Identifying nocturnal bird calls

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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)

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/
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
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
Call identification
Objectives
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
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


Score

Seconds
This tūi might be a kiwi
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 it is a little over-fitted to that small set
- Will supply a larger and better set of training data
Pipeline
Automated classification will happen

- 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

- 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

- 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)