Accept-Reject Sampling

→ rejection sampling

Say we have $p(x) = \frac{f(x)}{NC}$

→ normalizing constant $\int_{-\infty}^{\infty} f(x)\,dx$

Steps

① Select a $g(x)$ which is close to $p(x)$ [or $f(x)$] and easy to sample from. Also domain should be same as $p(x)$

It could be that we know $f(x)$ but cannot compute $\int f(x)\,dx$. So then how can we sample from $p(x)$?

② Scale $g(x)$ so that $g(x) \geq f(x)\ \forall x$. Say you multiply by m.

③ Sample a point (s) from $g(x)$

④ Compute prob. $\frac{f(s)}{m \cdot g(s)} \in [0,1]$ and accept/reject based on it

↳ the accepted samples will seem to have been sampled from $p(x)$

$$I\left\{\frac{f(s)}{mg(s)} > u\right\}$$

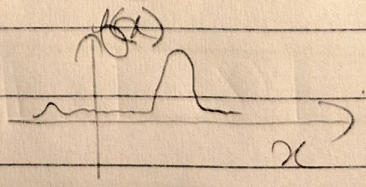
where $u \sim \text{Unif}(0,1)$

Intuition

If prob. is high then $f(s)$ is high and $g(s)$ is small meaning sample is "rare" and does exist in $f(s)$. So accept it

Issue

If you have $f(x)$ like



then m has to be very large but then prob becomes small ← rejecting a lot of samples