Title:
subtitle

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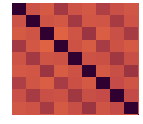


Motivation

Research question:

- Find the thing

Data:

- Hierarchical

Model:

- Generalized Linear Mixed Model (GLMM)

ML is used to obtained the parameter estimates in GLMMs

- The (profiled) log-likehood function is approximated to a specified degree

Motivating data: some data

outcome	cluster	individual	predictor	covariates
0	1	1	49	$x'_{1,1}$
1	1	2	88	$x'_{1,2}$
⋮	⋮	⋮	⋮	⋮
0	1	n_1	59	x'_{1,n_1}
1	2	1	91	$x'_{2,1}$
0	2	2	45	$x'_{2,2}$
⋮	⋮	⋮	⋮	⋮
0	2	n_2	94	x'_{1,n_2}
⋮	⋮	⋮	⋮	⋮
1	m	1	49	$x'_{m,1}$
1	m	2	147	$x'_{m,2}$
⋮	⋮	⋮	⋮	⋮
0	m	n_m	57	x'_{1,n_m}

Adaptive GHQ (aGHQ)

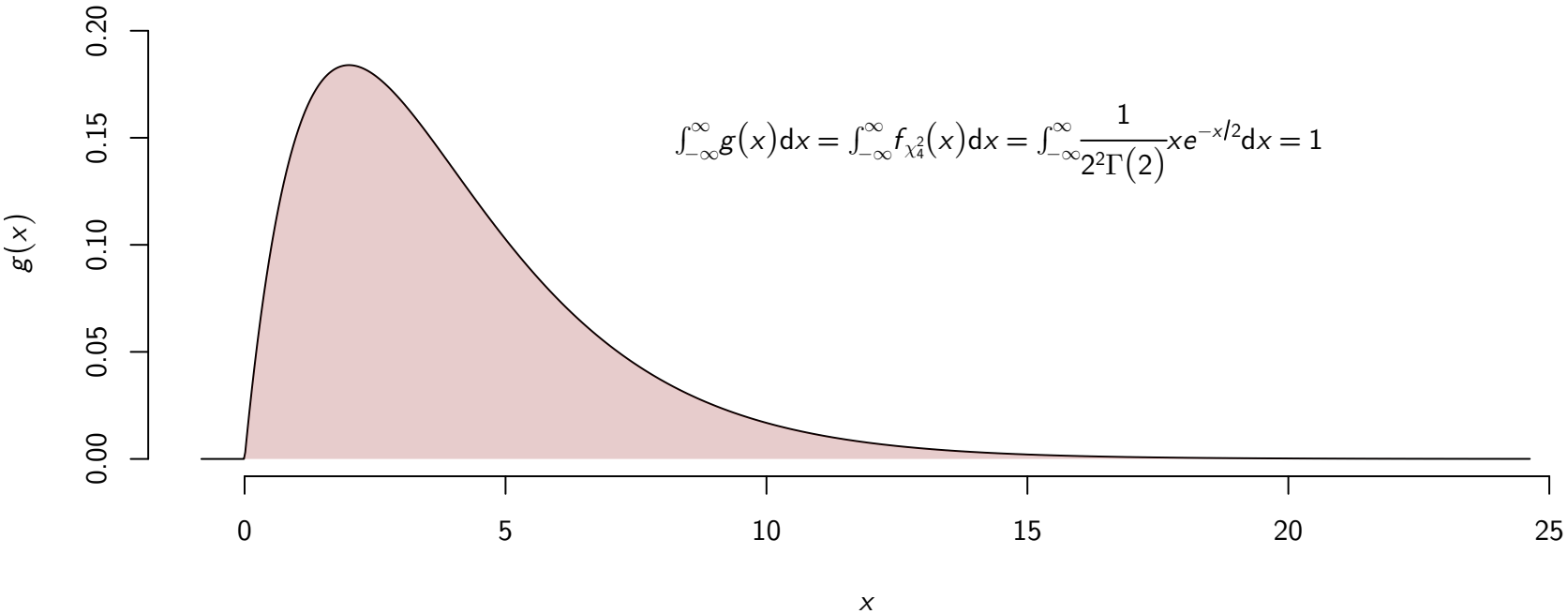
aGHQ simply means standard normal variate type tranformation takes place which alters the formula (Liu and Pierce, 1992):

