

Time Consistent Discounting

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A possibly immortal agent tries to maximise its summed discounted rewards over time, where discounting is used to avoid infinite utilities and encourage the agent to value current rewards more than future ones. Some commonly used discount functions lead to time-inconsistent behavior where the agent changes its plan over time. These inconsistencies can lead to very poor behavior. We generalise the usual discounted utility model to one where the discount function changes with the age of the agent. We then give a simple characterisation of time-(in)consistent discount functions and show the existence of a rational policy for an agent that knows its discount function is time-inconsistent.

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