Fitting distribution

Let us focus on a log file containing service time for jobs of an application server. Using the data provided in the attachments, fit the service time distribution using both the method of moments the maximum likelihood method. As target distribution, use and hyper-exponential with two stages, and determine parameters p_1, λ_1 and λ_2.

Before preforming the fitting compute:

- First four moments
- Variance, Standard Deviation and Coefficient of variation
- Skewness
- Kurtosis

Then, after having performed the fitting, prepare then the following pictures:

- A graph comparing the **PDF** approximated from the samples, with the ones of the hyper-exponentials that uses the parameters found with both procedures
- Two **PP plots** comparing the fitted distributions (for both methods) with sampled data
- A **QQ plot**, comparing the distribution of the first half of the samples, with the second half.

Chose the appropriate set of model parameters according to the last digit on the right (the least significant) of your “Codice Persona”. **This exercise is mandatory and must be presented at the exam!**

	Last digit of "Codice Persona"										Ex. Session	
Sample	0	1	2	3	4	5	6	7	8	9	fri	mon
1	9.4810	24.2226	1.1732	48.6361	0.0499	0.0062	143.3766	3999.7590	0.4247	83.0518	8.2036	1.1993
2	8.3559	7.7602	33.2854	65.1843	0.1288	0.0062	515.9312	4873.3308	0.6182	95.5551	2.3811	0.1587
3	1.4088	24.4917	37.6126	15.2920	0.2601	0.0494	741.3055	657.9015	0.7537	197.5067	9.1848	0.3903
4	0.1941	4.7339	0.2069	39.7452	0.7057	0.0006	127.2085	263.9267	0.4040	96.1955	3.4964	0.4902
5	15.8016	31.1814	66.5719	28.3493	0.1652	0.0286	452.0866	2515.7431	1.2779	462.5564	0.3407	4.0301
6	5.5383	50.7011	57.6686	24.1880	0.3263	0.0336	408.2421	1456.3485	0.0327	37.4712	1.8424	0.2465
7	0.5876	18.7177	18.3280	36.3415	0.5318	0.0047	734.4828	34.3719	0.5681	483.0588	21.5658	0.5714
8	8.1924	14.8967	9.5383	65.5188	0.1051	0.0416	297.0595	529.0523	0.0103	153.7273	9.8172	0.4348
9	3.5879	7.3163	14.0689	1.5001	0.4518	0.0118	610.7683	433.3853	2.4828	0.0401	7.0199	0.1169
10	8.1745	45.5133	4.1717	20.6671	0.5990	0.0232	171.3931	979.6088	5.7684	56.4848	1.1112	0.0525
11	8.3455	1.3894	3.2209	2.6437	0.4074	0.0569	404.0916	21.7402	1.1224	75.1980	5.5333	0.0615
12	3.8228	15.9833	61.1814	43.7011	0.0734	0.0035	546.0579	438.5571	0.0286	17.2908	1.0566	1.3975
13	33.0932	4.6483	5.4886	16.0562	0.3425	0.0360	44.4005	438.5502	2.0584	150.2228	0.2760	0.2067
14	3.6783	1.5807	4.7428	34.4975	0.8020	0.0456	567.7140	1089.0326	0.7970	384.7410	3.0319	4.5125
15	1.1420	16.4279	17.0234	40.5871	0.0177	0.0521	31.0862	134.0435	2.8846	121.5439	6.7828	0.6449
16	22.7058	15.7272	9.7546	31.7152	0.8600	0.0228	28.0206	394.4434	1.7039	95.5085	2.9924	0.2975
17	17.1250	4.2731	1.0844	95.4797	0.4520	0.0132	36.1773	38.8816	0.6744	55.0714	1.9733	1.8474
18	17.5565	1.4547	0.8191	47.6989	0.1589	0.0104	338.4724	668.3665	0.5372	204.9500	0.1016	0.0096
