$g(t) = (\nabla^2 f, f) \in (D, > u) \qquad f = \nabla f .$

$$\Rightarrow \mathbb{E}[N_{\geq u}] = \int_T \mathbb{E}\Big[\, |\det \nabla^2 f(t)|\, \mathbb{1}[\nabla^2 f(t) \in D, f(t) > u] \;\Big|\; \nabla f(t) = 0 \Big]\, p_t(u)\, dt .$$

$\nabla^4 r = K .$

in short setting here is:

indep of $\boxed{\nabla f(t)}$!

$$\int_T \begin{pmatrix} f \\ \nabla^2 f \end{pmatrix} \sim N\left(0, \begin{pmatrix} \sigma^2 & \mathrm{vech} A \\ \mathrm{vech} A & K \end{pmatrix}\right).$$

$$\int |\det \nabla^2 f|\, \mathbb{1}[\nabla^2 f(t) \in D, f(t) > u]\, p_t(\nabla^2 f \mid f)\, p(f)$$

$$\nabla^2 f \mid f = \square f + N(0, K')$$