λ
w
b
λ
w
b
λ

The Differentiable Case

$w(\lambda) =$
$\mathcal{L}_{low}(w, \lambda)$
$\mathcal{L}_{upp}(w, \lambda)$
b
λ
w_{upp}
g_λ
$\mathcal{L}_{upp}$
λ
$^{upp}_{\lambda} =$
$\left(\frac{\partial}{\partial w}\mathcal{L}_{upp}(w, \lambda)\right)^\top \frac{\partial w(\lambda)}{\partial \lambda} +$
$\frac{\partial}{\partial \lambda}\mathcal{L}_{upp}(w, \lambda).$
$\frac{\partial w(\lambda)}{\partial \lambda}$

$$\frac{\partial w}{\partial \lambda} \in \frac{\partial}{\partial \lambda_w}\mathcal{L}_{low}(w, \lambda).$$

$\mathcal{L}_{low}$
w^*
$\lambda_0 >$
0

$$0 = \frac{\partial}{\partial w}\mathcal{L}_{low}(w^*, \lambda_0) \tag{1}$$

?
$F :$
$U \times$
$V \rightarrow$
Z
$U \in^m$
$, V, Z \in^n$
$\mathcal{C}^1$
$(x_0, y_0) \in$
$U \times$
V
$F(x_0, y_0) =$
0
$\frac{\partial}{\partial y}F(x_0, y_0)$
$U_0 \subset$
U
x_0
$V_0 \subset$
V
y_0
$f :$
$U_0 \rightarrow$
V_0
$\in$
$U_0 \times$
$V_0 \Leftrightarrow$
$y =$
$f(x), x \in$
$U_0.$
$x \lambda$
yw
$F(x_0, y_0) \frac{\partial}{\partial w}\mathcal{L}_{low}(w^*, \lambda_0)$
$\frac{\partial^2}{\partial w^2}\mathcal{L}_{low}(w^*, \lambda_0)$
$w(\lambda)$
w
??
$\lambda)w =$
$h(\lambda).$
λ
$\partial H(\lambda) \overline{\partial \lambda w + H(\lambda)\frac{\partial w}{\partial \lambda} = \frac{\partial h(\lambda)}{\partial \lambda}.}$
$H(\lambda)$
$\lambda \in$
Λ
$\partial w \overline{\partial \lambda = H^{-1}(\lambda)\left(\frac{\partial h(\lambda)}{\partial \lambda} - \frac{\partial H(\lambda)}{\partial \lambda} w\right).}$

The Non-differentiable Case

$\mathcal{L}_{low}$
$\mathcal{L}_{low}$
w