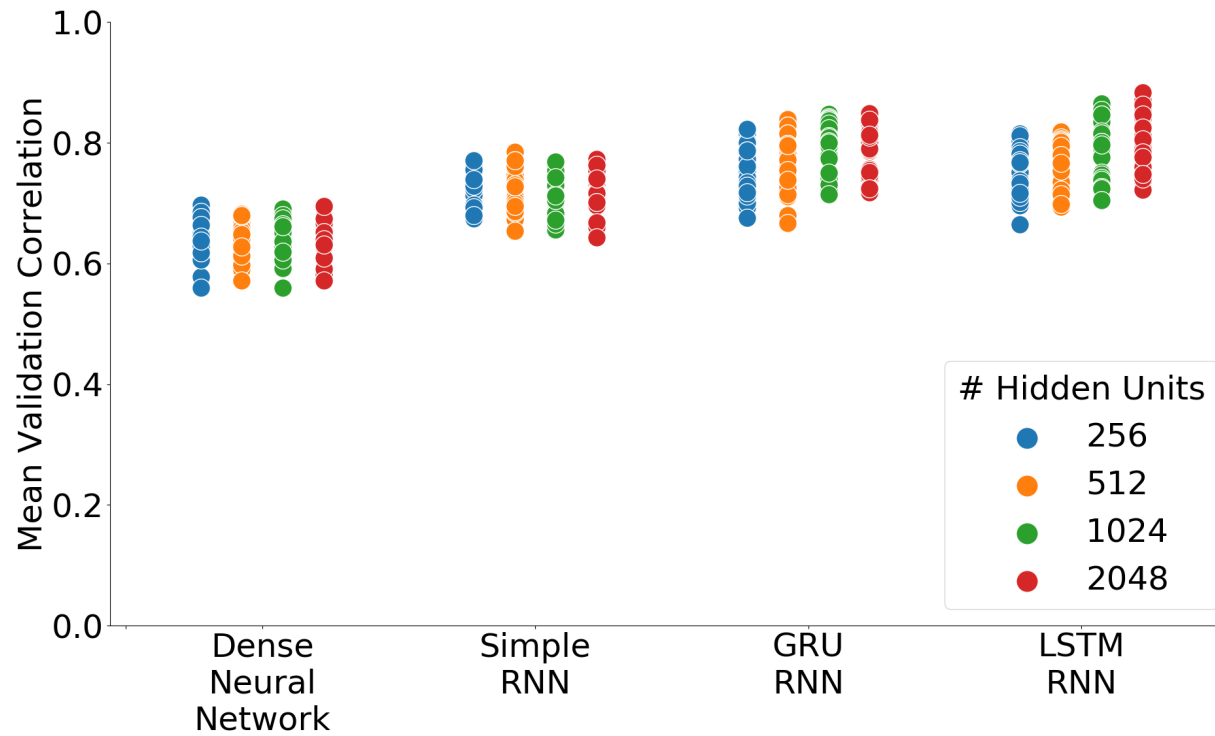
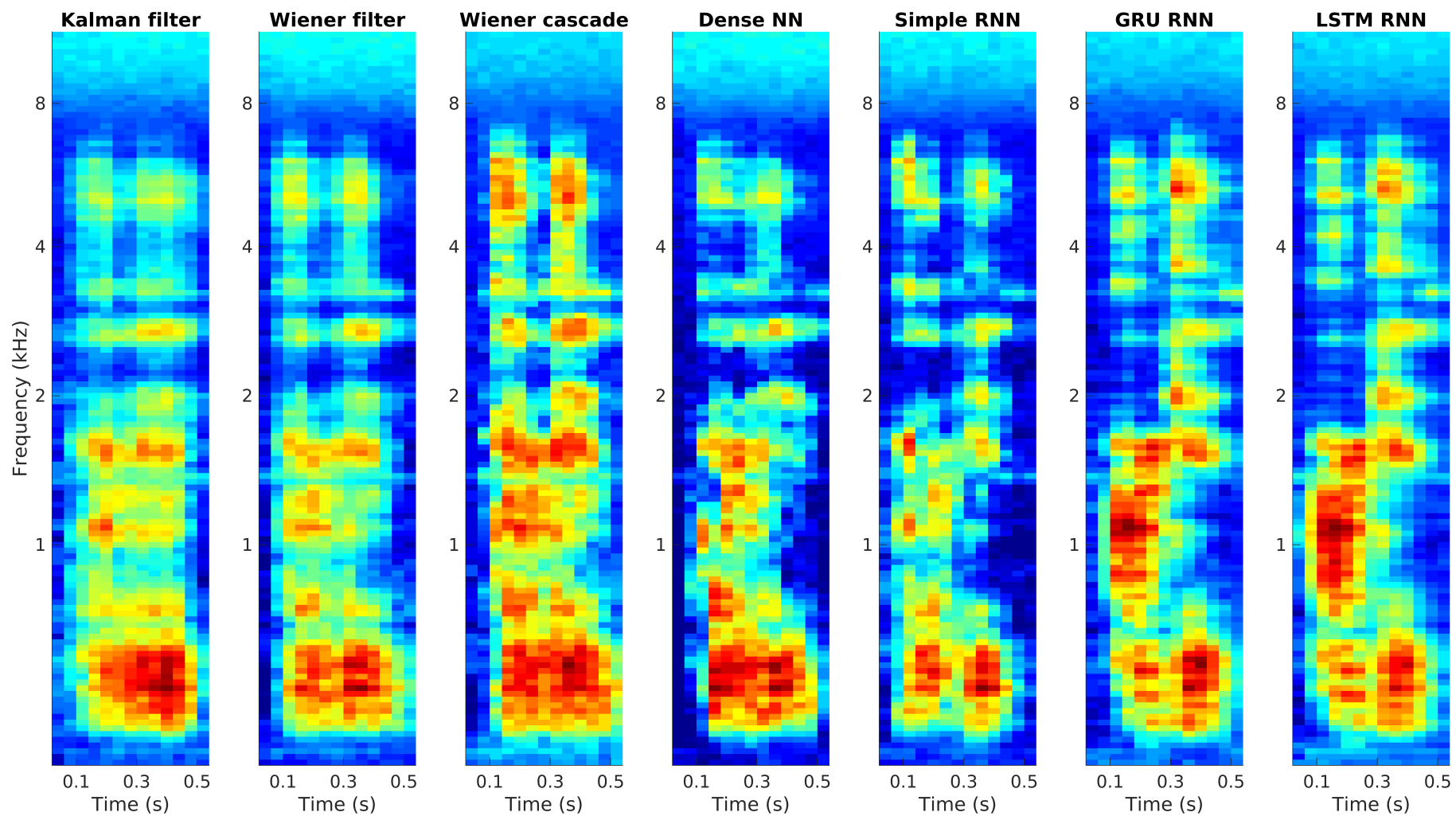


