



Data Mining for Bee Micro-sensors

Laboratorio Nacional de Análisis y
Síntesis Ecológica

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1. Analysis of the Hives' Activity

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).

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

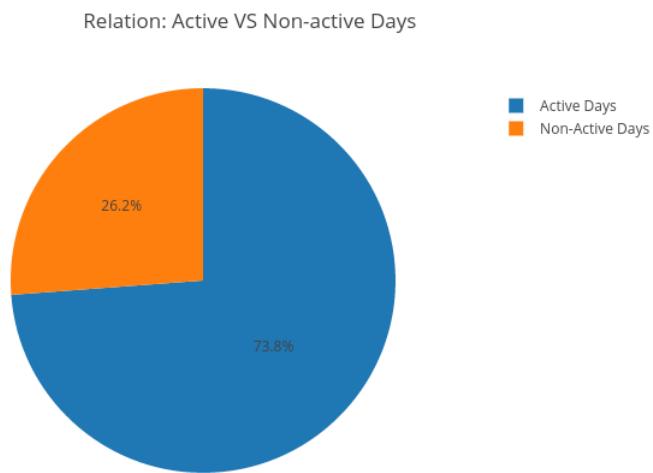


Figure 1.1: Days with and without Empty Reads

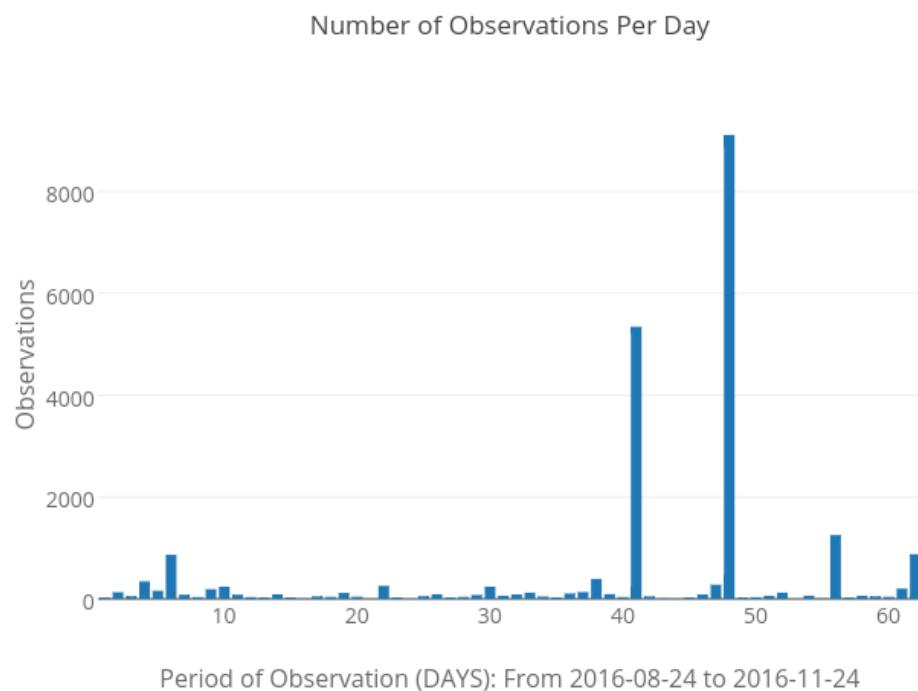


Figure 1.2: Number of Observations per Day

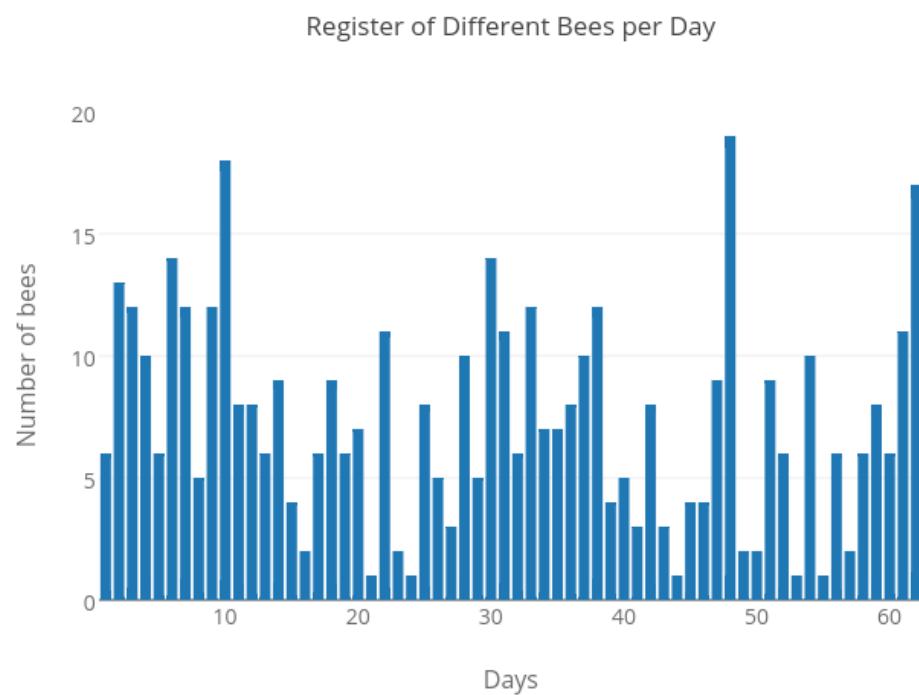


Figure 1.3: Different Bees Per Day

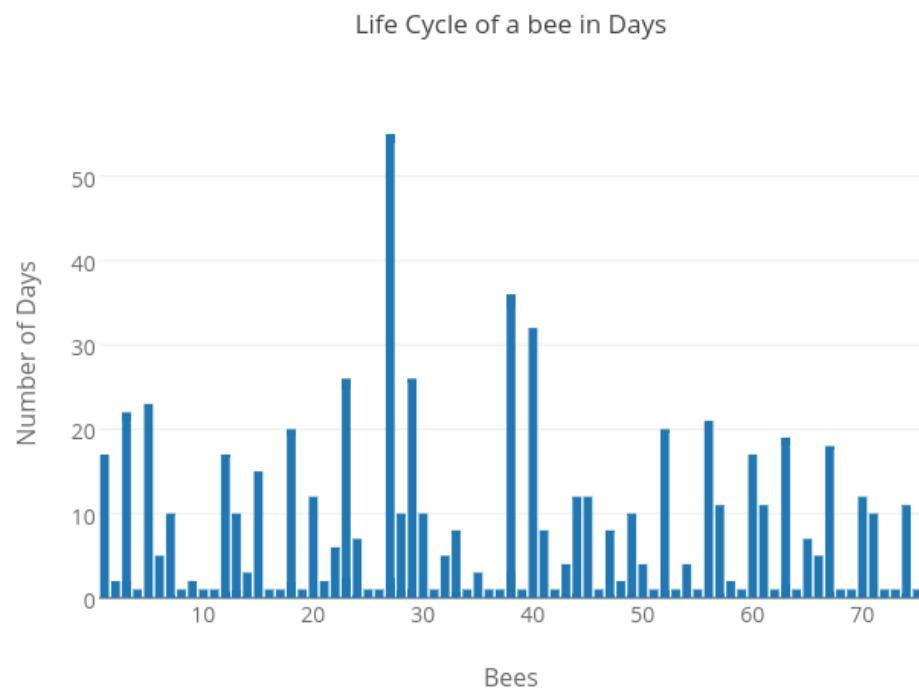


Figure 1.4: Bee Life cycle in days

