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Selection, adaptation, and predictive information in changing environments[1] QUENTIN FELTGEN, École normale supérieure, ILYA NEMENMAN, Emory University — Adaptation by means of natural selection is a key concept in evolutionary biology. Individuals better matched to the surrounding environment outcompete the others. This increases the fraction of the better adapted individuals in the population, and hence increases its collective fitness. Adaptation is also prominent on the physiological scale in neuroscience and cell biology. There each individual infers properties of the environment and changes to become individually better, improving the overall population as well. Traditionally, these two notions of adaption have been considered distinct. Here we argue that both types of adaptation result in the same population growth in a broad class of analytically tractable population dynamics models in temporally changing environments. In particular, both types of adaptation lead to subextensive corrections to the population growth rates. These corrections are nearly universal and are equal to the predictive information in the environment time series, which is also the characterization of the time series complexity.

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