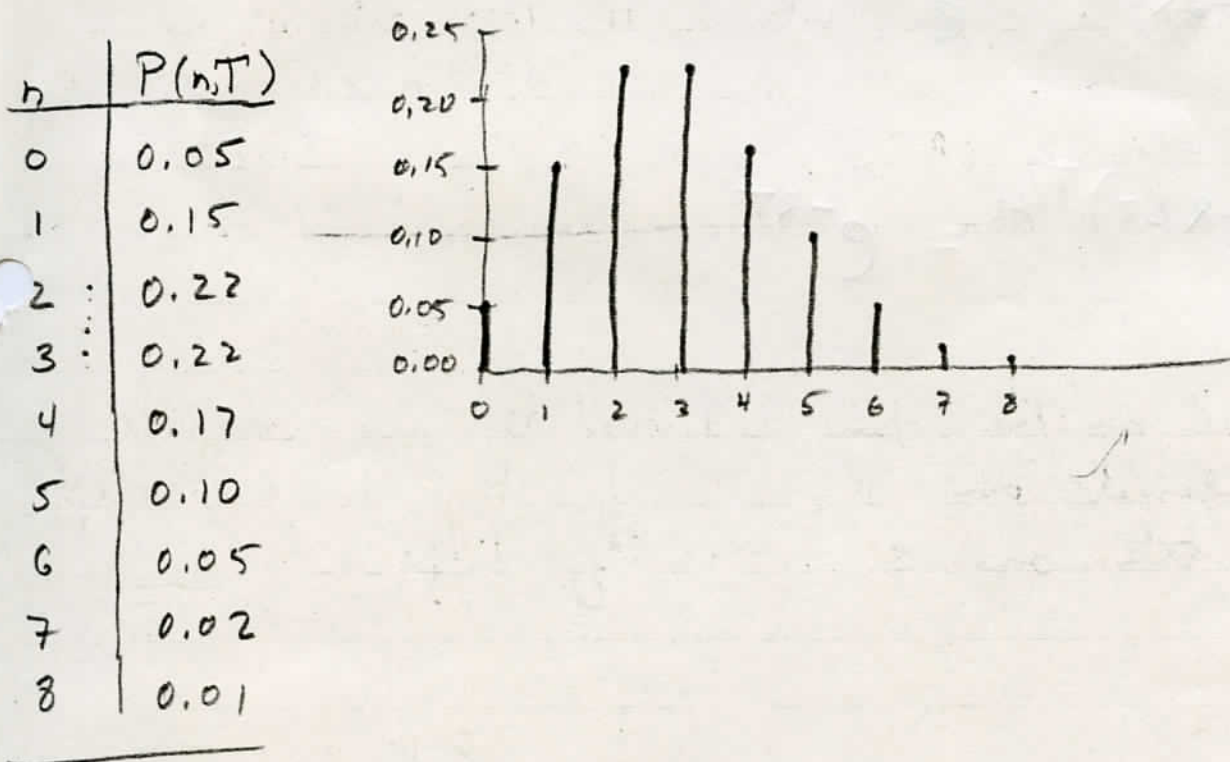


Suppose that the earthquakes occur at a rate of R per unit time, and that they are independent random processes. Then the probability of their being n earthquakes in a time interval T is:

$$P(n, T) = \frac{(RT)^n e^{-RT}}{n!} \underset{N \rightarrow \infty}{\sim} \frac{1}{\sqrt{2\pi n}} \left(\frac{RT}{n}\right)^n e^{n - RT}$$

example. suppose $R=1$, $T=3$. Then



sum, 0.99

now for any RT we can construct such a distribution and determine:

- $N_{peak} = n$ at which peak occurs
- $N_{min}, N_{max} = n$'s which bracket N_{peak} and contain 95% of the probability

distribution of ~~eg~~ intervals

probability of having eg in time $\Delta t = R\Delta t$

" " "not having" " " $\Delta t = (1-R\Delta t)$

probability of not having earthquake in time T

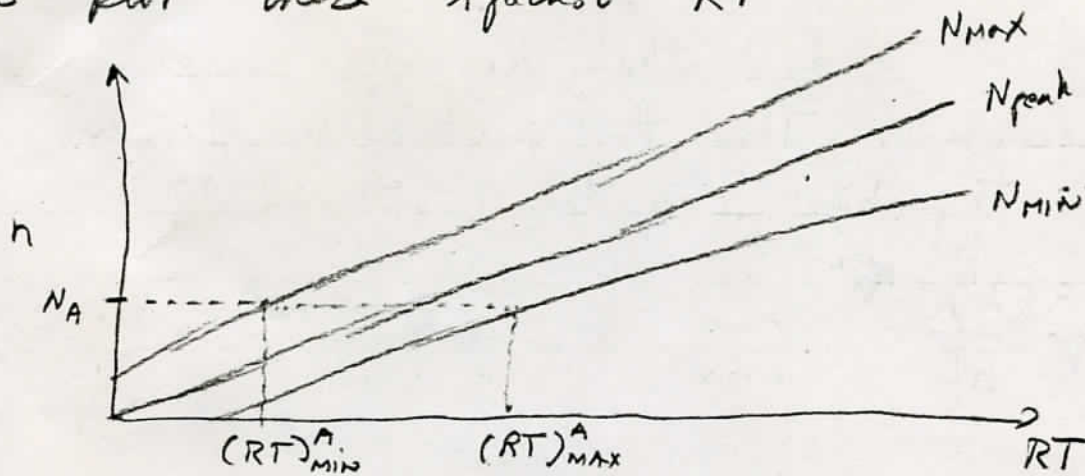
$$(1-R\Delta t)^{T/\Delta t}$$

now take limit $\Delta t \rightarrow 0$ and use

$$\lim_{x \rightarrow 0} (1-ax)^{\frac{1}{x}} = e^{-a}$$

$$\lim_{\Delta t \rightarrow 0} (1-R\Delta t)^{T/\Delta t} = e^{-RT}$$

lets plot these against RT



now suppose in some ^{time} interval A there are N_A earthquakes. Then RT has a 95% chance of falling between $(RT)_{min}^A$ and $(RT)_{max}^A$. Since \bar{T} is known; this puts confidence limits on R_A

if we have another time interval B , we compute confidence limits on R_B . if they don't overlap, then the rates are statistically different.

