



Data Mining for Bee Micro-sensors

Laboratorio Nacional de Análisis y
Síntesis Ecológica

Framework Developed by Ulises Olivares

HIGH PERFORMANCE COMPUTING APPLIED TO BIOLOGICAL SCIENCES, UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO - ESCUELA NACIONAL DE ESTUDIOS SUPERIORES UNIDAD MORELIA - LABORATORIO NACIONAL DE ANÁLISIS Y SÍNTESIS ECOLÓGICA

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1. Introduction

Introduction

The main propose of this document is to show a concise report about the activity of bees and behavior in a specific period of time. This report also shows a complete analysis of the most active hours.

This report corresponds to a period of time of 62 day(s). From 2016-08-24 to 2016-11-24. During this period of time, a total amount of 22305 lectures were registered from 75 different bees. There exist a total of 22 non-active days. We define an 'active day' if there is more than one observation. (see Figure 1.1).

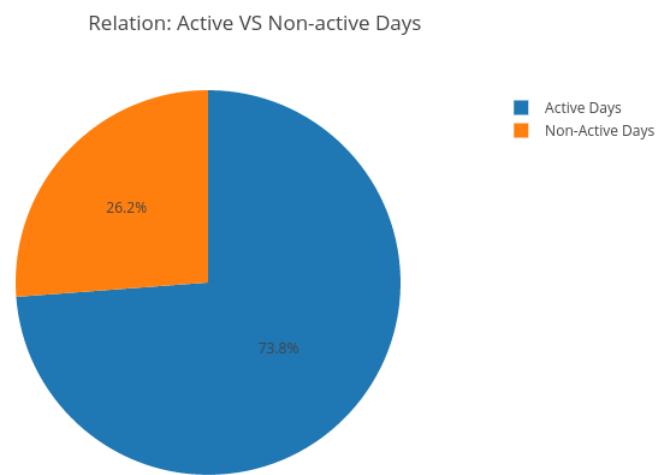


Figure 1.1: Days with and without Empty Reads



2. Analysis of Raw Data

Introduction

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Activity per day

This section addresses the analysis of the activity per day

Day	Date	# Observations	# Bees per day
1	2016-08-24	35	8
2	2016-08-25	7	3
3	2016-08-26	7	2
4	2016-08-27	86	4
5	2016-08-29	33	2
6	2016-08-30	3	1
7	2016-08-31	2	1
8	2016-09-02	8	1
9	2016-09-05	2	1
10	2016-09-08	3	1
11	2016-09-09	25	6
12	2016-09-10	5345	3

13	2016-09-11	189	12
14	2016-09-12	94	4
15	2016-09-13	82	12
16	2016-09-14	135	10
17	2016-09-15	160	6
18	2016-09-16	30	7
19	2016-09-17	52	12
20	2016-09-18	88	6
21	2016-09-19	131	13
22	2016-09-20	77	5
23	2016-09-21	203	11
24	2016-09-22	92	5
25	2016-09-23	51	8
26	2016-09-24	257	11
27	2016-09-25	1253	6
28	2016-09-26	39	9
29	2016-09-27	123	6
30	2016-09-28	90	9
31	2016-09-29	9109	19
32	2016-09-30	239	18
33	2016-10-01	122	12
34	2016-10-02	877	17
35	2016-10-03	240	14
36	2016-10-04	866	14
37	2016-10-05	393	12
38	2016-10-06	345	10
39	2016-10-07	107	8
40	2016-10-08	83	8
41	2016-10-09	49	8
42	2016-10-10	36	5
43	2016-10-11	36	5
44	2016-10-12	118	6
45	2016-10-13	23	2
46	2016-10-14	28	4
47	2016-10-15	24	4
48	2016-10-16	25	3
49	2016-10-17	29	2
50	2016-10-18	28	2
51	2016-11-13	279	9
52	2016-11-14	49	6
53	2016-11-15	60	9
54	2016-11-16	42	7
55	2016-11-17	63	10

56	2016-11-18	52	8
57	2016-11-19	63	6
58	2016-11-20	39	10
59	2016-11-21	40	6
60	2016-11-22	62	11
61	2016-11-23	30	6
62	2016-11-24	47	7
--	Average	359	7

Bee Life Cycle

In this section is analyzed the Life Cycle of each bee in the hive

Register	Bee ID	Life Cycle in Days
1	0034	1
2	0039	1
3	0044	1
4	0127	23
5	0148	1
6	0182	1
7	0022	1
8	0029	4
9	0036	3
10	0038	1
11	0044	2
12	0053	1
13	0065	55
14	0073	1
15	0088	1
16	0090	1
17	0100	4
18	0106	5
19	0107	4
20	0108	18
21	0110	17
22	0113	2
23	0114	15
24	0115	22
25	0122	12
26	0131	17
27	0132	11
28	0136	5
29	0143	26
30	0148	7
31	0153	19

