Supervised by
Professor Laurel H. Carney

Detection of tones in reproducible noises, a set of pre-generated random noises, has been studied for decades. These studies help us to understand how people detect signals in noise in everyday life. However, it is not clear what cues or combination of cues are used by listeners in these tasks. Previous studies have shown that energy and temporal cues could predict a significant amount of the variance in listeners' detection performance in the diotic condition, in which identical noise-alone and tone-plus-noise stimuli were presented at both ears. For the dichotic condition, in which identical noise and out-of-phase tones were presented, interaural level and time difference cues, and combinations of these two cues partially explain listeners' performance.

In this thesis, an optimal cue-combination model was proposed to explain listeners' performance in the diotic condition. This model combined energy and temporal cues nonlinearly, based on the logarithmic likelihood-ratio test. Predictions from this model explained a substantial amount of the variance in listeners' performance from three different sets of reproducible noises.

For the dichotic condition, two different models were proposed: one based on a linear