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They do move!
VISUAL ANALYTICS
of Rose Crested Blue Pipit Habitat

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The population of the Rose-Crested Blue Pipits is significantly decreasing

In this fictitious scenario recent disclosures indicate an alarming reduction in the number of the Rose-Crested Blue Pipits' nesting pairs and point out to the local manufacturing company Kasios, as a possible culprit. Kasios denies any fault and provides a collection of bird calls, consisting of 15 audio files, for which the company claims to be recordings of healthy Pipits taken in the Boonsong Lekagul Nature Preserve. However, the Mistford College has a large collection of bird calls from all over the Preserve. The collection has been validated by various ornithology groups. We need to investigate if the two collections of bird class are consistent, i.e., if the company claims are credible.

We process the data using Deep Learing and analyzed it using a coordinated multiple view system with new visualizations

We have processed audio files so that they can be analyzed by means of deep learning. We have also cleaned meta data, and derived various additional attributes, such as **sun angle** (to differentiate between daylight and night), or **centroids of birds positions per year**, for example. Such cleaned and extended meta-data set is analyzed using a coordinated multiple views (CMV) system which supports linking and brushing.
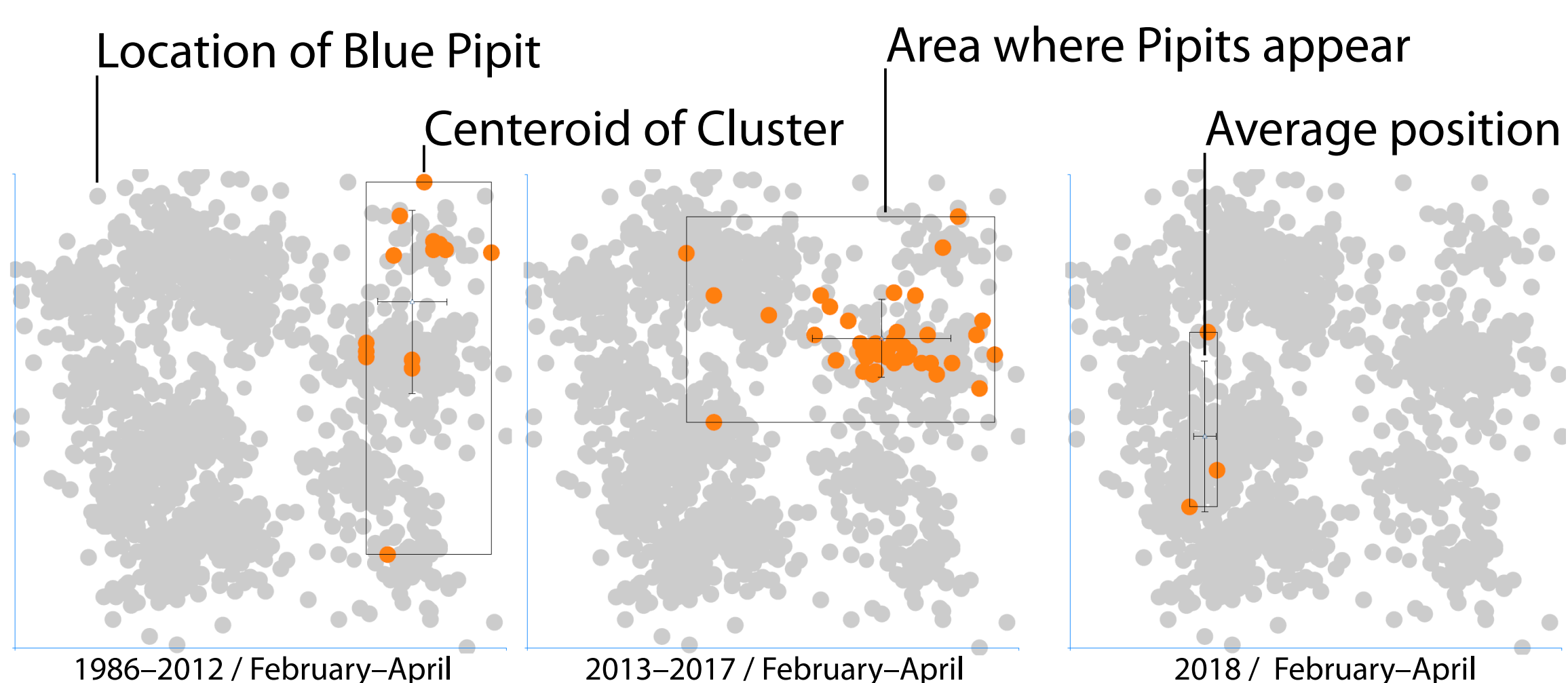
Centeroids over year show that birds move away
Pipits moved towards west and in the last period to the south as well.
Such moving pattern might indicate a change in the original pipits' habitat.