32	0161	26
33	0170	2
34	0176	21
35	0177	1
36	0183	36
37	0186	32
38	0189	1
39	0202	1
40	0210	2
41	0211	10
42	0222	1
43	0232	1
44	0244	17
45	0246	1
46	0250	1
47	0255	3
48	0259	20
49	0260	1
50	0262	20
51	0263	10
52	0272	1
53	0273	1
54	0278	1
55	0284	1
56	0288	1
57	0292	1
58	0300	6
59	0356	11
60	0357	7
61	0385	1
62	0406	2
63	0407	11
64	0417	10
65	0431	12
66	0433	8
67	0434	8
68	0456	10
69	0459	5
70	0465	12
71	0466	12
72	0469	1
73	0482	10
74	0490	10

75	0499	8
--	Average	8

Analysis of Activity per Hour

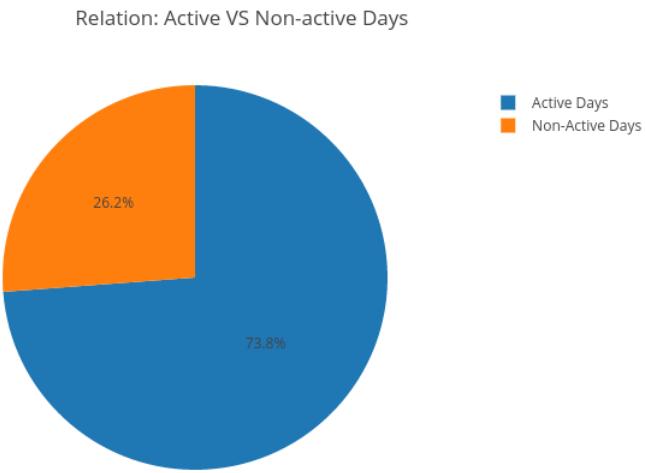


Figure 2.1: Days with and without Empty Reads

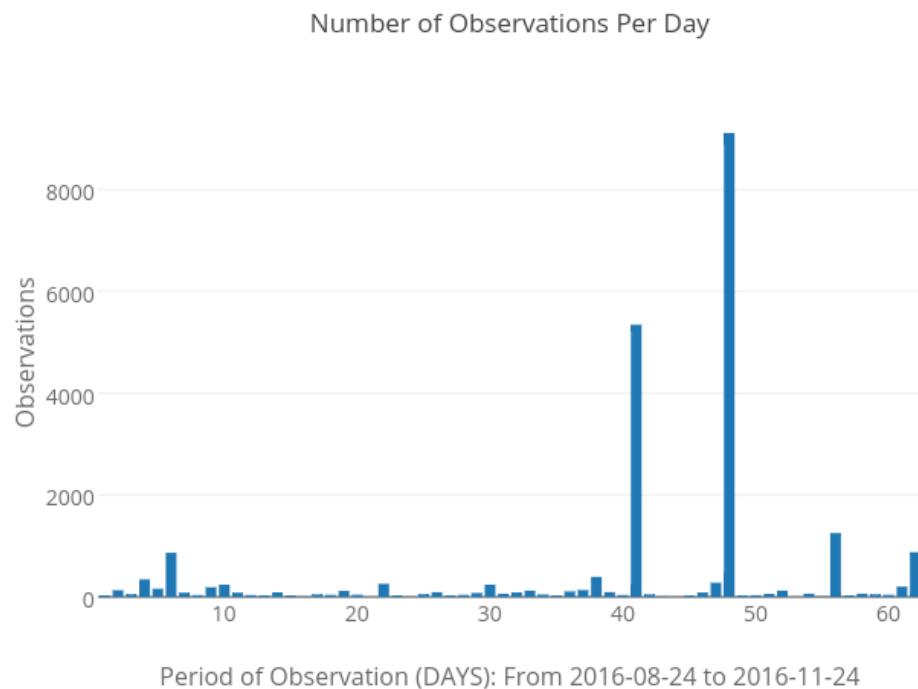


Figure 2.2: Number of Observations per Day

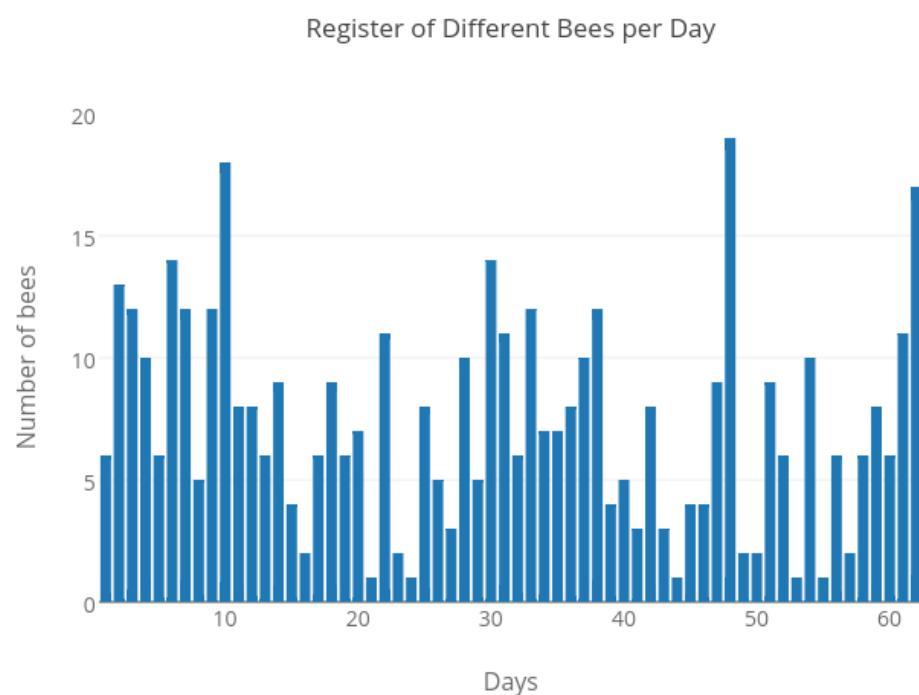


Figure 2.3: Different Bees Per Day

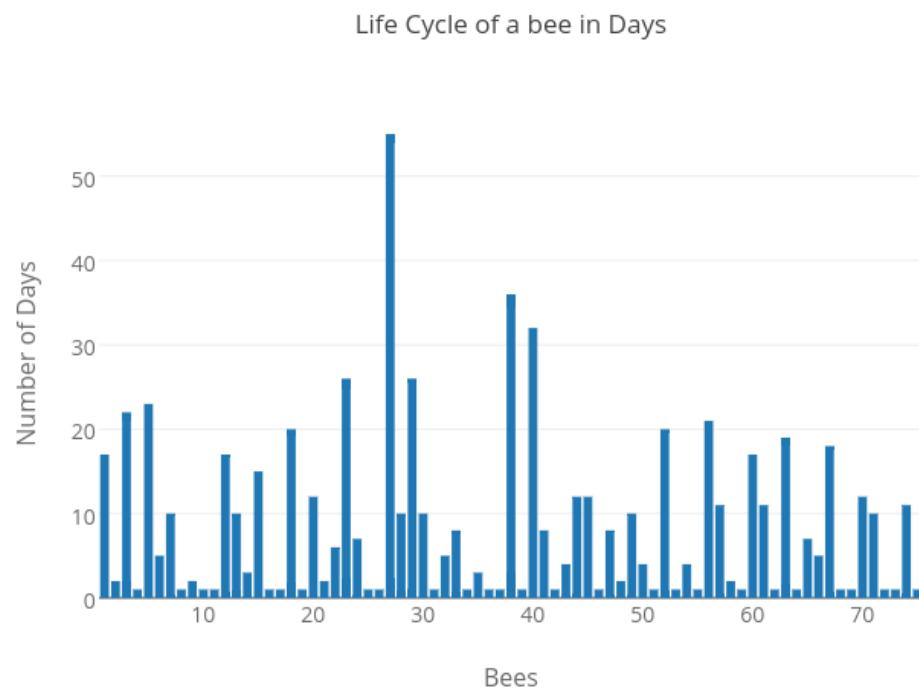


