Statistical Machine Learning
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CE 40-956

# TH Quiz 2 (Gaussian Processes)

**Due March 15, 2020 (11:59 pm)**

1. Assume that $W(t)$ is a white Gaussian noise with autocorrelation function $\mathbf{R}_W(\tau) = \alpha\delta(\tau)$. $X(t)$ is obtained by passing $W(t)$ through an integrator:

$$X(t) = \int_0^t W(\tau)d\tau$$

   (a) Find $\mathbb{E}[X(t)]$ and $\mathbf{R}_X(t, t+\tau)$.

   (b) Show that $X(t)$ is nonstationary.

2. A process $W(t)$ is called Brownian if $W(0) = 0$ and for $\tau > 0, W(t+\tau) - W(t)$ is a Gaussian $\mathcal{N}(0, \sqrt{\alpha\tau})$ independent of $W(t')$ for all $t' \leq t$. Show that A Brownian motion process is a Gaussian process.