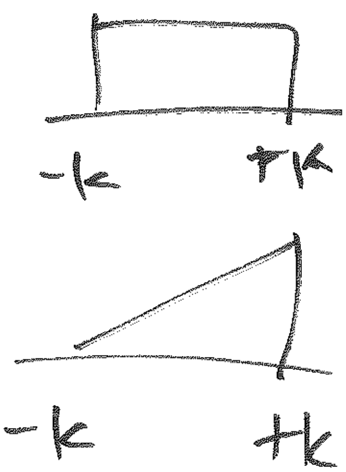
this Markov
time: chains;
Monte

AMS 131
1 Sep 17

(1)



(9.47)

Metropolis
& Ulam (1942; 1949)

Monte-Carlo

θ
k

von Neumann

Metropolis,
Teller E. Teller

Biometrika

1944; 1953

Hastings (1970)

Metropolis-Hastings

1981
Geman & Geman
Gibbs sampling
IEEE

~~SE~~

1990
Gelfand
& Smith

JASA

analogy engine

data $\underset{\sim}{D}(y_1 \cdots y_n)$

unknown $\underset{\sim}{\theta}$

want: summarize

$$p(\underset{\sim}{\theta}_k, \mid \underset{\sim}{D}, \text{background info \& assumptions})$$

$$\begin{array}{cccc}
\theta_1 & \theta_2 & \cdots & \theta_k \\
\theta^*_{11} & \theta^*_{12} & \cdots & \theta^*_{1k} \\
\theta^*_{21} & \theta^*_{22} & \text{—} & \theta^*_{2k} \\
\vdots & \vdots & & \vdots \\
\theta^*_{M1} & \theta^*_{M2} & \cdots & \theta^*_{Mk}
\end{array}$$

