

# Algorithm Practice

November 19, 2024

One way to compute an average is to use Algorithm 1.

---

**Algorithm 1** Compute arithmetic mean

---

**Require:**  $A = [1..N]$  ▷ We have an array of numbers  $A$   
1:  $len \leftarrow A.length$   
2:  $sum \leftarrow 0$   
3: **for**  $i \leftarrow 1$  to  $N$  **do**  
4:      $sum \leftarrow sum + A[i]$   
5: **end for**  
6: **Return**  $\frac{1}{len} \cdot sum$

---

Another way commonly used in Reinforcement Learning is to compute an average *over time* as in Algorithm 2.

---

**Algorithm 2** Compute cumulative arithmetic mean

---

**Require:**  $A = [1..N]$  ▷ We have an array of numbers  $A$   
1:  $len \leftarrow A.length$   
2:  $mean \leftarrow 0$   
3: **for**  $i \leftarrow 1$  to  $N$  **do**  
4:      $mean \leftarrow mean + \frac{1}{i}(mean - A[i])$   
5: **end for**  
6: **Return**  $mean$

---

Why is this special? It allows you to formulate the average as a learning algorithm with an error term i.e.  $mean - A[i]$ .