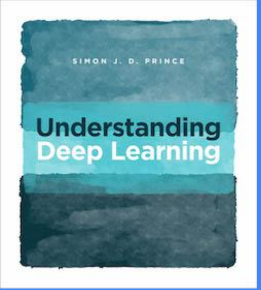
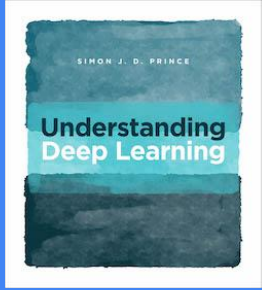
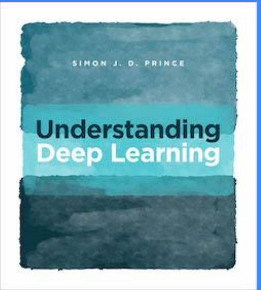
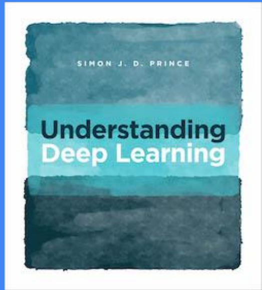




Supervised learning





A model as a mathematical concept

$$\mathbf{y} = \mathbf{f}[\mathbf{x}]$$

$$\mathbf{y} = \mathbf{f}[\mathbf{x}, \phi] \qquad \mathrm{L}[\phi]$$

$$\hat{\phi} = \underset{\phi}{\mathrm{argmin}}\left[\mathrm{L}\left[\phi\right]\right]$$

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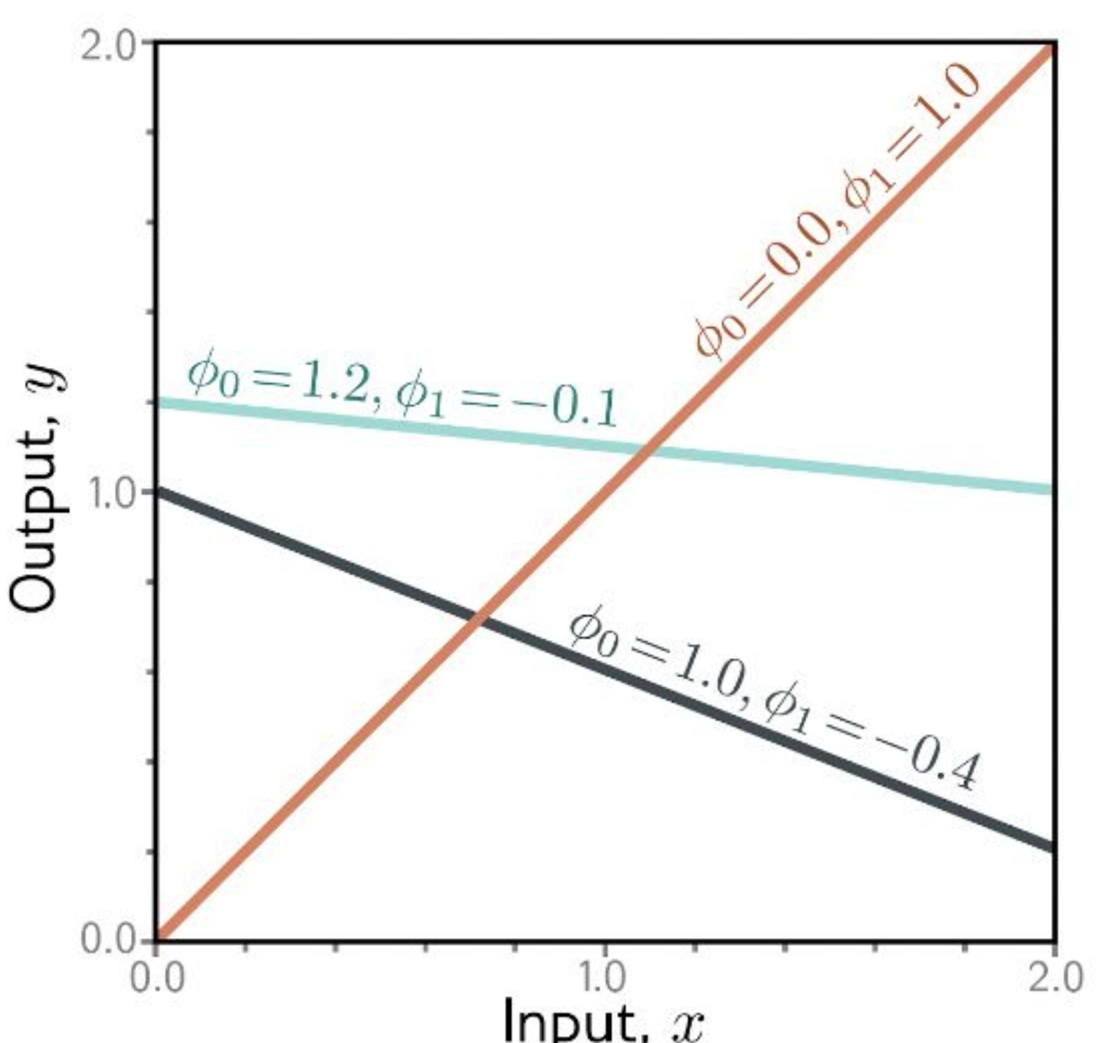
Linear Regression Model

