Goal Outcome 1. The proposed enhanced feature representation can 1. Review previous work Chapter 3 achieve a better classification performance compared with most previous studies. 2. Develop a novel feature representation High SNR to improve current classification 2. Cepstral features are effective for classifying frog recordings performance calls, but very sensitive to the background noise Design a novel cepstral feature Motivation representation with both good classification performance and excellent anti-noise ability? Goal Outcome 1. Wavelet-based cepstral features are effective for Chapter 4 Use wavelet packet decomposition to classifying frog calls, and robust to background noise 2. These features can be used for both low SNR and design a novel feature representation High and low high recordings SNR recordings Motivation So far almost all recordings used are high SNR. Low SNR recordings have multiple simultaneously vocalising frog species, how to design a suitable classification framework? Outcome Goal MIML learning can effectively classify frog calls in low Chapter 5 Use multiple-instance multiple-label (MIML) SNR recordings. However, the classification learning to classify frog calls in low SNR performance is highly effected by the event detection recordings Low SNR results recordings Motivation To improve the classification performance, we can (1) use supervised learning to perform event detection. But we do not have much annotated acoustic data, (2) use multiple-label learning. Goal Outcome Chapter 6 ML learning can improve the classification performance Use multiple-label (ML) learning to classify of MIML learning, and frog calling activity of three frog calls Low SNR months are monitored recordings