WEEKLY PARTICIPATION 1: EQUIVALENCE OF MAXIMIZATION AND MINIMIZATION

We stated in class that optimization problems take the form of finding

$$\boldsymbol{x}^\star \in \arg\min_{\boldsymbol{x}\in C} J(\boldsymbol{x}) \quad \text{or} \quad \boldsymbol{x}^\star \in \arg\max_{\boldsymbol{x}\in C} J(\boldsymbol{x}),$$

where J is an *arbitrary* objective function.

Argue that these optimization problems are *equivalent*, meaning that $\boldsymbol{x}^\star$ maximizes the objective function J if and only if it minimizes another related objective function: what is the most straightforward choice for the objective function that it minimizes?

This equivalence means that algorithms for minimization problems can be used to maximize, and vice versa. In this class we will usually follow the machine learning convention of posing optimization problems as minimization.