Supplementary Figures



Supplementary Figure 1: The optimal number of hidden units for neural network decoders varied across network types. The top-performing LSTM RNN algorithm achieved its highest decoding performance with a larger number of hidden units (2048).



Supplementary Figure 2: Each mel-spectrogram shows a reconstruction of the word "cricket" generated by the top-performing model for each algorithm.

Supplementary Tables

Supplementary Table 1: The results of the decoding algorithm multiple comparisons Tukey-type test.

B	A	Correlation B	Correlation A	Adjusted p-value	Result
LSTM RNN	GRU RNN	0.88	0.85	0.175	Correlations NOT significantly different
LSTM RNN	Simple RNN	0.88	0.78	0.001	Correlation B significantly greater than Correlation A
LSTM RNN	Dense Neural Network	0.88	0.69	0.001	Correlation B significantly greater than Correlation A
LSTM RNN	Wiener Cascade	0.88	0.67	0.001	Correlation B significantly greater than Correlation A
LSTM RNN	Wiener Filter	0.88	0.60	0.001	Correlation B significantly greater than Correlation A
LSTM RNN	Kalman Filter	0.88	0.57	0.001	Correlation B significantly greater than Correlation A
GRU RNN	Simple RNN	0.85	0.78	0.017	Correlation B significantly greater than Correlation A
GRU RNN	Dense Neural Network	0.85	0.69	0.001	Correlation B significantly greater than Correlation A
GRU RNN	Wiener Cascade	0.85	0.67	0.001	Correlation B significantly greater than Correlation A
GRU RNN	Wiener Filter	0.85	0.60	0.001	Correlation B significantly greater than Correlation A
GRU RNN	Kalman Filter	0.85	0.57	0.001	Correlation B significantly greater than Correlation A
Simple RNN	Dense Neural Network	0.78	0.69	0.017	Correlation B significantly greater than Correlation A
Simple RNN	Wiener Cascade	0.78	0.67	0.001	Correlation B significantly greater than Correlation A
Simple RNN	Wiener Filter	0.78	0.60	0.001	Correlation B significantly greater than Correlation A
Simple RNN	Kalman Filter	0.78	0.57	0.001	Correlation B significantly greater than Correlation A
Dense Neural Network	Wiener Cascade	0.69	0.67	0.900	Correlations NOT significantly different
Dense Neural Network	Wiener Filter	0.69	0.60	0.086	Correlations NOT significantly different
Dense Neural Network	Kalman Filter	0.69	0.57	0.006	Correlation B significantly greater than Correlation A
Wiener Cascade	Wiener Filter	0.67	0.60	0.437	Correlations NOT significantly different
Wiener Cascade	Kalman Filter	0.67	0.57	0.076	Correlations NOT significantly different
Wiener Filter	Kalman Filter	0.60	0.57	0.900	Correlations NOT significantly different