

Math 362: Mathematical Statistics II

Le Chen

le.chen@emory.edu
chenle02@gmail.com

Emory University
Atlanta, GA

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Chapter 11. Regression

§ 11.1 Introduction

§ 11.4 Covariance and Correlation

§ 11.2 The Method of Least Squares

§ 11.3 The Linear Model

§ 11.A Appendix Multiple/Multivariate Linear Regression

§ 11.5 The Bivariate Normal Distribution

Plan

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Regression analysis

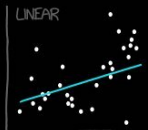
FITS A STRAIGHT LINE TO
THIS MESSY SCATTERPLOT.
 x IS CALLED THE
INDEPENDENT OR
PREDICTOR VARIABLE, AND
 y IS THE DEPENDENT OR
RESPONSE VARIABLE. THE
REGRESSION OR PREDICTION
LINE HAS THE FORM

$$y = a + bx$$

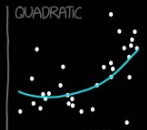


<https://madhureshkumar.wordpress.com/>

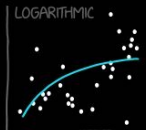
CURVE-FITTING METHODS AND THE MESSAGES THEY SEND



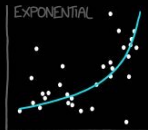
"HEY, I DID A
REGRESSION."



"I WANTED A CURVED
LINE, SO I MADE ONE
WITH MATH."



"LOOK, IT'S
TAPERING OFF!"



"LOOK, IT'S GROWING
UNCONTROLLABLY!"



"I'M SOPHISTICATED, NOT
LIKE THOSE BUMBLING
POLYNOMIAL PEOPLE."



"I'M MAKING A
SCATTER PLOT BUT
I DON'T WANT TO."

<https://xkcd.com/>

Three ways to view the same thing

$$(x_1, y_1), \dots, (x_n, y_n)$$

1. Purely data, no probability structure assumed.

$$(x_1, Y_1), \dots, (x_n, Y_n)$$

2. A random sample of size n , where Y_i follows a distribution depending on x_i which is deterministic.

$$(X_1, Y_1), \dots, (X_n, Y_n)$$

3. A random sample of size n , where (X_i, Y_i) follow some joint distribution.

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