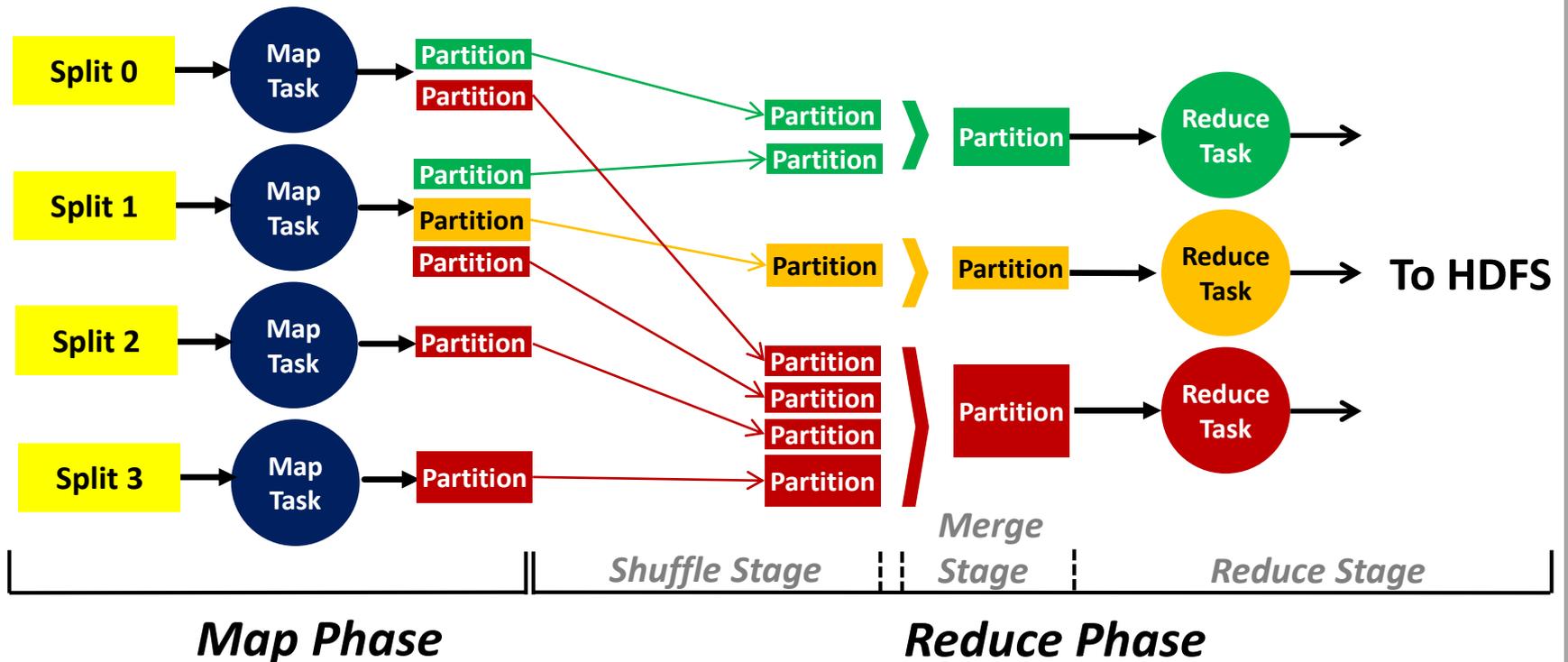# 15-440
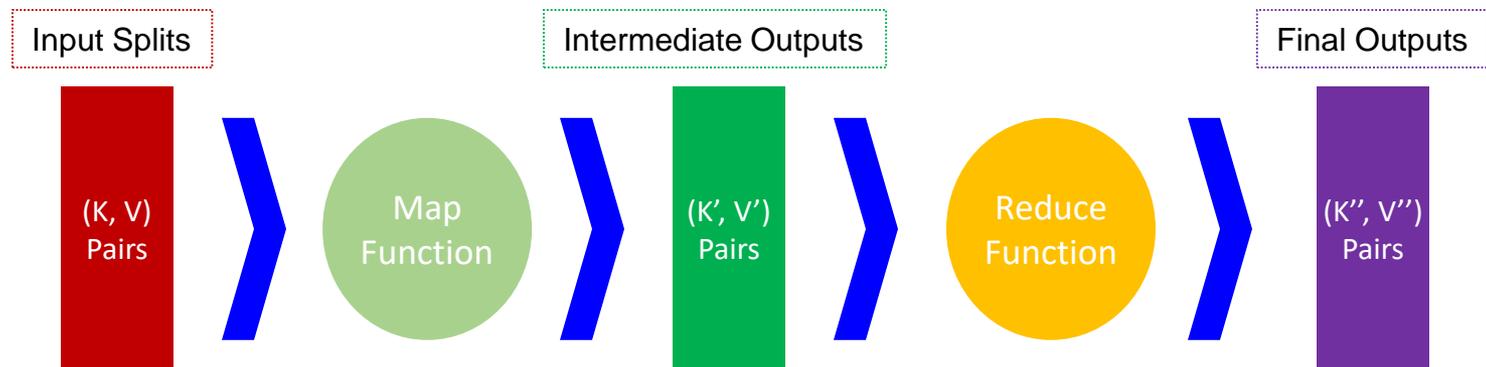# Distributed Systems
Recitation 11

Tamim Jabban

Project 4

- Apply MapReduce to cluster analysis, using the **K-Means** algorithm

- Due date: November 30th
  - Please start early!

MapReduce: A Systems View

Data Structure: Keys and Values

- In a MapReduce program, the programmer has to specify two functions: the Map function and the Reduce function that implement the *Mapper* and the *Reducer*, respectively

- In MapReduce, data elements are always structured as key-value (i.e., (K, V)) pairs

- Therefore, the Map and Reduce functions receive and *emit* (K, V) pairs

Input Splits	Intermediate Outputs	Final Outputs

(K, V) Pairs > Map Function > (K', V') Pairs > Reduce Function > (K'', V'') Pairs

MapReduce: An *Application* View

A Chunk of File

Tamim is delivering a recitation to the 15-440 class

A *Map* Function

Key1	Value1
0	Tamim is
20	delivering a
38	recitation to
60	the 15-440 class

Parse & Count

Key2	Value2
Tamim	1
is	1
delivering	1
a	1
recitation	1
to	1
the	1
15-440	1
class	1

A Chunk of File

The course name of 15-440 is Distributed Systems

A *Map* Function

Key1	Value1
0	*The course*
17	*name of 15-440*
40	*is Distributed*
58	*Systems*

Parse & Count

Key2	Value2
The	1
course	1
name	1
of	1
15-440	1
is	1
Distributed	1
Systems	1

A *Reduce* Function

Iterate & Sum

Key2	Value2
Tamim	1
is	2
delivering	1
a	1
recitation	1
to	1
the	2
15-440	2
class	1
course	1
name	1
of	1
Distributed	1
Systems	1