Solutions to Sheet 5

Friedrich May, 355487; Markus Moll, 406263; Mariem Mounir, 415862
Group 57

June 24, 2020

Exercise 5

To calculate the expected total aggregated runtime for a job of n tasks we need to know the expected runtime of a task.

$$E(R) = nE(R_1)$$

.

The expected runtime of a task consists of the time the task itself takes t and the expected additional recovery time A_1

$$E(R_1) = t + E(A_1)$$

. We know that a failure during the execution or the recovery of a task happens with probability $p_f \in [0, 1)$. The probability for a task to fail k times therefore is p_f^k. With every recovery takeing $10t$ this yields a expected additional recovery time

$$E(A_1) = 10t \sum_{k=1}^{\infty} kp^k = 10t \frac{p_f}{(p_f - 1)^2}$$

. Therefore the expected total accumulated runtime is

$$E(R) = n \left(t + 10t \frac{p_f}{(p_f - 1)^2} \right)$$

.

Exercise 6

a)

Map: Input:

$$(P, \text{Friends}_P)$$

Output:

$$(\{P_1, P_2\}, \{\text{Friends}_{P_1}, \text{Friends}_{P_2}\})$$

Reduce: Input:

$$(\{P_1, P_2\}, \{\text{Friends}_{P_1}, \text{Friends}_{P_2}\})$$

Output:

$$(\{P_1, P_2\}, \{P | P \in \text{Friends}_{P_1} \wedge P \in \text{Friends}_{P_2}\})$$

b)

Map: Input:

$$(P, \text{Friends}_P)$$

Output:

$$(P, \text{Friends}_F) \forall F \in \text{Friends}_P$$

Reduce: Input:

$$(P, \text{Friends}_F)$$

Select 10 values Friends_F. From every value select one person $F_i \neq P$.
Output:

$$(P, \{F_i\})$$