

# Probability

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## 1. Introduction

- **Experiment/Trial:** An uncertain situation.
- **Outcome:** Result of an uncertain situation.
- **Sample space:** Set of all possible outcomes of an experiment.
- **Event:** Subset of the sample space.

### Definition 1.1 (Field):

$\mathcal{F}$  is a field over  $\Omega$  if it satisfies the following three properties:

1.  $A, B \in \mathcal{F} \implies A \cup B \in \mathcal{F}$  and  $A \cap B \in \mathcal{F}$ .
2.  $A \in \mathcal{F} \implies A^c \in \mathcal{F}$ .
3.  $\emptyset \in \mathcal{F}$ .

### Definition 1.2 ( $\sigma$ -field):

$\mathcal{F} \subseteq \mathcal{P}(\Omega)$  is a  $\sigma$ -field if the following three properties are satisfied.

1.  $A_1, A_2, \dots \in \mathcal{F} \implies \bigcup_{i=1}^{\infty} A_i \in \mathcal{F}$  and  $A \cap B \in \mathcal{F}$ .
2.  $A \in \mathcal{F} \implies A^c \in \mathcal{F}$ .
3.  $\emptyset \in \mathcal{F}$ .