B. Menke.

$P(k, h)$

$$n^k e^{-n}$$

n rate

$$k!$$

prob that there
will be k per
unit time.

$$P(0) = e^{-.5}$$

0.50

$$P(1) = (.5) \cdot e^{-.5}$$

.61

.30

$$P(2) = \frac{(.5)^2 \cdot e^{-.5}}{2}$$

.076

$$P(3) =$$

Poisson distribution.
 $n k e^{-n} / k!$

n = rate of occurrence per unit time
 min, max = k values that contain given % of probability
 mode = peak in distribution

percentile = .667

percentile = .850

Percentile = .900

percentile = .950

n	min	mode	max
1	0	0	1
2	1	1	3
3	1	2	4
4	2	3	5
5	3	4	7
6	4	5	8
7	4	6	9
8	5	7	10
9	6	8	11
10	7	10	13
11	8	10	14
12	9	11	15
13	10	12	16
14	10	13	17
15	11	14	18
16	12	15	19
17	13	16	20
18	14	17	22
19	15	18	23
20	16	19	24
21	17	20	25
22	17	21	26
23	18	22	27
24	19	23	28
25	20	24	29
26	21	25	30
27	22	26	31
28	23	27	33
29	24	28	34
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31	26	30	36
32	27	31	37
33	27	32	38
34	28	33	39
35	29	34	40
36	30	35	41
37	31	36	42
38	32	37	43
39	33	38	45
40	34	39	46
41	35	40	47
42	36	41	48
43	37	42	49
44	38	43	50
45	39	44	51
46	39	45	52
47	40	46	53
48	41	47	54
49	42	48	55
50	43	49	56
51	44	50	57
52	45	51	58
53	46	52	60
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55	48	54	62
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59	52	58	66
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62	54	61	69
63	55	62	70
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66	58	65	73
67	59	66	74
68	60	67	75
69	61	68	77
70	62	69	78
71	63	70	79
72	64	71	80
73	65	72	81
74	66	73	82
75	67	74	83
76	68	75	84
77	69	76	85
78	69	77	86
79	70	78	87

n	min	mode	max
1	0	0	2
2	0	1	3
3	1	2	5
4	1	3	6
5	2	4	8
6	3	5	9
7	3	6	10
8	4	7	12
9	5	8	13
10	6	10	14
11	6	10	15
12	7	11	16
13	8	12	18
14	9	13	19
15	10	14	20
16	10	15	21
17	11	16	22
18	12	17	24
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20	14	19	26
21	14	20	27
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23	16	22	29
24	17	23	30
25	18	24	32
26	19	25	33
27	20	26	34
28	20	27	35
29	21	28	36
30	22	29	37
31	23	30	38
32	24	31	40
33	25	32	41
34	26	33	42
35	27	34	43
36	27	35	44
37	28	36	45
38	29	37	46
39	30	38	47
40	31	39	49
41	32	40	50
42	33	41	51
43	34	42	52
44	35	43	53
45	35	44	54
46	36	45	55
47	37	46	56
48	38	47	57
49	39	48	59
50	40	49	60
51	41	50	61
52	42	51	62
53	43	52	63
54	43	53	64
55	44	54	65
56	45	55	66
57	46	56	67
58	47	57	68
59	48	58	70
60	49	59	71
61	50	60	72
62	51	61	73
63	52	62	74
64	53	63	75
65	53	64	76
66	54	65	77
67	55	66	78
68	56	67	79
69	57	68	80
70	58	69	82
71	59	70	83
72	60	71	84
73	61	72	85
74	62	73	86
75	63	74	87
76	63	75	88
77	64	76	89
78	65	77	90
79	66	78	91

n	min	mode	max
1	0	0	2
2	0	1	4
3	1	2	6
4	1	3	7
5	2	4	9
6	2	5	10
7	3	6	11
8	4	7	13
9	4	8	13
10	5	10	15
11	6	10	16
12	7	11	18
13	7	12	18
14	8	13	20
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18	11	17	24
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30	21	29	38
31	22	30	40
32	23	31	41
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37	27	36	46
38	28	37	48
39	29	38	49
40	30	39	50
41	31	40	51
42	31	41	52
43	32	42	53
44	33	43	54
45	34	44	55
46	35	45	57
47	36	46	58
48	37	47	59
49	38	48	60
50	38	49	61
51	39	50	62
52	40	51	63
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54	42	53	66
55	43	54	67
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57	45	56	69
58	46	57	70
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69	55	68	82
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72	58	71	85
73	59	72	87
74	60	73	88
75	61	74	89
76	62	75	90
77	63	76	91
78	64	77	92
79	64	78	93

n	min	mode	max
1	0	0	3
2	0	1	5
3	0	2	6
4	1	3	8
5	1	4	9
6	2	5	11
7	2	6	12
8	3	7	13
9	4	8	15
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78	61	77	95
79	62	78	95

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88	79	87	97	88	75	87	101	88	73	87	103	88	70	87	96
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93	84	92	102	93	79	92	106	93	77	92	108	93	75	92	101
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