Investigating Bicycle Usage Patterns

AMSE 2023 Course Project

Muhammetmyrat Yarmatov

M. Sc. in Artificial Intelligence

Haagstraße 17, Erlangen, 91054 – Germany

medyarmatov@gmail.com
muhammetmyrat.yarmatov@fau.de

+49 178 3714629

linkedin.com/in/myarmatov/

Integrating and Pre-processing Datasets

df1

Timestamp	Fahrradbruecke	Fahrradbruecke stadteinwaerts	Fahrradbruecke stadtauswaerts	Symbol Wetter	Temperatur (°C)	Gefühlte Temperatur (°C)	Regen (mm)
2019-01-01 00:00:00	61.0	25.0	36.0	Leicht bewölkt	2	2	0
2019-01-01 01:00:00	100.0	49.0	51.0	Leicht bewölkt	2	2	0
2019-01-01 02:00:00	143.0	73.0	70.0	Leicht bewölkt	2	2	0
2019-01-01 03:00:00	98.0	59.0	39.0	Leicht bewölkt	3	3	0
2019-01-01 04:00:00	68.0	34.0	34.0	Leicht bewölkt	3	2	0

df2

Timestamp	countTo	countFrom	classification
2019-01-01 00:00:00	3	0	Cold
2019-01-01 00:15:00	4	10	Light rain
2019-01-01 00:30:00	8	6	Cold
2019-01-01 00:45:00	10	20	Cold
2019-01-01 01:00:00	12	13	Cold

Pre-processed datasets before integrated

Integrating and Pre-processing Datasets

Integrated dataset with many variables and 15 mins. frequency

Timestamp	Count to	Count from	Weather type	Temperature (°C)	Perceived temperature (°C)	Rain (mm)
2019-01-01 00:00:00	3	0	Cold	2	2	0
2019-01-01 00:15:00	4	10	Light rain	2	2	0
2019-01-01 00:30:00	8	6	Cold	2	2	0
2019-01-01 00:45:00	10	20	Cold	2	2	0
2019-01-01 01:00:00	12	13	Cold	2	2	0

