yc4384_Yangyang_Chen_HW9

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1.

$H(t) = \int_0^t h(t)dt = \int_0^\infty \frac{2t}{(1+t^2)}dt = log(1+t^2)|_0^\infty = log(1+t^2)$

Survival function:

$S(t) = exp(-H(t)) = \frac{1}{1+t^2}$

pdf of t:

$f(t) = h(t) \times S(t) = \frac{2t}{1+t^2} \times \frac{1}{1+t^2} = \frac{2t}{(1+t^2)^2}$

2.

For the following data 1, 2, 2, 4+, 5+, 6, 7+, 8+, 9+, 10+, where + denotes a right censored observation. Write out the data table and calculate the following by hand.

(a) Find the Kaplan-Meier estimate of the survival function;

t_i	n_i	d_i	c_i	λ_i	$S(t)$
1	10	1	0	$\frac{1}{10}$	$1 \times \left(1 - \frac{1}{10}\right) = 0.9$
2	9	2	0	$\frac{2}{9}$	$0.9 \times \left(1 - \frac{2}{9}\right) = 0.778$
4	7	0	1	$\frac{0}{7}$	$0.778 \times \left(1 - \frac{0}{7}\right) = 0.778$
5	6	0	1	$\frac{0}{6}$	$0.778 \times \left(1 - \frac{0}{6}\right) = 0.778$
6	5	1	0	$\frac{1}{5}$	$0.778 \times \left(1 - \frac{1}{5}\right) = 0.622$
7	4	0	1	$\frac{0}{4}$	$0.622 \times \left(1 - \frac{0}{4}\right) = 0.622$
8	3	0	1	$\frac{0}{3}$	$0.622 \times \left(1 - \frac{0}{3}\right) = 0.622$
9	2	0	1	$\frac{0}{2}$	$0.622 \times \left(1 - \frac{0}{2}\right) = 0.622$
10	1	0	1	$\frac{0}{1}$	$0.622 \times \left(1 - \frac{0}{1}\right) = 0.622$

(b) Find the Nelson-Aalen estimate of the cumulative hazard function;

(c) Find the Fleming-Harrington estimate of the survival function.