A fast approximation to $\nabla^2 G_\sigma$ is a scaled version of the difference of two Gaussians with different and carefuly selected σ's.

$$B(G_{\sigma_1} - G_{k\sigma_1})$$

where

$$B = 2\frac{\sigma_1^2}{\sigma^4}\frac{k^2}{1-k^2} \quad \text{and} \quad \sigma_1^2 = \sigma^2\frac{k^2-1}{k^2 \ln k^2}$$

and where $1 < k < 2$ gives acceptable approximations.