19	9.2849	19.6377	27.6820	19.5968	0.1871	0.0365	7.0688	1399.7037	0.5007	307.4539	8.8834	0.8819
20	3.1491	31.2565	8.8006	27.9888	0.1262	0.0041	104.1562	790.0480	1.3185	39.1659	10.9799	0.1524
21	3.2460	5.7975	105.6133	16.6338	0.2856	0.0751	93.1283	35.7869	3.1986	73.2173	16.5337	0.1614
22	17.7650	2.1227	25.0359	33.4152	0.5788	0.0912	62.7042	35.2670	5.1702	113.7731	2.2241	0.0766
23	4.7555	1.1170	167.9888	46.5433	0.8972	0.0371	22.9260	57.5264	0.5500	177.6760	14.3707	0.6218
24	0.7716	1.1068	6.3529	24.2378	0.7812	0.0289	211.1793	9.5463	1.0511	9.6423	8.5471	0.5512
25	9.8158	1.5816	18.6321	43.9911	0.0283	0.0301	204.5407	6.4869	0.1527	187.4039	1.1598	0.1424
26	2.1400	1.9847	5.1722	58.3799	0.2073	0.0245	37.3815	263.5200	0.1434	55.2405	0.2941	0.7908
27	13.7279	0.0089	57.6614	9.1046	0.1174	0.0418	17.4240	9.5613	2.4475	158.7251	0.6405	0.0138
28	13.3402	5.3936	277.1823	7.4788	0.5330	0.0287	114.8574	102.1849	1.2538	9.1873	8.9068	0.1480
29	4.8268	1.4652	15.0382	88.0254	2.7225	0.0007	87.7289	22.5790	3.9688	136.7742	2.2668	3.5248
30	53.4844	4.8786	5.9259	37.6090	0.9048	0.0824	31.6216	62.2536	1.3605	210.1293	4.0626	4.6380
31	4.3201	2.8054	15.6766	6.9580	0.5993	0.0021	3.3140	79.3429	1.2101	143.4120	4.6096	0.5915
32	8.8337	2.1326	40.8244	15.3846	0.1563	0.0991	0.4034	0.8676	1.3475	30.1575	0.8116	2.2333
33	10.8516	1.9142	47.1897	8.5230	3.5385	0.0653	70.3620	160.2323	1.6919	331.4791	3.9764	1.9755
34	4.8268	3.4192	5.8184	12.4968	2.4341	0.0568	34.5960	13.6022	0.4792	24.2404	10.5744	0.0428
35	1.4781	2.7361	54.8563	3.1199	0.0672	0.0503	0.7568	30.1122	0.6250	95.0578	4.3862	9.5036
36	52.4847	0.0396	11.2073	36.4298	1.2998	0.0283	211.2653	15.0549	0.9198	100.7470	1.9290	0.7614
37	1.8946	1.7402	131.0357	38.7001	0.4061	0.0241	47.4247	23.3381	0.0515	49.3430	3.8225	0.5053
38	3.7069	0.3865	22.0693	18.0032	4.8163	0.1152	84.6978	1.6759	1.0435	86.2075	38.5378	0.1679
39	36.4107	10.9859	59.3431	4.7077	8.6830	0.0030	36.6917	0.7752	0.0863	39.3886	2.0726	0.5914
40	9.3580	0.1167	39.2126	87.2037	0.5711	0.0241	18.4885	4.1438	0.1362	54.6220	2.2324	0.4478
41	0.0744	0.4629	2.1682	2.1516	0.2685	0.0206	9.1509	39.7733	0.4509	71.0132	7.3761	4.1059
42	17.5881	3.8690	4.9952	19.2559	1.7576	0.0311	1.4335	1.1742	0.1044	28.2343	3.8468	0.1230
43	7.6545	9.9479	22.0654	55.3208	5.2056	0.0168	44.2479	37.6159	0.3895	213.1239	0.8831	0.0458
44	2.8727	5.8056	0.5097	14.4078	6.1825	0.0203	236.6644	17.3432	1.6656	41.6857	3.8438	0.3650
45	1.5523	0.9132	6.2918	40.3843	0.5258	0.0307	179.2494	36.4319	0.0348	100.1341	8.8181	2.3223
46	14.7858	2.8256	2.1180	65.2186	6.1928	0.1005	310.3794	22.1285	1.7690	551.0086	9.5871	0.7536
47	4.7923	2.1171	0.2946	17.3653	1.2443	0.0209	103.9635	6.7328	3.0650	682.4562	2.4950	0.0031
48	0.1545	2.6349	1.8733	13.3027	3.9963	0.1365	17.3960	34.6140	0.3375	83.0542	0.1763	1.1044
49	9.0413	0.0779	0.0222	13.1416	0.7345	0.1296	24.1293	17.4747	0.3283	82.4715	5.8692	0.1745
