

Characteristics of Multiple Random Variables

Young W Lim

June 19, 2019

Copyright (c) 2018 Young W. Lim. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

This work is licensed under a Creative Commons
"Attribution-NonCommercial-ShareAlike 3.0 Unported"
license.



Based on
Probability, Random Variables and Random Signal Principles,
P.Z. Peebles,Jr. and B. Shi

Outline

1 Joint Gaussian Random Variables

Bivariate Gaussian Density

two random variables

Definition

The two random variables X and Y are said to be jointly Gaussian, if their joint density function is

$$f_{X,Y}(x,y) = \frac{1}{2\pi\sigma_X\sigma_Y\sqrt{1-\rho^2}}.$$

$$= \exp \left\{ \frac{-1}{2(1-\rho^2)} \cdot \left[\frac{(x-\bar{X})^2}{\sigma_X^2} - \frac{2\rho(x-\bar{X})(y-\bar{Y})}{\sigma_X\sigma_Y} + \frac{(y-\bar{Y})^2}{\sigma_Y^2} \right] \right\}.$$

wher

$$\bar{X} = E[X], \quad \bar{Y} = E[Y],$$

$$\sigma_X^2 = E[(X - \bar{X})^2]$$

$$\sigma_Y^2 = E[(Y - \bar{Y})^2]$$

