

AI1110: Assignment 8

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Question

A new car is introduced with the claim that its average mileage in highway driving is at least 28 miles per gallon. Seventeen cars are tested, and the following mileage is obtained:

19	20	24	25	26	26.8	27.2	27.5	
28	28.2	28.4	29	30	31	32	33.3	35

Can we conclude with significance level at most 0.05 that the claim is true?

Solution

We need to test the composite null hypothesis $\eta > \eta_0 = 28$ against the hypothesis $\eta < \eta_0$

Consider the first simple null hypothesis that $\eta = \eta_0 = 28$. In this case

$$\bar{x} = \frac{1}{17} \sum x_i = 27.67 \quad (1)$$

$$\sigma^2 = \frac{1}{16} \sum (x_i - \bar{x}) \quad (2)$$

$$= 17.6 \quad (3)$$

$$\sigma = 4.2 \quad (4)$$

$$q = \frac{\bar{x} - \eta_0}{\sigma / \sqrt{n}} = -0.33 \quad (5)$$

Since, we know that

$$q_u = t_u(n-1) = t_{0.05}(16) = -1.95 \quad (6)$$

Clearly $q_u < q$

Solution(Contd..)

Also, we know that the Order Characteristic function(for $q_u < q$ is given by

$$\beta(\eta) = \int_c^{\infty} f_q(q, \eta) dq \quad (7)$$

If $\eta_0 > 28$ then the corresponding value of q is larger than -0.33. This does not support the hypothesis η_0 for any $\eta_0 > 28$