

Identifying nocturnal bird calls

Dr Edward Abraham
Douglas Bagnall

Presentation to Department of Conservation
28 February 2014



Outline

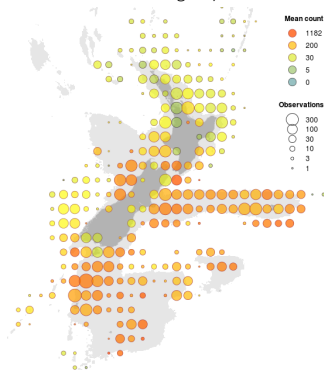
- 1 About Dragonfly
- 2 Songscape
- 3 Call identification
- 4 Pipeline

- Data science
- Mix of scientific and technical computing skills
- 7 scientific staff
- Founded in 2006
- Strong public-good focus

- Dashboard on the New Zealand economy (MBIE Sector Performance)
- Protected Species bycatch (MPI)
- Identification of Māori language (Te Māngai Paho)

Recent work

About Dragonfly



Seabird count data

<http://data.dragonfly.co.nz/seabird-counts>

- Support open, public release of data
- Index of New Zealand bird species <https://github.com/dragonfly-science/new-zealand-birds>
- Sea lion count data <http://data.dragonfly.co.nz/nzsl-demographics>
- Protected species bycatch <http://data.dragonfly.co.nz/psc/>



Where possible we use creative commons attribution licenses to support data reuse, following NZGOAL (<http://nzgoal.info>)

Songscape

Rimutaka Forest Park Trust

Songscape

- Using recorders to monitor the kiwi population
- Have 600,000 minutes of recordings
- Need a solution to organising and identifying the calls
- Working on a web-based open-data solution



Recording kiwi in the Rimutaka Forest Park

Songscape and counting Rimutaka kiwi

Songscape

- Use a simple heuristic based on spectral analysis to identify 'possible kiwi'
- Many, many false positives
- But allows for removal from analysis of over 95% of 1-minute clips, making analysis feasible
- Manually screen these clips, as well as a random selection

RFPT-WW17A, Sept. 12, 2012, 2:01 p.m.

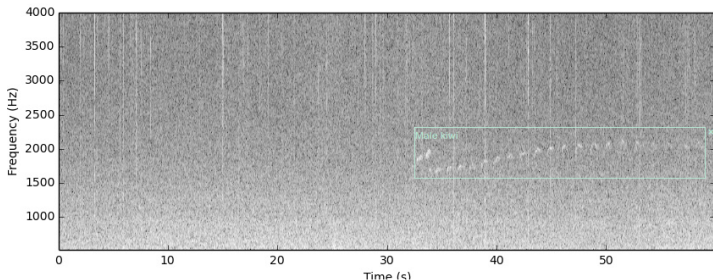
You have analysed 9390 snippets, out of 22417. There are 12201 to go.

[← Previous](#)

Male kiwi

Female kiwi

Uncertain

[Next →](#)[Skip forwards →](#)[Download sound file](#)

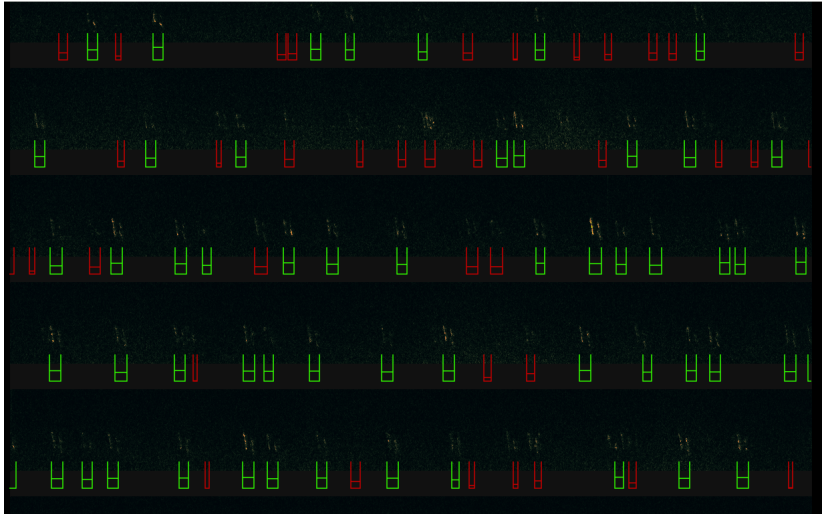
Unless otherwise stated data, recordings, and images on this site are made available under a creative commons attribution 3.0 licence. This licence allows the data to be used for any other purpose and republished, provided that attribution is given. Songscape is a project of Dragonfly Data Science.