Exploratory Data Analysis

1. **Impact of Weather Conditions on Bicycle Usage:**
   a. How do different weather types (sunny, rainy, cloudy, etc.) affect bicycle counts?
   b. Is there a specific temperature range that correlates with higher bicycle usage?
   c. Does rainfall significantly impact bicycle counts?
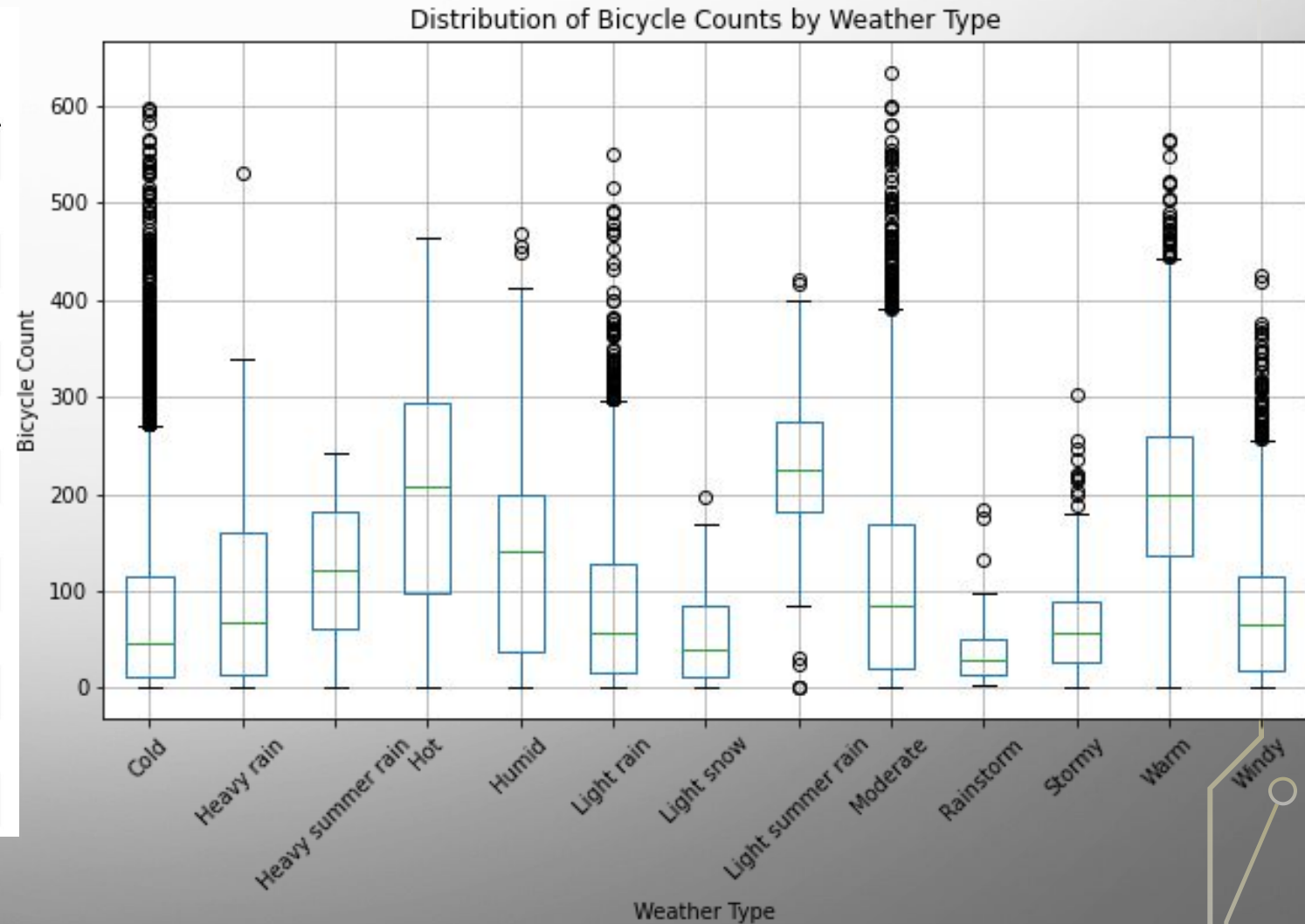
2. **Temporal Patterns in Bicycle Usage:**
   a. Are there any seasonal or monthly variations in bicycle counts?
   b. How does bicycle usage vary between weekdays and weekends?
   c. Are there any distinct peak hours or periods of high bicycle usage throughout the weekdays and weekends?

