Chapter 7

Probability.

Definition 7.0.1. *A probability space defined by a tuple* (Ω, P) *such that:*

1. Ω *is a set, called the sample space. Any element* $\omega \in \Omega$ *is named an atomic event. Conceptually, we think of atomic events as possible outcomes of our experiment. Any subset* $A \subset \Omega$ *is an event.*

2. P*, called the probability function, is a function that assigns a number in* $[0, 1]$ *to any event, denoted as* $P : 2^{\Omega} \to [0, 1]$*, and satisfies:*

   (a) *For any event* $A \subset \Omega$, $P(A) = \sum_{\omega \in A} P(w)$.

   (b) *Normalization, over the atomic events, to* 1*, which means* $\sum_{\omega \in \Omega} P(\omega) = 1$.

Example 7.0.1.

Result: Sorting $A_1, A_2, ..A_n$

```
for i ∈ [n] do
    for j ∈ [n] do
        if A_i < A_j then
            swap A_i ↔ A_j
        end
    end
end
```

Algorithm 1: "ICan'tBelieveItCanSort" alg.