Figure 2.4: Bee Life cycle in days

Life Cycle of a bee in Days

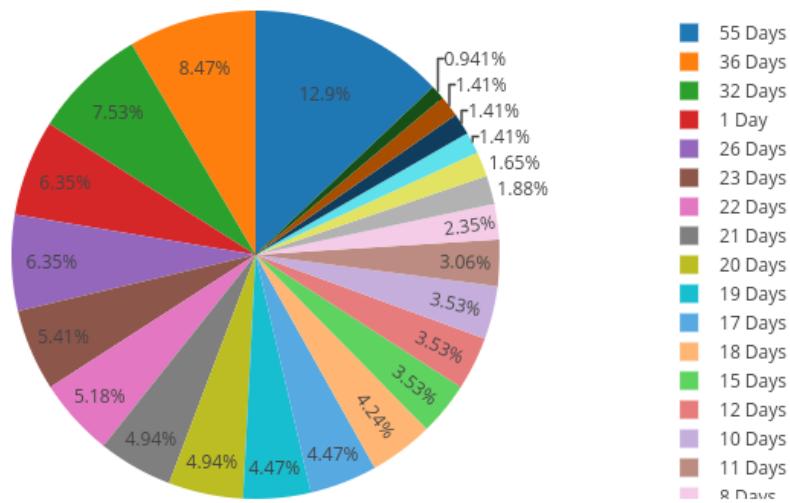


Figure 2.5: Bee Life cycle in days

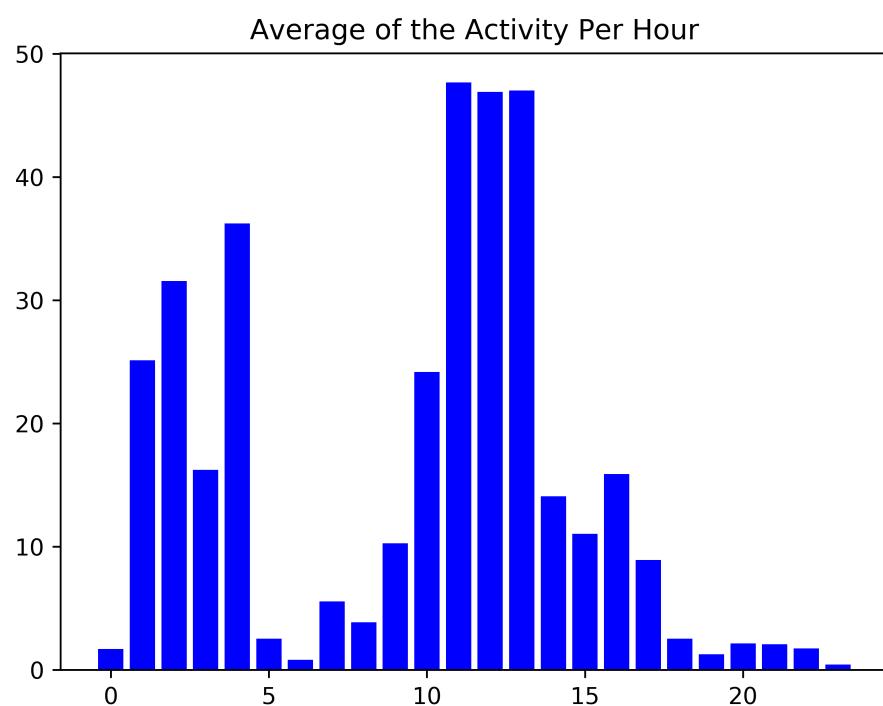


Figure 2.6: Histogram of frequencies per hour

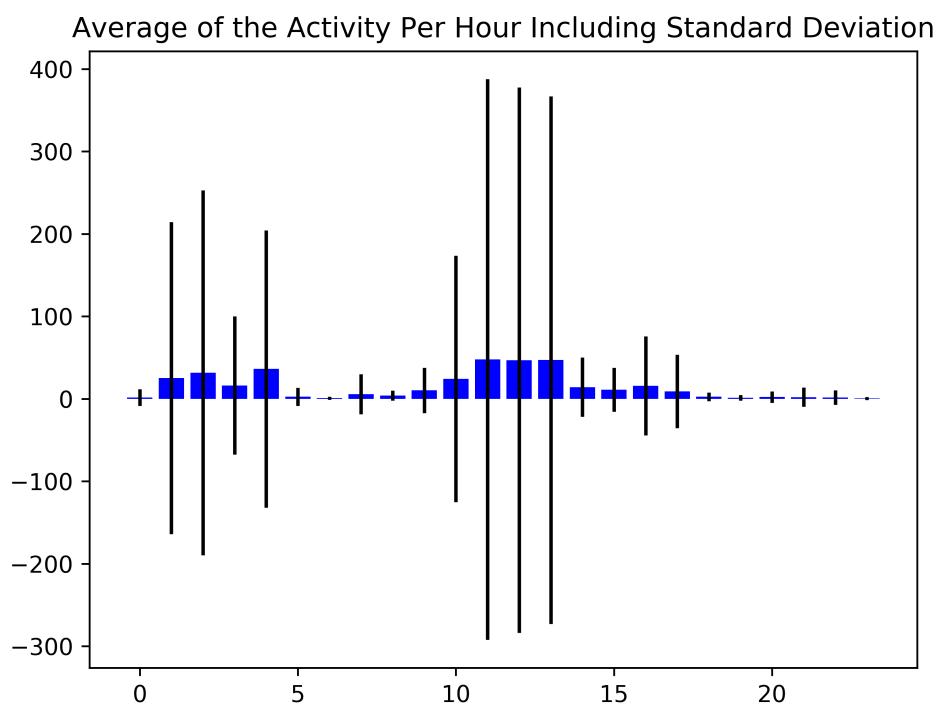


Figure 2.7: Histogram of frequencies per hour. It includes standard deviation



3. Analysis of Clean Data