$$
\begin{aligned}
y &= \mathrm{f}[x, \boldsymbol{\phi}] \\
&= \phi_0 + \phi_1 x
\end{aligned}
$$

$$\{\mathbf{x}_i, \mathbf{y}_i\}$$

i=1, …, n



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$$
\begin{aligned}
\mathrm{L}[\phi] &= \sum_{i=1}^{I} (\mathrm{f}[x_i, \boldsymbol{\phi}] - y_i)^2 \\
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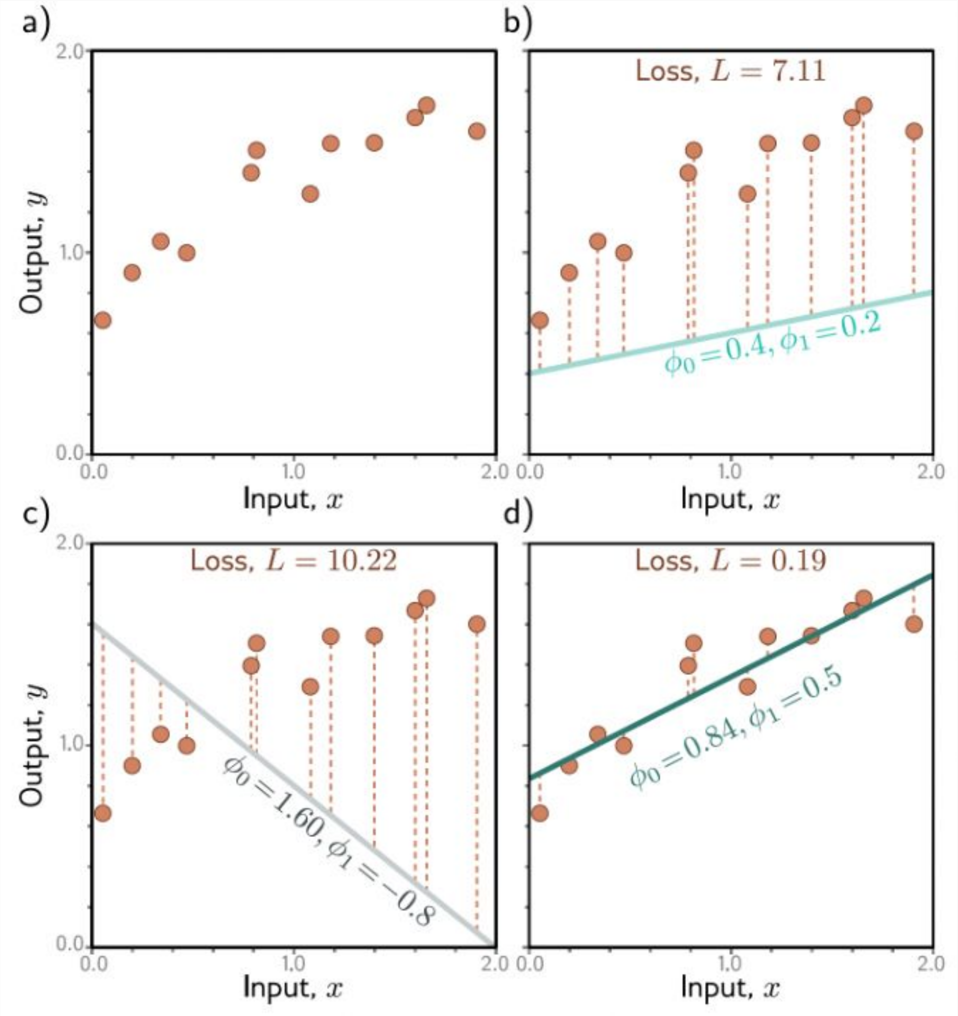
$$