1. Impact of Weather Conditions on Bicycle Usage:
a. How do different weather types (sunny, rainy, cloudy, etc.) affect bicycle counts?
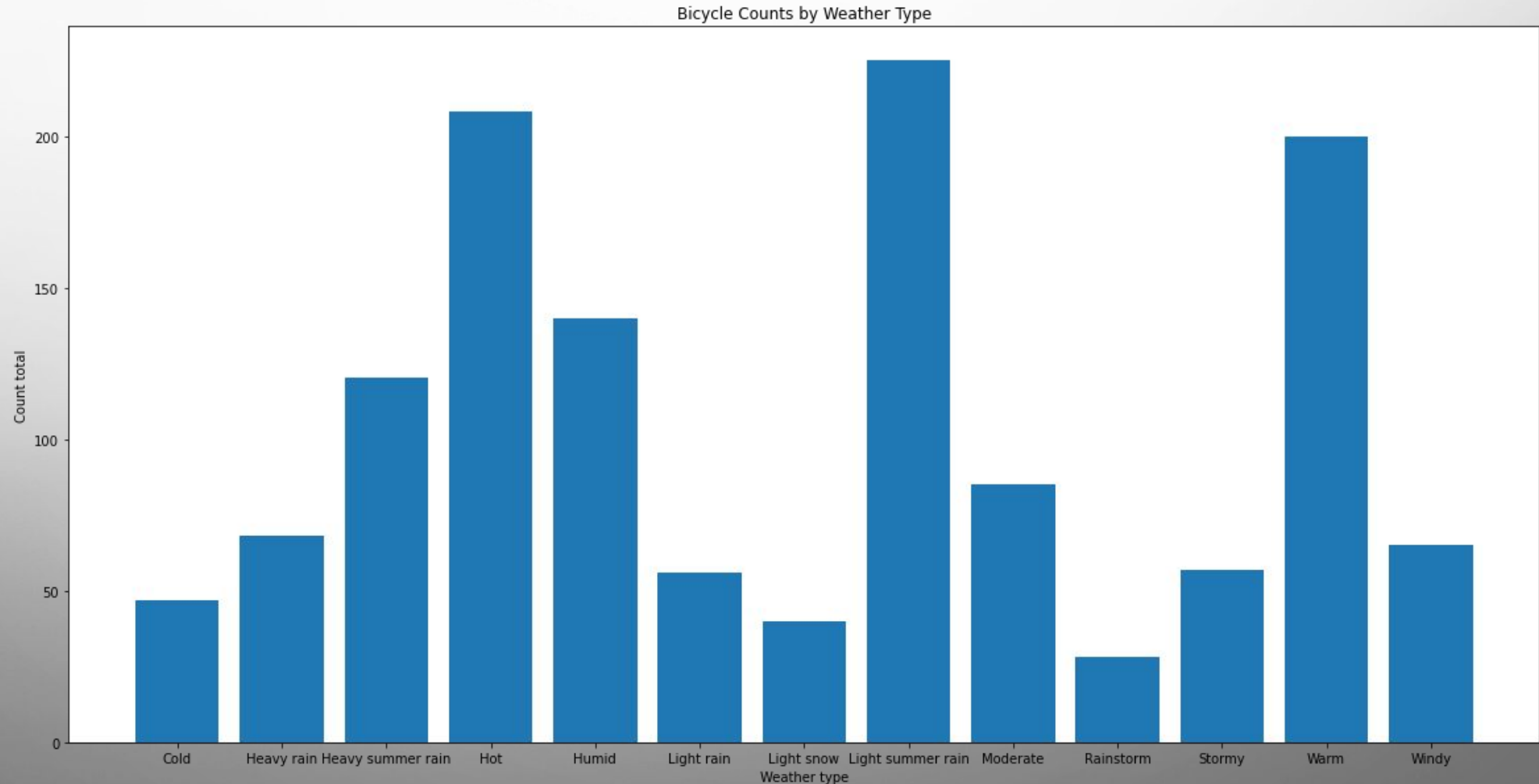
Weather type	mean	median	min	max	std
Cold	74.167514	47.0	0	598	80.036989
Heavy rain	95.698413	68.0	0	531	93.768610
Heavy summer rain	120.500000	120.5	0	241	170.412734
Hot	194.019157	208.0	0	463	127.155279
Humid	137.796380	140.0	0	469	102.877726
Light rain	82.075810	56.0	0	549	82.113440
Light snow	53.341463	40.0	0	197	46.931382
Light summer rain	223.898438	225.0	0	420	81.293174
Moderate	104.856433	85.0	0	634	93.786068
Rainstorm	39.733333	28.0	3	183	40.254531
Stormy	70.103659	57.0	0	303	57.996575
Warm	196.271761	200.0	0	564	98.661005
Windy	79.703340	65.0	0	425	74.104734

