Gaussian Processes for Time Series

Raphaela Azar and Sbonelo Gumede

July 22, 2025

Introduction

Variable	Feature Name	Feature Description	Unit
NO_2	Nitrogen dioxide	A harmful gas from vehicles and industry.	$\mu g/m^3$
PM_{10}	Particulate matter 10	Small inhalable dust particles.	$\mu g/m^3$
SO_2	Sulphur dioxide	Mainly from burning fossil fuels.	$\mu g/m^3$
Direction	Wind direction	Indicates where the wind is coming from.	Degrees (0–360°)
Speed	Wind speed	How fast the wind is moving.	m/s

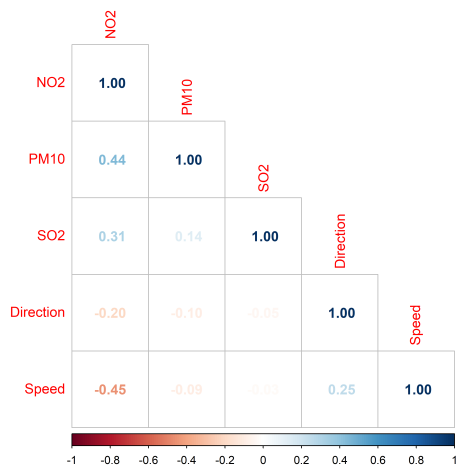Table 1: Description of variables used in the analysis.
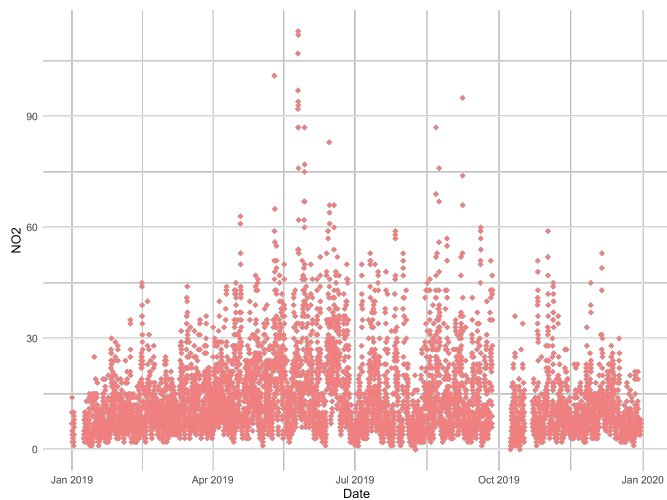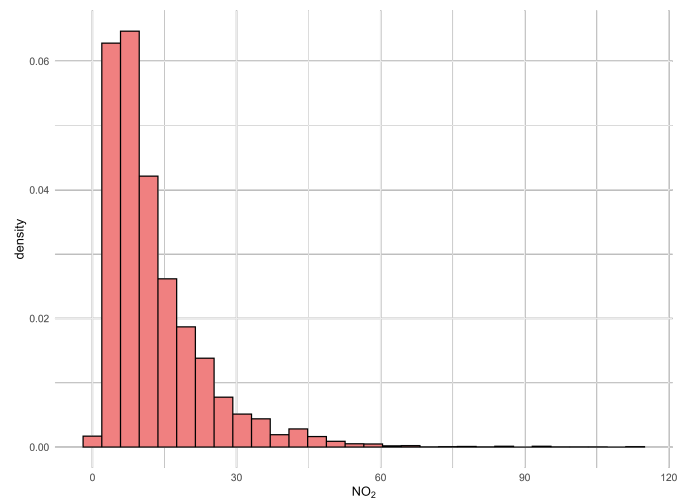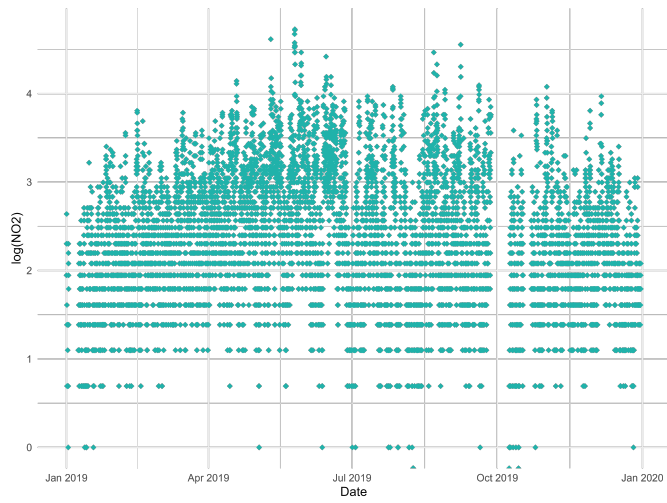
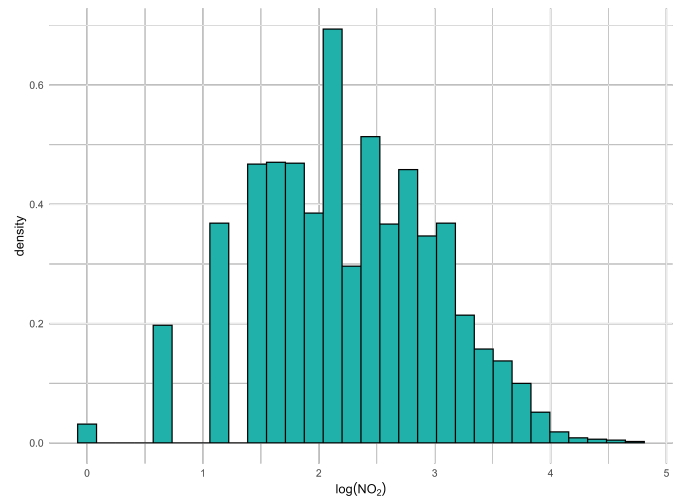## Exploratory Data Analysis

Figure 1: Correlation plot of the variables.

(a) Scatter plot of NO_2.

(b) Histogram of NO_2.

(a) Scatter plot of $log(NO_2)$.

(b) Histogram of $log(NO_2)$.

Let $Y := NO_2$

$Y \not\sim \mathcal{N}(\mu, \sigma)$

$log(Y) \sim \mathcal{N}(\mu, \sigma)$

References

1. https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/nitrogen-dioxide