

MLaRPIS Homework Exercise 1

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1 Bayes Rule

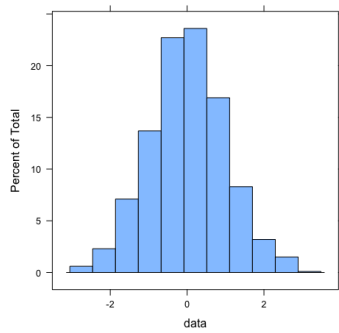
Bayes Rule is a formula that is used to update the prior using the likelihood to obtain the posterior distribution.

1.1 Equation

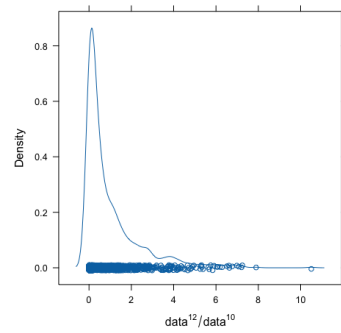
This is the equation for Bayes rule.

$$P(\theta|D) = \frac{P(D|\theta)P(\theta)}{P(D)} = \frac{P(D|\theta)P(\theta)}{\int P(D|\theta)P(\theta)d\theta} \quad (1)$$

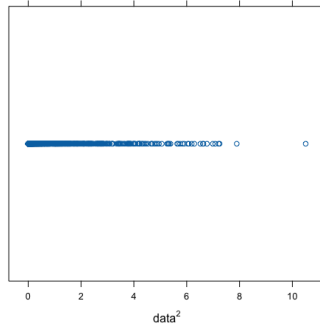
1.2 Visualizations



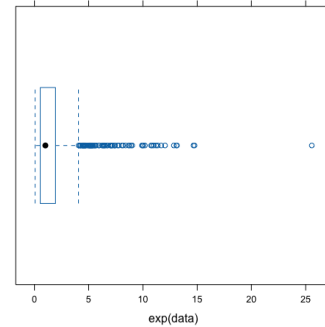
(a) Histogram



(b) Densityplot



(c) Stripplot



(d) Boxplot

Figure 1: Different plots of the same data, sometimes transformed. No particular objective other than it being an exercise.

1.3 Story

The Enchanted Garden and the ~~Luminous~~ Magical Dove

Once, in a land covered by mists and whispers, there lay an enchanting garden hidden behind a great stone wall. No one knew who had built the wall

Table 1: The same data, but now in a table. Only the first nine rows are displayed.

	data	squared1	squared2	exponent
1	-0.56	0.31	0.31	0.57
2	-0.23	0.05	0.05	0.79
3	1.56	2.43	2.43	4.75
4	0.07	0.00	0.00	1.07
5	0.13	0.02	0.02	1.14
6	1.72	2.94	2.94	5.56
7	0.46	0.21	0.21	1.59
8	-1.27	1.60	1.60	0.28
9	-0.69	0.47	0.47	0.50

or why, but one thing was for certain – nobody had ever seen what was behind it.

A little ~~girl named Clara~~ boy named Peter lived in a village nearby. ~~Fueled~~ Fuelled by curiosity and tales of magical creatures, ~~she-he~~ often dreamt of the wonders that the walled garden might hold. One day, unable to resist its lure any longer, ~~she-he~~ decided to find a way in.

As ~~she-he~~ approached the towering stone barrier, ~~she-he~~ noticed a tiny gap just big enough for ~~her-him~~ to peek through. The garden inside was bathed in a shimmering golden light, unlike any ~~she-he~~ had ever seen. To ~~her-his~~ amazement, in the center stood a magnificent tree with leaves that glittered as if they were made of starlight. And resting on one of its branches was a dove, glowing with the same luminous hue.

Before ~~she-he~~ could process this beautiful sight, the dove spoke to ~~her-his~~ in a voice as soft as the wind, "To enter the garden, one must share a pure and selfless desire."

~~Clara, with her~~ Peter, with his heart pounding, whispered ~~her-his~~ wish, "I wish for everyone in my village to be happy and free from suffering."

The massive stone door, seemingly of its own accord, began to open. The luminous dove flew to ~~Clara Peter~~ and rested on ~~her-his~~ shoulder. "Your wish is genuine, and so you may enter," it said.

Inside, the garden was more wondrous than ~~Clara Peter~~ had ever imagined. Flowers sang in soft harmonies, and a gentle breeze carried the sweetest of fragrances. Every step ~~she-he~~ took made the grass shimmer with colors she'd never seen before.

The dove explained that this was an Enchanted Garden, a place where one's purest wishes could come true. But, there was a catch. To make ~~her-his~~ wish a reality, ~~Clara Peter~~ had to plant a seed from the magical tree in ~~her-his~~ village and care for it with unwavering love and dedication.

~~Clara Peter~~ accepted the challenge. With the seed safely tucked in ~~her-his~~ pocket and the dove guiding her, ~~she returned to her~~ he returned to his village.

Years went by, and with ~~Clara Peter~~'s love, the seed grew into a magnificent tree, similar to the one in the Enchanted Garden. With its growth, joy and happiness blossomed in the village like never before.

~~Clara's selfless wish not only transformed her village but also changed her. She became known as the Keeper of Joy, teaching future generations about love,~~

~~compassion, and the magic of selfless wishes.~~

And so, in a village once shadowed by mystery, there stood a tree that bore witness to the pure heart of a ~~girl and her~~ boy and his luminous companion, reminding everyone that magic was always just a wish away.