ABSTRACT

Our approach combines the automatic analysis and interactive exploration. We improve user interaction and introduce new views to support analysis.

At the same time, we design a convolutional neural network in order to compute a classifier of bird-calls audio files.

Our analysis suggests that the recordings are most probably not of Pipits and, moreover, if there are Pipits among them, they are in minority. This finding indicates a need for further investigation.
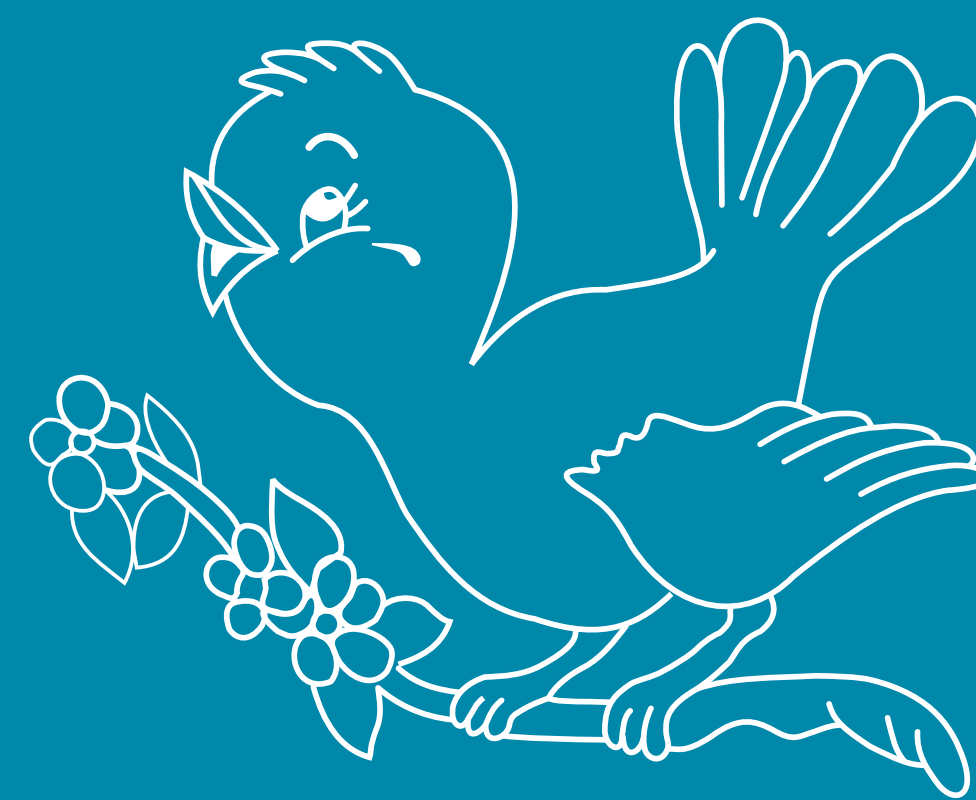
Using Deep Learning to recognize bird call recordings

In order to verify Kasios' claim, we use the large bird collection provided by the Mistford College to build a classifier and further employed it to predict the bird species within the Kasios collection.
Our classifier uses a Deep Learning approach and custom designed Convolutional Neural Network (CNN), which takes pictures as the input. Therefore, the original mp3 audio files have been converted into spectral files with an equal length of three seconds each and, furthermore, separated into signal and noise [1]. We create the classifier with the Python library Keras.

