STA 4412: Statistical Inference: New theory, techniques, current research, ... 
Prerequisite: STA 422

Theme: Current theory, methods, research, conflicts ... usually to joint paper
Evaluation: Attendance, participation, contributions @ 1/3

Proposed
- Brief overview of STA 422
- Details, understanding, fine-tuning of
- What is statistical inference?
- Why does statistics have two approaches?
- New topics, research, directions

Statistics See Perception-role.pdf

Perception: 1) NSERC/grants/SSC 2) Science Feb 11, 2011 - Issue on Data
Science Sep 23, 2011 - Andrew Groves: Don't need clinical, again, and again, and again
Science Dec 2, 2011 - Again, and Again, and Again (replication but not from "core"

Role?

Two approaches: "Discipline" should be embarrassed!

See web site
Last year's research paper
Verify/understand all details

neumann.re.ca/pages/jean-francois.peutes/SSC2009/Potvin.html

264.pdf

that contradict each other?
no one cares?
"Topics" called things they aren't?
court of law? of logic?

Trial
Background: 422: 7 topics

0 p-Value

Core of S.R.

\[ p(y) = \text{Prob} \{ \text{data} \leq y \} \quad \text{for} \quad y \in \mathbb{R} \]

Have

\[ d\text{m}_y = d\text{m}_\theta = d\text{m}_\phi = 1 \]

\[ p(\theta) = F'(y; \theta) = F'(y) \quad \text{Cont.} \quad \text{(U(0, 1))} \quad \text{Stat.} \quad \text{p} \quad \text{data} \]

\[ = S(y_0; y) \quad \text{Stoch.} \quad \text{dec.} \]

\[ d\text{m}_y = 1 \quad \text{(Latin d\text{m}_y \geq 1)} \]

Modern Lat. anal.; H.O.A.; gender

\[ \text{conf.} \quad \text{from} \quad p(\theta) \]

Conf. from \( p(\theta) \)

Conf. 90\% in \( \beta \)-level conf. Reg. Reproducibly

Upper conf. Reg.

\( (\hat{\theta}_L, \hat{\theta}_U) \approx 85\% \text{ Conf. Int.} \)
(i) Joe's L(θ), L(θ), L(θ, y), L(θ, y) e L
(ii) Obs L(θ) > L(θ; y)
(iii) In set with a disto when θ e \{Ω, Ω, Ω, etc \}
(iv) CLT LLN Stirling Lemma \[ \frac{N(θ, c(θ))}{c(θ)} \sim Φ \]
\[ z = c(θ)/i(θ) \]
\[ s = (θ - θ_0)n \]
\[ c(θ) = c(θ_0) + z - \delta - \delta^2/2 \]
\[ = c(θ_0) + z^2/2 - (z-δ)^2/2 \]
\[ \text{Quadratic} \Rightarrow \text{solve } θ \text{, Dutm, etc} \]
\[ \text{etc} \]
(ii) \( \text{SN Pn formulation} \) \( F_{\text{SN}} \) \( (h \rightarrow \nu \nu \eta) \rightarrow F_{\nu} \) \( \text{Hadronic} \)

\( S = \frac{1}{n} \epsilon \) \( \text{example} \) \( \bar{e} \) \( \text{stable} \)

\( \text{Jet} \) \( \text{to} \) \( \text{quark} \) \( \text{indium} \) \( \text{TgT} \) \( \text{expanded} \) \( \text{N.B.} \)

\( \text{KB} \) \( \text{mea. dependent} \) \( \Phi \) \( \text{p.m.} \)

\( g(r) = e^{-r^2/2\sigma^2} \text{(Gaussian)} \)

\( f(x,y) = e^{-x^2 - y^2} \text{plane} \)

\( \text{Johannes} \ 1957 \) \( \text{Cu BN} \) \( 1937 \) \( 8 - 14 \) \( \text{E.g.} \) \( \text{Asy.} \)

\( \text{Local} \) \( \text{is safe} \) \( \text{Jet} \) \( \text{to} \) \( \text{tor} \) \( \text{shrinkage} \) \( \text{local} \) \( \text{to} \) \( \text{shrink} \)

\( \text{N.B.} \)
Taylor Series (As in Laplace)

"A Taylor viewpoint and its general models" [online].

neumann.hec.ca/papers/jean-francois.plante/SSC2009/Poster.html.

Taylor expression: \[ \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{n!} x^n \]
Bayes: Jeffreys' prior: current version

Second order analysis (HOL; \( \Omega(n^2) \)): Exp model: Easy

Scalar \( y, \theta \) case

\[
\begin{align*}
    f(y; \theta) &= \exp \left[ \psi(y) \lambda(y) + k(y) \right] h(y) \quad \text{on} \quad \Omega R^n
    \Rightarrow \\
    f(\lambda; \theta) &= \exp \left[ \phi \lambda - K(y) \right] h(\lambda)
\end{align*}
\]

Both monotonic in \( \psi \) \( \phi \approx 0 \lim (\phi - \psi) \phi_k \psi \)

\[
    f(\lambda; \phi) = e^{\psi \phi_k \psi} \phi_k \psi
\]

\[
    F(\lambda; \psi) = \Phi \left( \lambda - n^{-1/2} \right)
\]

If not, need dep \( 0 \left( n^{-1/2} \right) \)