50	3.2829	0.2208	7.2433	3.8052	1.3377	0.0470	22.0748	39.7439	1.0212	211.1944	21.7383	8.1090
51	20.6885	3.1846	6.7560	34.2046	2.8952	0.0325	7.1954	154.2490	2.1617	27.1355	0.1182	0.6672
52	22.8563	3.3081	1.5284	51.7575	11.4920	0.0188	139.4933	4.1992	0.3879	76.0568	7.3472	1.0871
53	15.1838	2.6387	4.6501	18.5606	0.2874	0.0240	57.2290	25.0620	0.5777	205.2462	0.5936	0.7503
54	122.3093	3.2215	2.3661	50.5338	3.1299	0.0289	8.6078	6.0061	0.6898	42.4801	1.6986	0.7371
55	81.7189	0.4130	0.0452	18.3396	4.5520	0.1370	106.1609	22.0779	0.3599	9.1159	1.4111	0.6877
56	10.9648	5.6664	3.4730	15.2244	3.8041	0.0666	13.0454	91.4405	0.9849	45.7267	0.2779	0.2319
57	5.4392	1.9462	9.6796	10.7522	1.0674	0.1345	38.1474	32.2606	0.9360	428.0420	0.4923	0.4436
58	22.2226	7.4775	2.7003	2.2921	2.0863	0.1154	179.4729	10.8083	2.4404	1012.1255	0.6401	8.9053
59	3.5457	0.6280	0.1849	6.9391	6.1079	0.1402	41.5320	27.7661	3.9712	108.4397	6.8800	0.7635
60	133.2535	3.3961	15.8076	10.9672	2.1283	0.1532	2.6746	78.2987	2.9189	172.1349	0.2167	0.1733
61	28.1232	2.6996	3.1744	2.8813	4.3525	0.1253	268.0017	92.7888	0.4428	296.0820	4.4002	0.5372
62	54.6444	0.5640	0.8352	5.7159	2.6346	0.5844	41.2000	72.7074	4.4271	130.9521	4.8162	0.8746
63	9.3921	0.4285	0.8636	3.2704	3.8227	0.0788	59.3897	92.2954	2.4625	144.0923	2.0899	0.6075
64	8.8869	0.9711	0.7566	32.0999	0.8013	1.0762	53.0373	15.8254	5.2068	495.1323	8.7242	0.0204
65	7.4199	0.6035	4.3694	4.1181	0.4865	0.0236	32.9107	131.4476	1.3715	270.6510	4.7398	0.4925
66	75.6073	0.4571	3.1399	31.7495	0.0319	1.1583	49.8587	21.9921	1.6157	202.2330	24.2925	10.1055
67	24.9236	4.2295	2.4247	24.2983	0.4736	0.2175	122.2598	3.2147	0.4324	17.2283	2.9226	0.8690
68	40.1459	0.3758	0.1521	16.8977	0.0317	0.2131	17.4241	10.4166	1.4294	293.1474	4.6801	0.1509
69	31.6510	1.3761	9.4307	7.4132	1.0926	0.8641	4.9987	187.7344	0.1953	917.4103	0.2190	0.0109
70	10.0601	1.0372	4.8225	11.4203	3.4527	0.2927	22.2173	27.5339	2.3119	603.9217	4.4889	0.3228
71	13.9703	5.1157	0.4201	14.0356	0.1383	0.0042	15.1907	5.0171	4.8107	738.5212	0.7639	0.2134
72	5.0716	2.6967	2.1507	25.5878	0.7710	0.0723	99.8089	19.3571	0.6045	477.0479	1.6291	0.0012
73	23.3817	1.0731	1.7267	11.5751	2.0884	1.4415	46.6819	26.8627	0.5727	282.1197	1.3883	1.0641
74	23.5754	1.7096	6.6979	39.5660	4.6602	0.0883	103.3937	1.1083	1.7443	62.5262	0.6150	0.1340
75	13.0396	1.1938	0.4042	0.8737	0.7680	0.1246	55.1505	38.5264	3.6812	127.0851	10.3112	0.3510
76	24.2943	1.5121	2.7009	9.2408	1.1028	0.3877	106.1796	17.9437	0.5813	754.6534	0.0463	0.4289
77	35.0755	2.5938	4.1083	19.4000	7.0800	0.2861	65.0149	40.0032	0.2648	484.6382	1.2094	1.2116
78	46.7118	0.5127	6.0365	8.2086	1.5406	0.0958	46.4786	19.9451	0.9337	516.1840	24.7151	0.6515
79	4.2425	3.0982	2.7874	63.2335	0.1864	0.0415	126.4510	256.6203	1.7615	1105.8636	0.1819	0.2079
80	25.9916	1.2962	1.1723	24.6554	2.3205	0.4993	68.2961	52.7596	0.3779	300.2210	10.9581	1.3294