TTIC 31020 HW1
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Many heating implements are binary. They are either heating or not heating. Most electric stoves function in this way. They are usually equipped with a very rudimentary temperature regulator that turns off the heating implement as soon as the stove reaches a fixed temperature, and turns on when the stove's temperature drops below a fixed number. For most situations, this method works fantastic, and the temperature of the stove, or whatever object to be heated, oscillates within a few degrees of the target temperature. However, in many applications, very precise temperature control is required, and a fixed temperature may not be desired. For instance, a specific temperature over time could be desired. Machine Learning can be used to develop an algorithm to turn on and off the heating implement at particular instances that will minimize the L^2 norm of the temperature of the object to be heated over time and a given temperature vs time curve. The end system should be able to control the turning on and off of the heating implement to minimize the variance around the desired temperature curve. The metric for the system performing well is a small L^2 norm difference between the desired temperature curve and the actual temperature curve, or a small L^2 when restricted to the curve on a prespecified interval. The task could be built using expert knowledge and careful programming. This is essentially a classical question in engineering, however complex curves could require very mathematical techniques, making it difficult to solve the problem. The data collected would be observed heat curves for various binary strings of heating. The advantages of using machine learning is a much easier way to solve the problem, but the disadvantages might be that it's unnecessary, and the problem could be solved exactly without much loss.