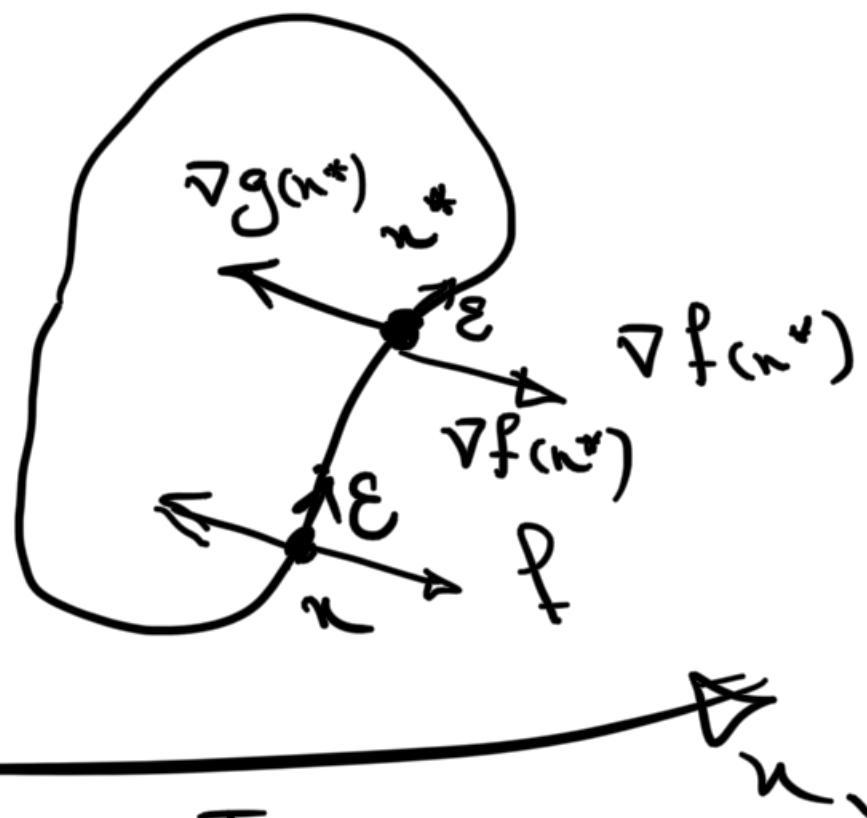


$$\begin{cases} \max f(x_1, x_2) \\ \text{s.t. } g(x_1, x_2) = 0 \end{cases}$$

$$g(x) \neq 0$$

$$g(x+\varepsilon) \approx g(x) + \varepsilon^T \nabla g(x)$$



$$\|\varepsilon\| \rightarrow 0 \quad g(x) \neq g(x+\varepsilon) = 0 \Rightarrow \varepsilon^T \nabla g(x) = 0$$

$$\nabla f + \lambda \nabla g = 0$$

$$L(x, \lambda) = f(x) + \lambda g(x)$$

$$\underbrace{\frac{\partial L}{\partial x}}_{=0} \quad \frac{\partial L}{\partial \lambda} = 0 \Rightarrow \boxed{g(x) = 0}$$

$$\boxed{\nabla f(x) + \lambda \nabla g(x) = 0}$$

$$\arg \max_x \max_{\lambda} \underline{L(x, \lambda)} = \boxed{\begin{array}{l} \arg \max_x \underline{f(x)} \\ \text{s.t. } \underline{g(x) = 0} \end{array}}$$

$$x \in \mathbb{R}^d$$

d+1