We are using **2 convolution layers**, each followed by a **max-pooling layer**, and a **dropout of 30%**. The **dense layer contains 128 units** and **soft-max layer 39 units**, generating a probability for each class.
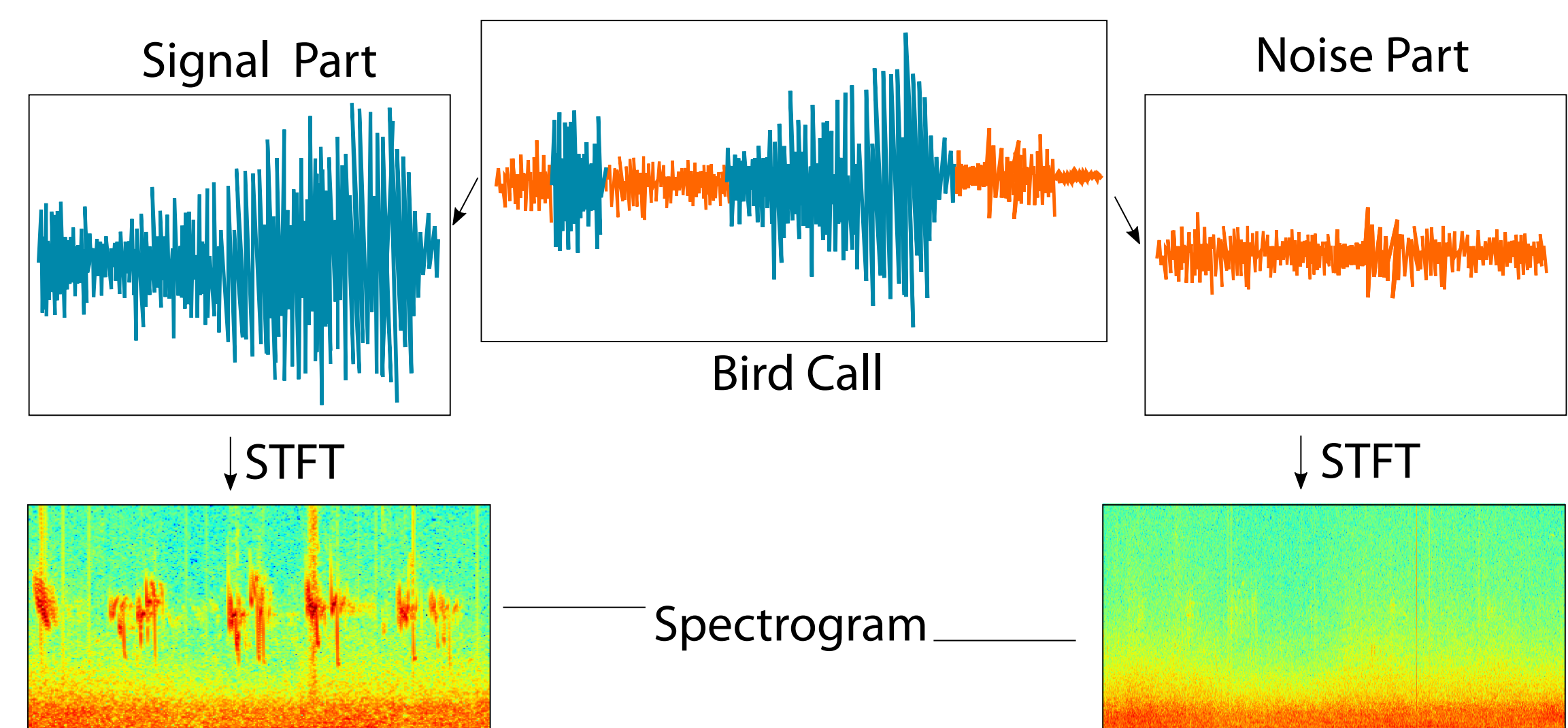
Preprocessing of the audio files to create spectrograms for classification [1]
We seperate a bird call recording into a signal and noise part.
The parts of the recording with higher amplitude (blue parts) are classified as signal, and parts with lower amplitude (orange parts) as noise.
The signal and noise parts are then transformed to frequency domain (spectrum) using a short-time Fourier transformation (STFT).

We overfit the problem

Our neural network classifies the recordings from the training collection with an **accuracy of 91%** and with a **validation accuracy of 68%**. Despite of data augmentation, we still have overfitting problems. In future work, we will add addidinal data augmentation to enlarge the data set and try different CNN architectures and we will optimize the parameters of the network. We will also test spectrograms with different lengths.

68%
VALIDATION ACCURACY

The Rose-Crested Blue Pipits migrated from their original area and Kasio's claims are invalid

The visualization of the centeroids of the bird positions over year show that the Rose Crested Blue Pipits have slowly migrated from their original area in the Preseve, especially from 2017 to 2018. In addition, our results led us to the conclusion that the collection provided by Kasios does not correspond to (healthy) Pipits, as claimed. The Rose-Crested Blue Pipits are not thriving, their numbers are dwindling and they have migrated from their original locations. Also the provided recordings from Kasios do not provide any evidence of a healty population of Rose-Crested Blue Pipits.

[1] E. Sprengel, M. Jaggi, Y. Kilcher, and T. Hofmann. Audio based bird species identification using deep learning techniques. Conference and Labs of the Evaluation Forum, LifeCLEF 2016, pp. 547–559, 2016.