Life Cycle of a bee in Days

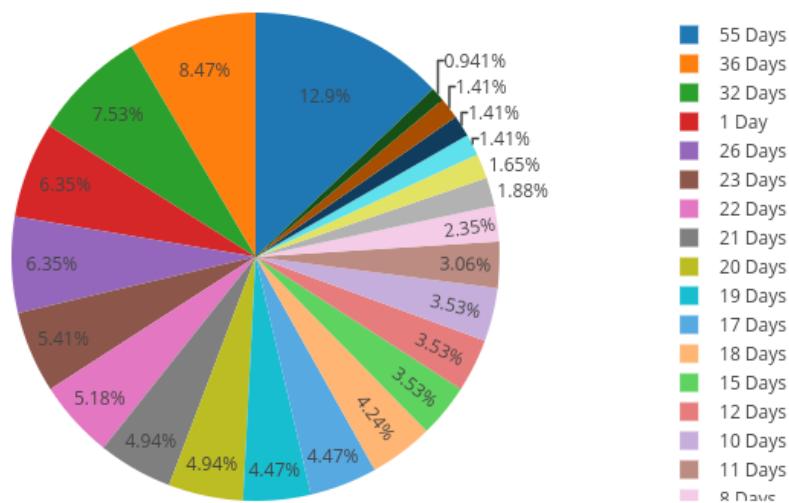


Figure 1.5: Bee Life cycle in days

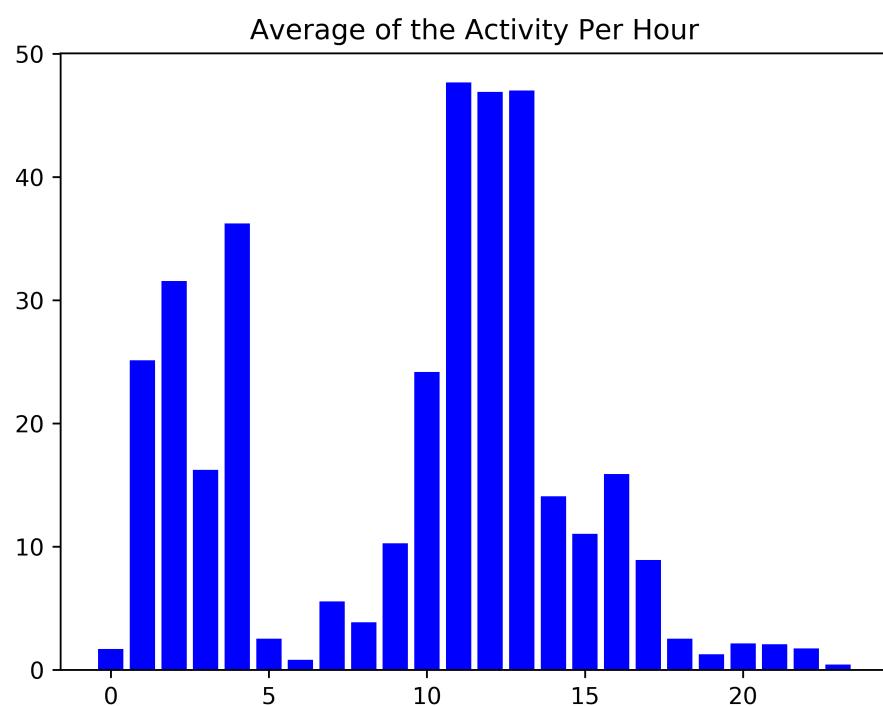


Figure 1.6: Histogram of frequencies per hour

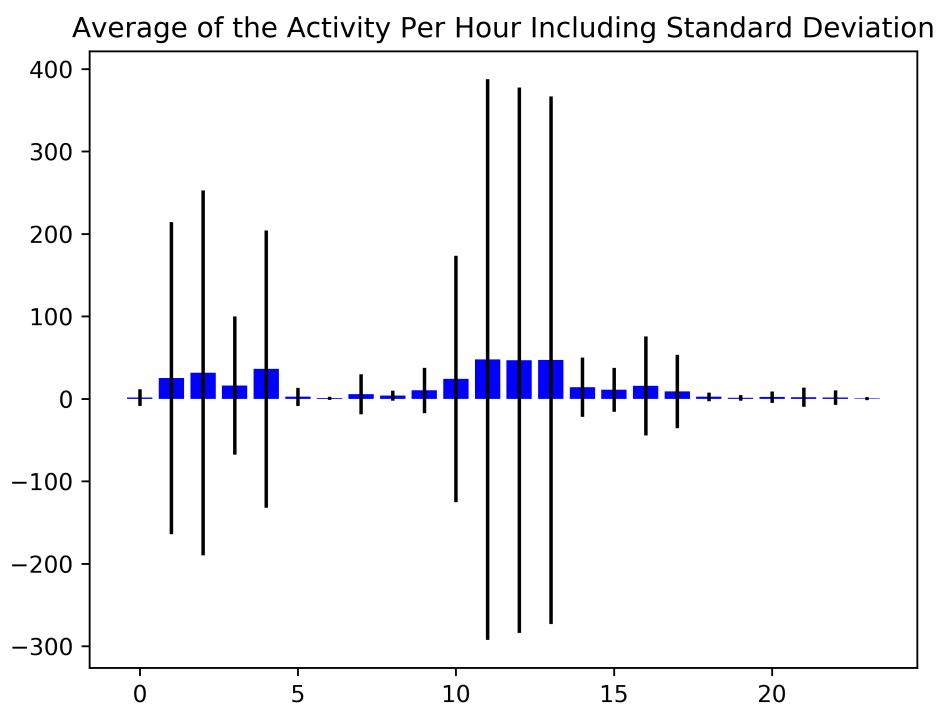


Figure 1.7: Histogram of frequencies per hour. It includes standard deviation