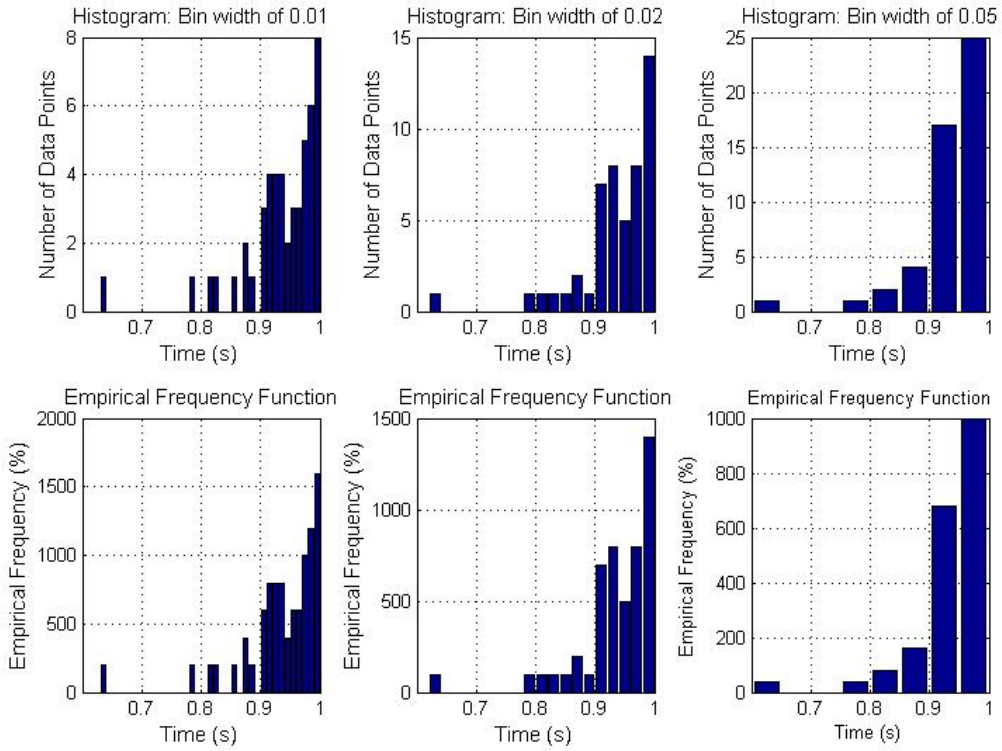
MAE108 S2014 - Homework 1 Solutions

Problems 1 and 2



Problem 3 - Exercise 2.1

1. The possibility (sample) space Ω_1 of his travel times from city A to city B is $\{6, 7, 9, 10, 11\}$ hours, this is the set of times that it may take him to travel from A to B. The possibility space Ω_2 of his travel times from A to C is $\{8, 9, 10, 11, 12, 13, 14\}$ hours.

2. The sample space of his travel cost from A to C is the set of total possible costs he can pay to get from city A to C, it is $\{850, 1500\}$ dollars.

3. If T = travel time from A to C and S = travel cost from A to C, then the sample space of T and S contains all possible combinations of travel time with travel cost from A to C. It is the following set:

   {(8h,1500$), (9h,1500$), (10h,1500$), (11h,850$), (12h,850$), (13h,850$), (14h,850$)}.

Problem 4 - Exercise 2.2

1. Pier 1 settles at x between 2 and 5 cm, and Pier 2 settles at y between 4 and 10 cm. The differential settlement is $d = y - x$, and by physical considerations we know $x \leq y$. The minimum differential is $d = 0$ cm when $y = x$ and the maximum is $d = 8$ cm when $x = 2$ cm and $y = 10$ cm. Therefore the sample space of this differential settlement between Pier 2 and Pier 1 is

   $\{d \in \mathbb{R} \mid 0 \leq d \leq 8 \text{ cm}\}$.

   Note that we are interested in the absolute difference.

2. Assuming that the differential settlements are equally likely in the given sample space, the probability that a differential settlement lies in some interval is equal to the length of the desired interval divided by the total interval length. So the probability that d is between 3 and 5 cm is $\dfrac{5-3}{8-0} = \dfrac{1}{4}$.