

Information theoretic analysis of the effectiveness of neural prosthetics

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Information capacity determines how well any system can extract information from a signal or set of signals that encodes the information. We extend our recent capacity calculations for neural populations to situations relevant to neural prosthetics. For neural stimulation scenarios, capacity calculations suggest no fundamental barriers prohibit obtaining high-fidelity prosthetics. In contrast, capacity results for neural control situations using few, unsorted recordings suggest that severe degradations in extracting information must occur. More detailed analysis shows that either increasing the number of simultaneous recordings (even if the recording fields overlap) or using even primitive spike sorting algorithms will greatly boost capacity, allowing more detailed information extraction.