Project Notes

Problem: App measures Reaction times

* Missing / open information *

- we want to predict next Reaction time
- we want to detect significant deviation
  ↳ * might we want to also give more gradual feedback?

Are there any concrete Requirements?
Or nice to have?
What is the goal?

Bonus:

System:

prior → → data → posterior
pop age / div / condition?

Data:

- Medication : Date Name Dose final
- operation Timeline [Event] Event: type time Note

- Age: Date ID: String

during Dutztime: time Reactiontime: time
test

Project:

- 5 (?) steps of Bayesian Data Analysis

settings Alarm - reminds user

(random distribution)

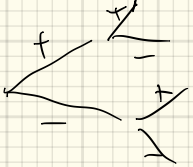
- signifikante Veränderungen feststellen
  ↳ wollen wir

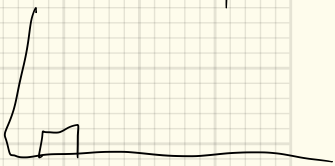
Vergleiche User User
population avg

- estimation for user - conjugate

~5 before
~5 during
~5 after

Questions:
ideal sample size





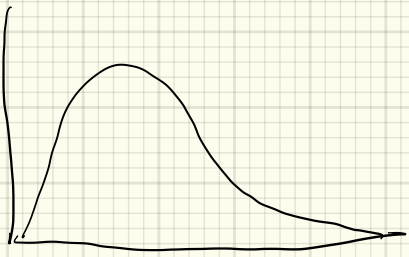
Narkose
aufschneiden
Intubation
—— stop
⋮ kann aufwachen
aufwachen
Reaktionstest
Reden
Alarm

pre-operativ : Tage davor

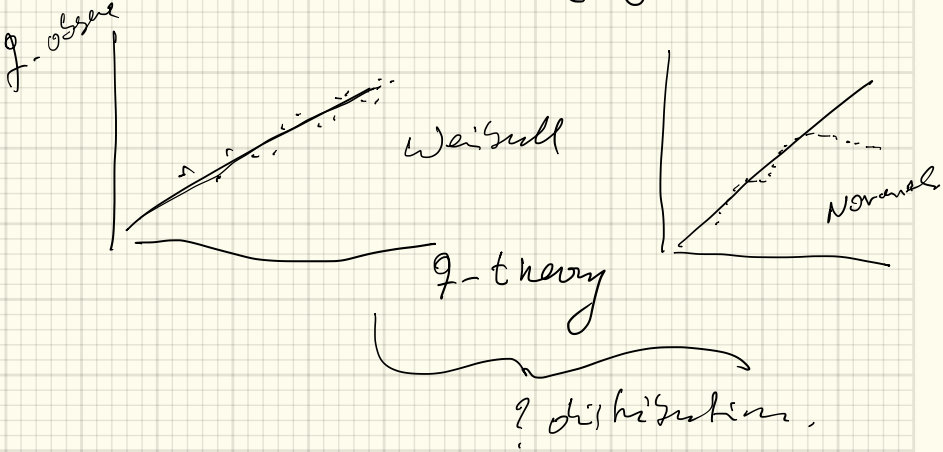
gleiche Reaktionszeit wie preoperativ

1-2 h

distributions for time to event.



qq-plots. { Normal, Weibull, Gamma.



R → MASS

fitdist(x, dens="weibull")

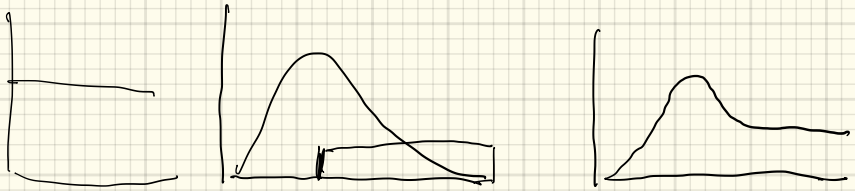
↓ $\theta_1 = 2$

$\theta_2 = 5$

BUGS | Prior.

Learned Priors

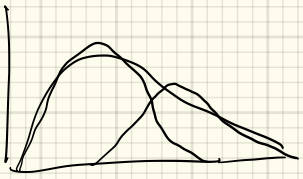
histogram prior.



Prior for normal.

Prior for patient.

fitmix



Idea: Stan:

C++, many bindings

-> + Embed in Android

slide: why Stan?

- interoperability
- performance
- shiny stan

slide: weibull

selecting

run does it work?

setup y with pts uniform in bin radius

```
for (b in N_bins) {
  y[sum(freqs[1:b]) - freqs[b] : sum(freqs[1:b]] ~ uniform[](freqs[b] - bin.radius, freqs[b] + bin.radius)
}
y[] ~ weibull[]
```

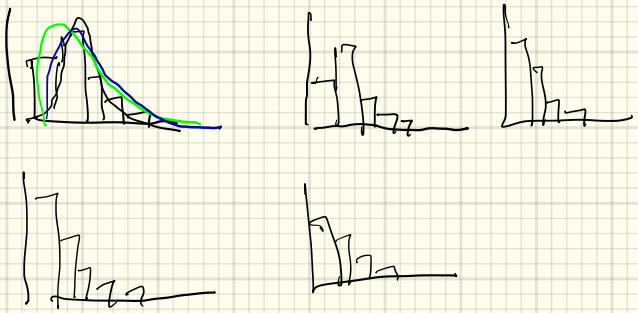
Idea: Aacra for prelmid operation

1) $y_1, \ldots, y_{20}$

2) fitdist MASS.

- Normal → $(\bar{x}, SD.)$
- Weibull → (scale, rate)
- Exponential → (rate)

retimes → Exponential Normal



3) Now informatic Bayesian analysis.

$(y \mid \mu, \sigma, \lambda) \sim$ Ex-Gaussian $=$ Lik(i)

$$p(\mu) \sim N(0, 10^{-3})$$
$$p(\sigma) \sim \text{Uniform}(0, 100)$$
$$\tau \sim \text{Exponential}(1)$$

Q1) Stan: Can I use the
→ ol exp gauss $(x; \mu, \sigma, \lambda)$
→ Likelihood

Q2) OpenBUGS ✓ Ok

logLik [i] ← log (f (y; μ, σ, λ))

4) retimes. test the code

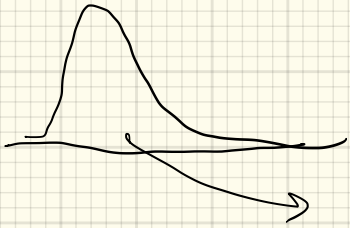
→ rexgauss(100, μ=0, sigma=1, tau=1) ✓

$y_1 \dots y_{100}$

test. OpenBUGS code

5) Use the model with real data.

6)



Informative Analysis

$$x \sim U(0,1)$$

$$y_1^* \quad \cdots\cdots \quad y_{1000}^*$$

$$\downarrow$$

$$(\mu, \sigma, \gamma)$$

$$\hat{\mu} = 30 \pm 3$$

$$\hat{\sigma} = 1 \pm 0.1$$

$$\hat{\gamma} = 1.5 \pm 0.5$$

Bayesian
informative
non-informative
t-test splitting

⑧ OpenBUGS

$$\Phi(x) = \int_{-\infty}^{x} \text{Normal}(x, 0, 1)\, dx$$

μ, σ

$z \leftarrow \frac{x - \mu}{\sigma}$

phi(z)

~~phi((x − μ)/σ)~~

$$\mu = \beta_0 + \beta_1 x$$

$x = \begin{cases} 0 \rightarrow \text{cont.} \\ 1 \rightarrow \text{fr.} \end{cases}$