M

# of monitoring iterations

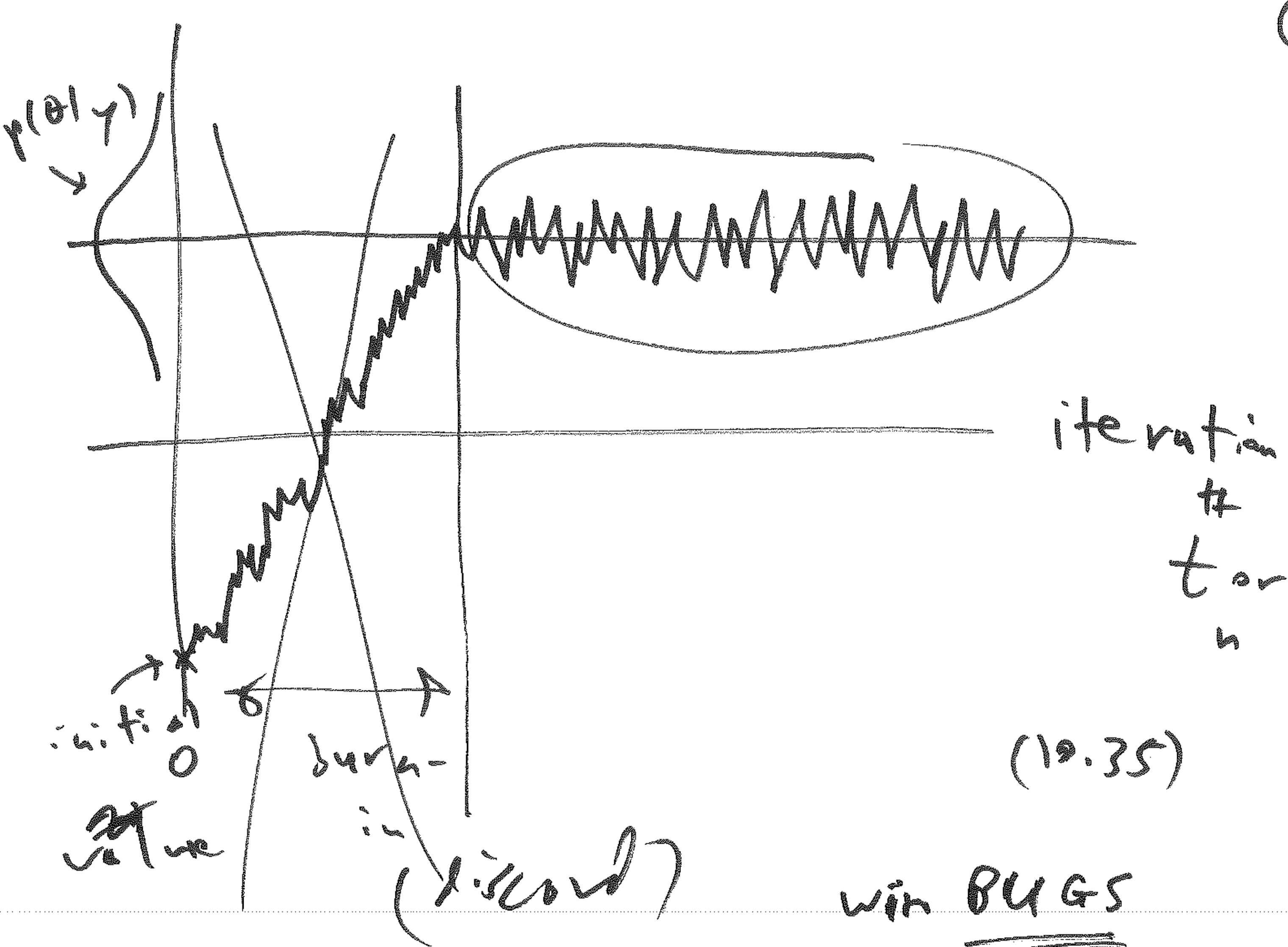
want N

I ID

Monte Carlo data set

hist of

$$\underline{\underline{p(\theta \mid D)}} \propto \underline{\underline{p(\theta)\, \ell(\theta \mid D)}}$$



(10.35)

win BUGS

precision

$$D_i \overset{IID}{\sim} N(\Delta, \sigma^2) \leftarrow \tau = \frac{1}{\sigma^2}$$

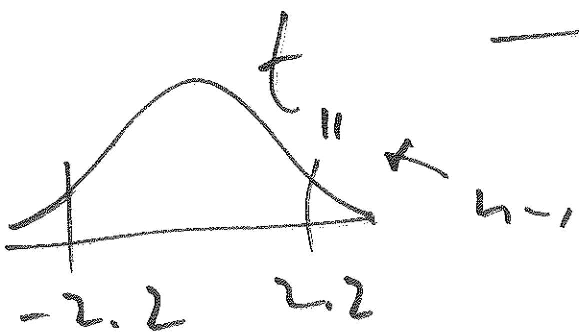
$$\bar{D}_n = \frac{1}{n}\sum_{i=1}^{n} D_i = \hat{\Delta} = 18.6$$

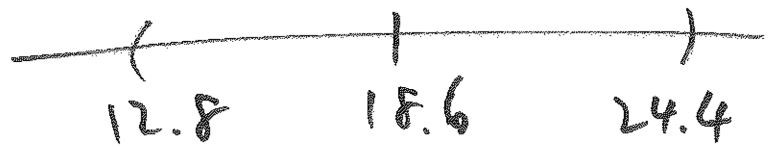
$$\widehat{SE}(\bar{D}_n) = \frac{\cancel{\sigma}\, SD}{\sqrt{n}} = \frac{10.1}{\sqrt{12}} \doteq 2.92$$

approx (large n)
95% CI for Δ: $\hat{\Delta} \pm 2\,\widehat{SE}(\hat{\Delta})$

$18.6 \pm 2(2.92)$

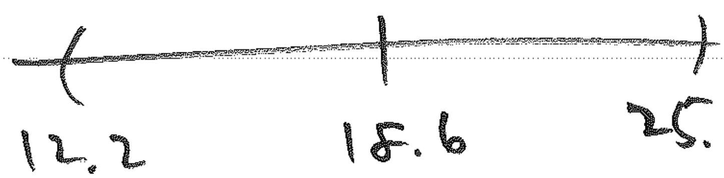
Q





more careful: $18.6 \pm 2.2(2.92)$

$\frac{2.2}{2.0} = 1.1$



$(2.92)(1.1)$