

# Essentials of Applied Data Analysis

## IPSA-USP Summer School 2017

### Handout - The Basics of Set Theory

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jan/17

## Set Theory

Basic notions and notation of set theory.

### First concepts and notation

- Sets are a list or collection of objects.
- These objects are elements.
- $\emptyset$  is the empty set.
- $p \in A$ :  $p$  is an element in the set  $A$ .
- $A \subset B$ :  $A$  is a subset of  $B$

### Set Theory - operations

- $A \cup B$ : union of  $A$  and  $B$ .
  - $p \in (A \cup B)$ :  $p$  is an element of  $A$  **OR**  $B$ .
- $A \cap B$ : intersection of  $A$  and  $B$ .
  - $p \in (A \cap B)$ :  $p$  is an element of  $A$  **AND**  $B$ .
- If  $A \cap B$  is equal to  $\emptyset$ , then  $A$  and  $B$  are **disjoint** sets.

- $A^c$  ( $A'$ ,  $\sim A$  or simply *not A*) is the set of all elements that does not belong to  $A$ .  $A_c$  is the complement of  $A$ .

## Venn Diagrams

We can represent sets with diagrams. These are called “Venn Diagrams”. Check Figure 1 and locate the following sets as a quick exercise:

- |               |                        |                             |                             |
|---------------|------------------------|-----------------------------|-----------------------------|
| 1) $A \cup B$ | 5) $(A \cup B) \cup C$ | 9) $A^c$                    | 13) $((A \cap B) \cap C)^c$ |
| 2) $A \cap B$ | 6) $(A \cap B) \cap C$ | 10) $(A \cap B)^c$          | 14) $((A \cup B) \cap C)^c$ |
| 3) $A \cup C$ | 7) $(A \cup B) \cap C$ | 11) $(A \cup C)^c$          |                             |
| 4) $A \cap C$ | 8) $(A \cap B) \cup C$ | 12) $((A \cup B) \cup C)^c$ |                             |

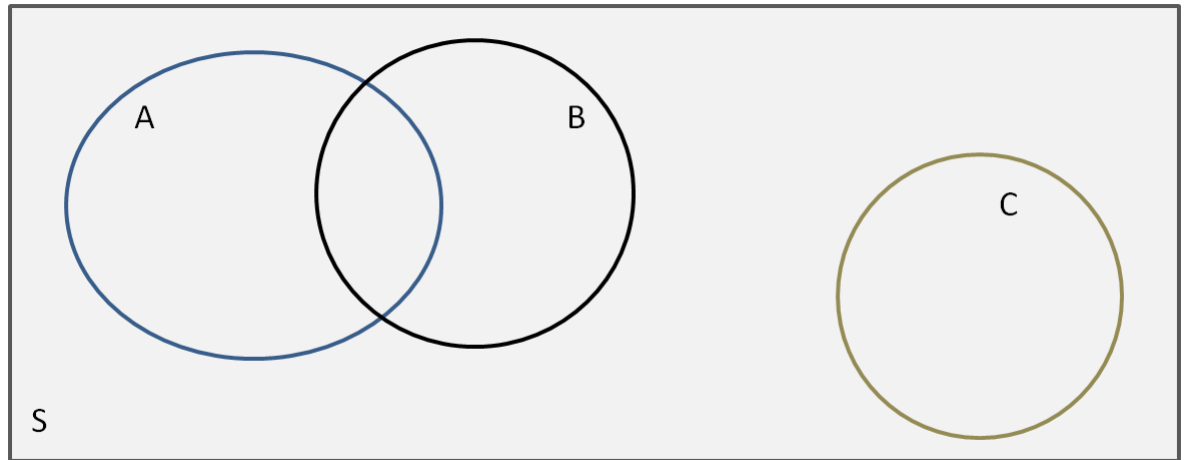


Figure 1: Venn Diagrams