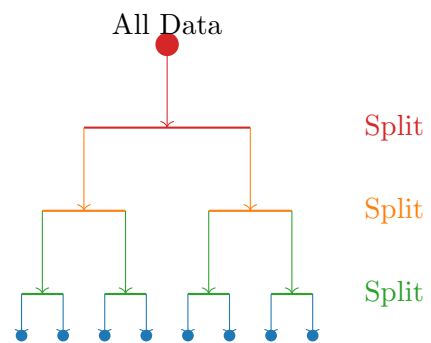


## Agglomerative vs Divisive: Two Strategies

### Agglomerative (Bottom-Up)



### Divisive (Top-Down)



## Distance Matrix: The Foundation

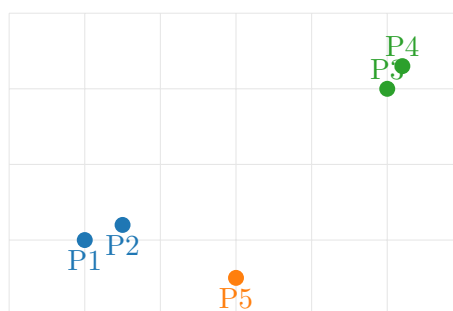
	A	B	C	D	E
A	0	2	6	10	9
B	2	0	5	9	8
C	6	5	0	4	7
D	10	9	4	0	5
E	9	8	7	5	0

→ Merge A-B ( $d=2$ )

→ Then C-D ( $d=4$ )

	AB	CD	E
AB	0	5.5	8.5
CD	5.5	0	6
E	8.5	6	0

## Discovery Challenge: Build Your Tree



Draw the dendrogram using:

Single linkage: \_\_\_\_\_

Complete linkage: \_\_\_\_\_

**Key Insight:** No need to choose  $k$  - cut the tree at any height!