$$\hat{\boldsymbol{\phi}} = \underset{\boldsymbol{\phi}}{\operatorname{argmin}}\Big[\mathrm{L}[\boldsymbol{\phi}]\Big]$$
$$= \underset{\boldsymbol{\phi}}{\operatorname{argmin}}\left[\sum_{i=1}^{I}\left(\mathrm{f}[x_i, \boldsymbol{\phi}] - y_i\right)^2\right]$$
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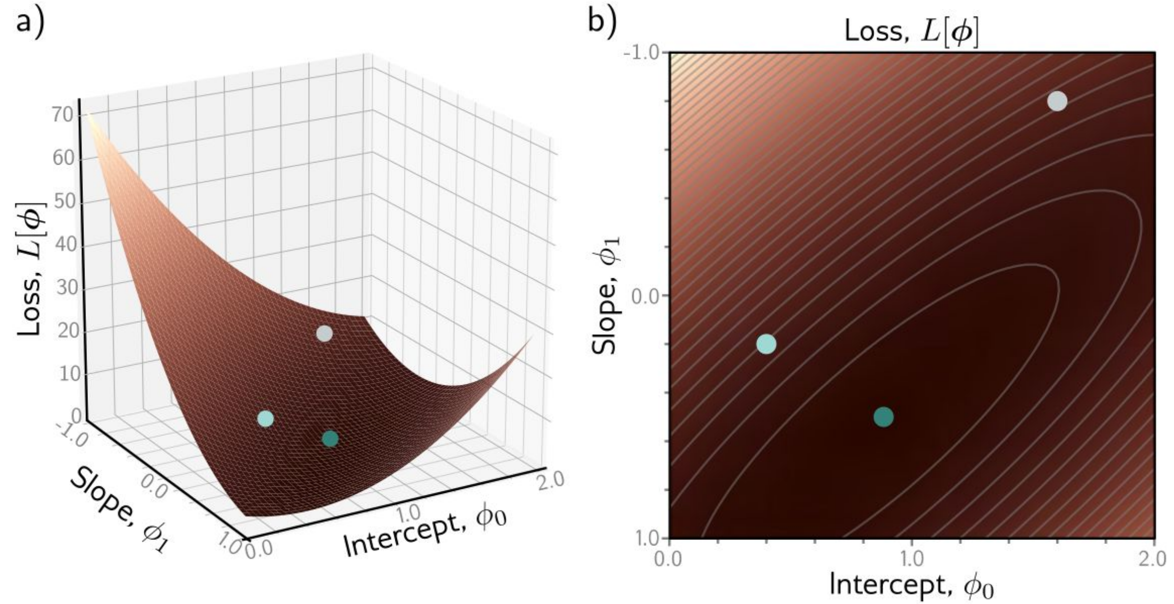

Model Training

$$
\begin{aligned}
\hat{\phi} &= \underset{\phi}{\operatorname{argmin}}\Big[\mathrm{L}[\phi]\Big] \\
&= \underset{\phi}{\operatorname{argmin}}\left[\sum_{i=1}^{I}(\mathrm{f}[x_i,\phi]-y_i)^2\right] \\
&= \underset{\phi}{\operatorname{argmin}}\left[\sum_{i=1}^{I}(\phi_0+\phi_1 x_i-y_i)^2\right]
\end{aligned}
$$