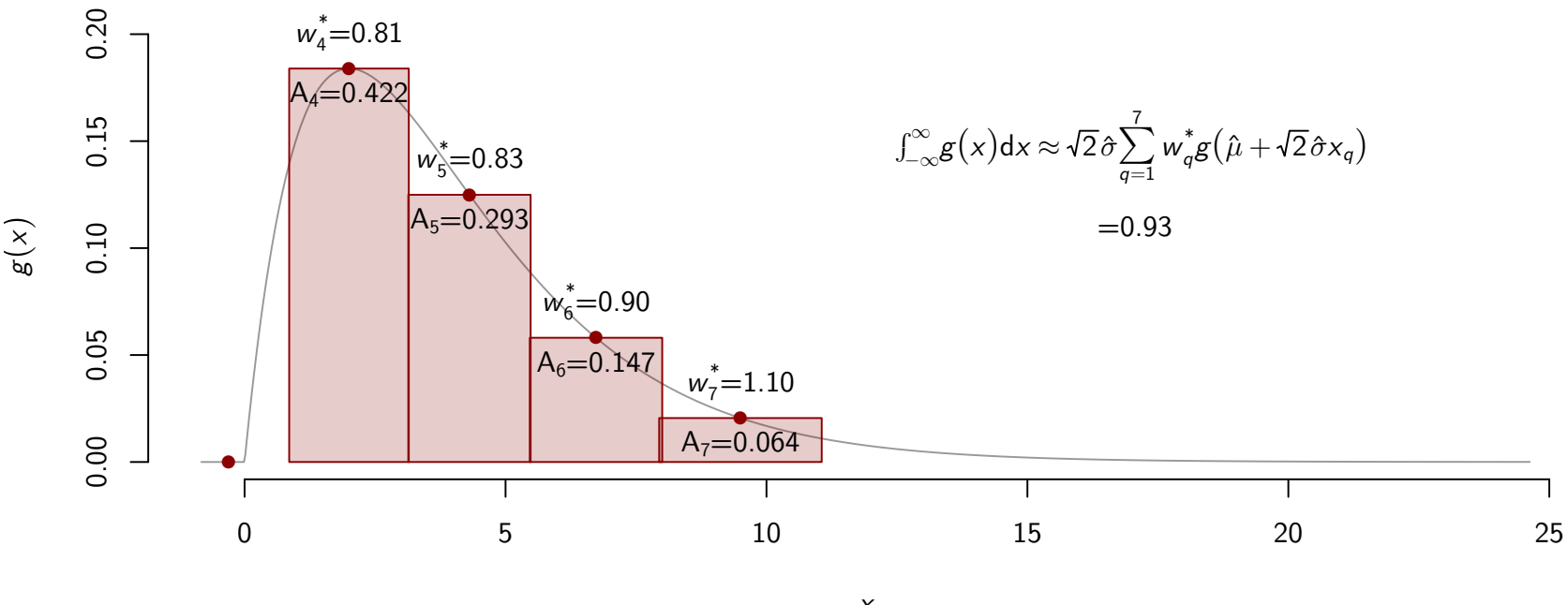
$$\int_{-\infty}^{\infty} g(x)\,dx \approx \sqrt{2}\hat{\sigma} \sum_{q=1}^{Q} e^{-x_q^2} w_q g\left(\hat{\mu} + \sqrt{2}\hat{\sigma} x_q\right)$$

where

- $\hat{\mu} = \arg\max_x g(x)$, and
- $\hat{\sigma}$ is the Fisher Information at $\hat{\mu}$: $\hat{\sigma} = \dfrac{1}{\sqrt{-\frac{\partial^2}{\partial x^2} \ln g(x)\Big|_{x=\hat{\mu}}}}$

aGHQ example ($Q = 7$)





$\tau_1 = 2$	$Q = 1$	$Q = 2$	$Q = 3$	$Q = 4$	$Q = 5$	$Q = 6$	$Q = 7$
$\alpha(\hat{\tau}_1)$	0.373	0.954	0.204	0.035	0.037	0.040	0.033
$\bar{\hat{\tau}}_1$	1.671	1.456	1.757	1.949	1.927	2.033	1.990

Summary

Statement

- sub statement 1
- sub statement 2
- sub statement 3

Acknowledgements

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