Call identification

- Identify potential calls
- Allow recordings to be ignored that are unlikely to contain calls
- Consistent, automated monitoring
- No such thing as perfect detection

- Requires a well-labelled training set
- Current Tier-1 protocol not ideal for two reasons
 - ① not all calls are labelled
 - ② time bounding of calls isn't precise
- Carried out our own labelling



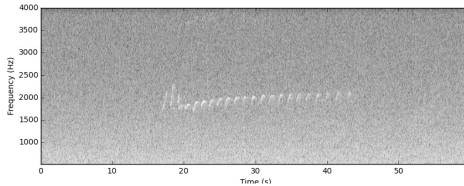
Machine learning approach

Call identification

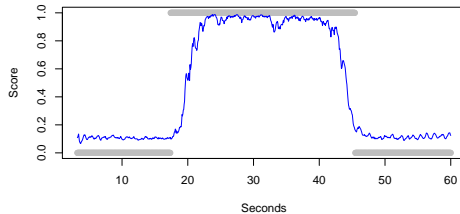
- There are many different methods that could be applied to this problem
- We used a recurrent neural network
- Initially trained on a small set from the Rimutaka
- Plan was to extend it to sample set from the Tier-1 monitoring
- One step forward, two steps back

A successful prediction

Call identification

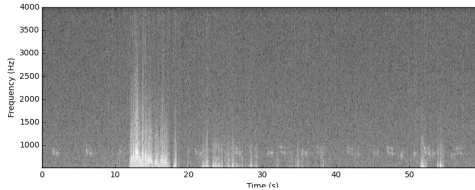


RFPT-LPC-2011-11-26T13:45:03Z-540-60.wav

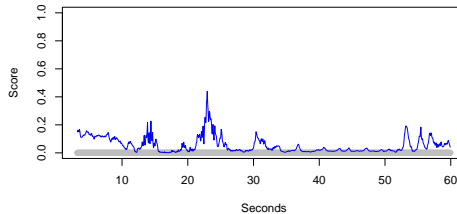


No kiwi here

Call identification

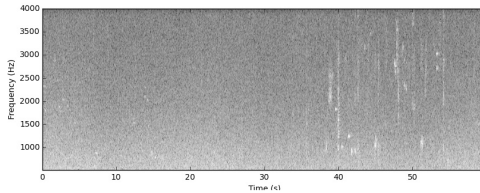


RFPT-LPA-2011-12-25T16:45:02Z-120-60.wav

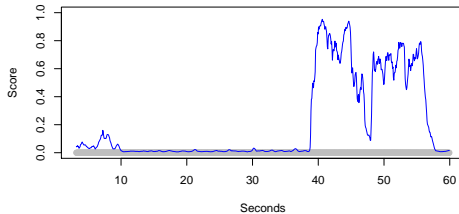


This tūi might be a kiwi

Call identification

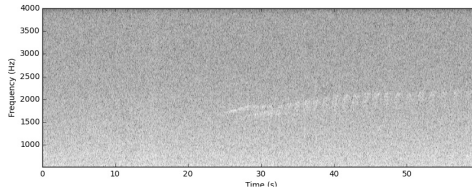


RFPT-SG2-2012-03-16T22:45:03Z-660-60.wav

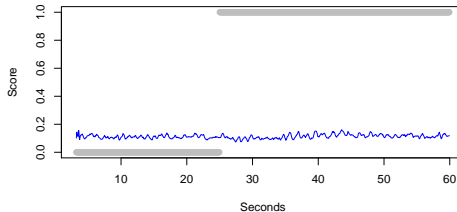


And it didn't find this call

Call identification



RFPT-LPB-2011-11-19T15:00:02Z-600-60.wav



Too early to evaluate

Call identification

- Training on a larger dataset from the Rimutaka
- Need to manually tag examples in the Tier-1 set
- Range of 'not-kiwi' noises in the Tier-1 set much more diverse (sheep, ducks), could use a list of sites that are known not to have kiwi
- Morepork training underway
- Too few weka in the Tier-1 set

Other approaches

Call identification

- Lukasz Tracewski from the Netherlands has been working on call identification (through Barry Polley)
- Based on a small set from the Rimutaka
- Open-source software that we have been able to run
- Initial impression is that is a little over-fitted to that small set
- Will supply a larger and better set of training data

Pipeline

Automated classification will happen

Pipeline

- Already useful in some contexts (such as the Rimutaka project)
- Requires high-quality and high-volume training data (1000's of calls of each type)
- Initially it will augment rather than replace manual classification
- How to integrate that into a pipeline?

Advantages of getting the data online

Pipeline

- Store in one place
- Allow for many people to carry out the classification tasks through a web interface (easier to manage; community engagement)
- Potential for lower cost manual services (such as <http://www.crowdflower.com>)
- Open access allows for other people to participate in the development of classifiers (such as Luckasz)

Our next steps

Pipeline

- Complete evaluation of recurrent network on the Tier-1 data (kiwi, morepork)
- Complete analysis of the Rimutaka Forest Park Trust data
- Potential to hook Songscape up to Amazon data store
- At some stage, release Songscape into the wild (<http://songscape.org>)