Some objective functions you might play with.

$$
\begin{aligned}
&\text{Quadratic} \\
\theta &\in \mathbb{R}^D \\
f(\theta) &= \frac{1}{2}\theta^T A \theta + b^T \theta
\end{aligned}
$$

$$
\begin{aligned}
&\text{Normal log likelihood} \\
\mu, \sigma, x &\in \mathbb{R} \\
\ell(x|\mu,\sigma) &= -\frac{1}{2}\sigma^{-2}(x-\mu)^2 - \frac{1}{2}\log \sigma^2
\end{aligned}
$$

$$
\begin{aligned}
&\text{Normal influence function} \\
\mu, \sigma &\in \mathbb{R} \\
x, w &\in \mathbb{R}^N \\
f(\mu,\sigma,x,w) &= \sum_n w_n \ell(x_n|\mu,\sigma)
\end{aligned}
$$

$$
\begin{aligned}
&\text{EM mixture model} \\
x &\in \mathbb{R}^N \\
\mu_1, ..., \mu_K, \sigma_1, ..., \sigma_K &\in \mathbb{R} \\
\pi &\in [0,1]^K \\
z_n &\in [0,1]^K \text{ (the interval, not binaries)} \\
f(x, \mu_1, ..., \mu_K, \sigma_1, ..., \sigma_K, z) &= \sum_n \sum_k z_{nk} \ell(x_n|\mu_k,\sigma_k) + \sum_n \sum_k z_{nk} \log \pi_k.
\end{aligned}
$$

$$
\begin{aligned}
&\text{Logistic regression} \\
y &\in \{0,1\}^N \text{ (binary)} \\
x_n &\in \mathbb{R}^D \\
x &= x_1, ..., x_N \\
\theta &\in \mathbb{R}^D \\
\ell(y|\theta,x) &= \sum_n \left(y_n\left(\theta^T x_n\right) + \log\left(1+\exp\left(\theta^T x_n\right)\right)\right)
\end{aligned}
$$