Distribution of Bicycle Counts by Weather Type

1. Impact of Weather Conditions on Bicycle Usage:

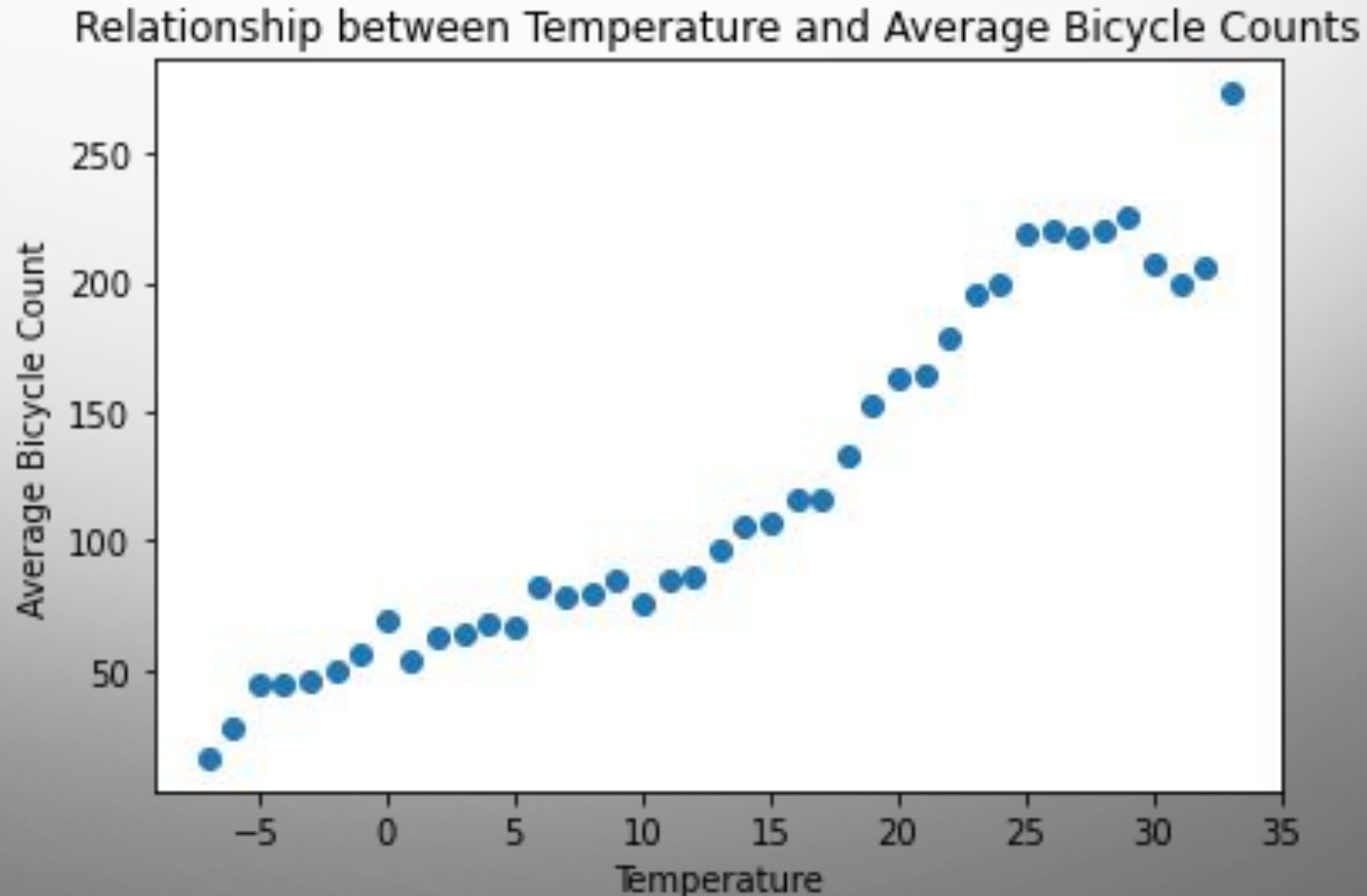a. How do different weather types (sunny, rainy, cloudy, etc.) affect bicycle counts?

Weather types with highest bicycle usage: light summer rain, hot, and warm

Bicycle Counts by Weather Type

1. Impact of Weather Conditions on Bicycle Usage:

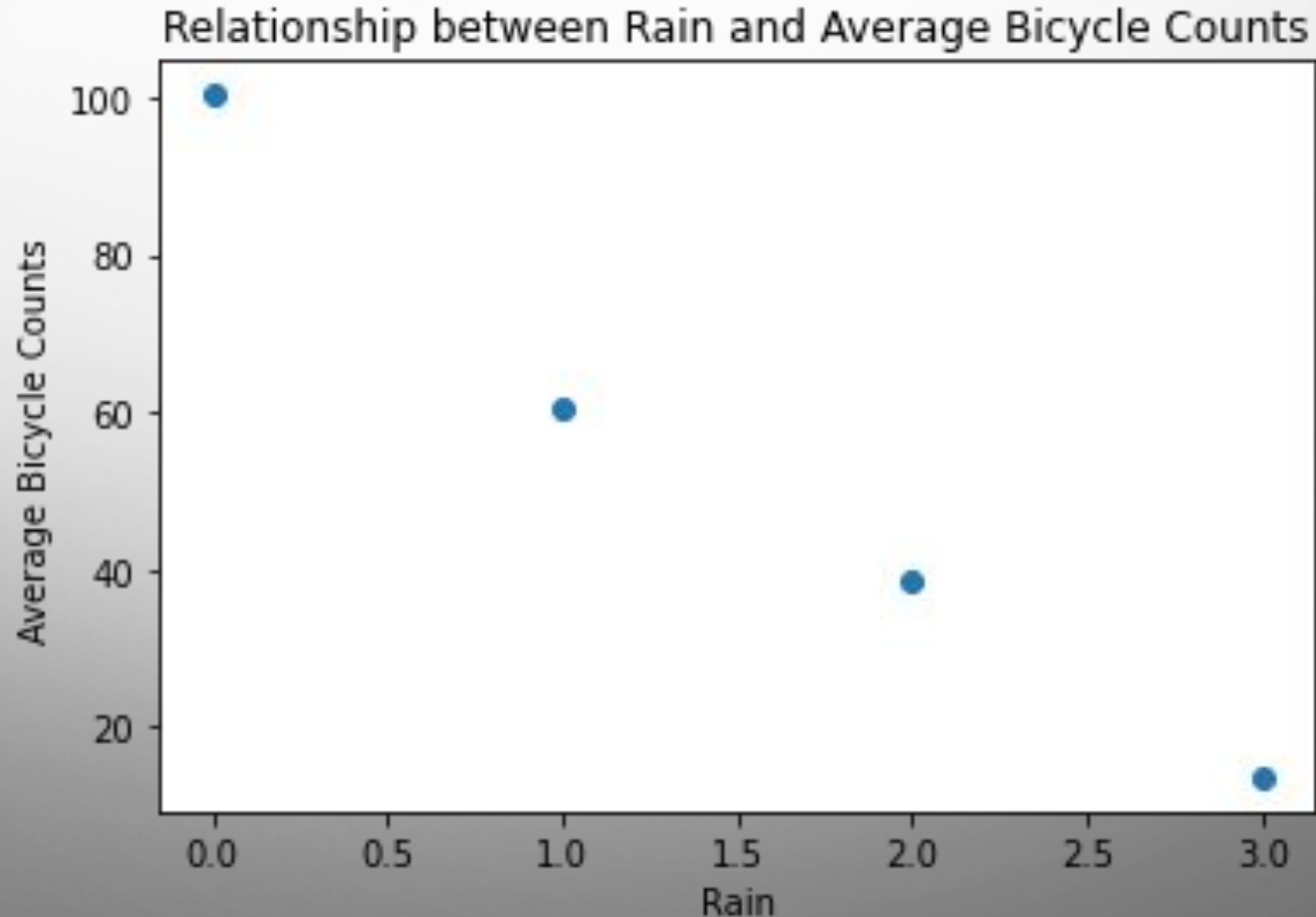b. Is there a specific temperature range that correlates with higher bicycle usage?

Higher temperatures correlate with increased bicycle usage

Relationship between Temperature and Average Bicycle Counts

1. Impact of Weather Conditions on Bicycle Usage:

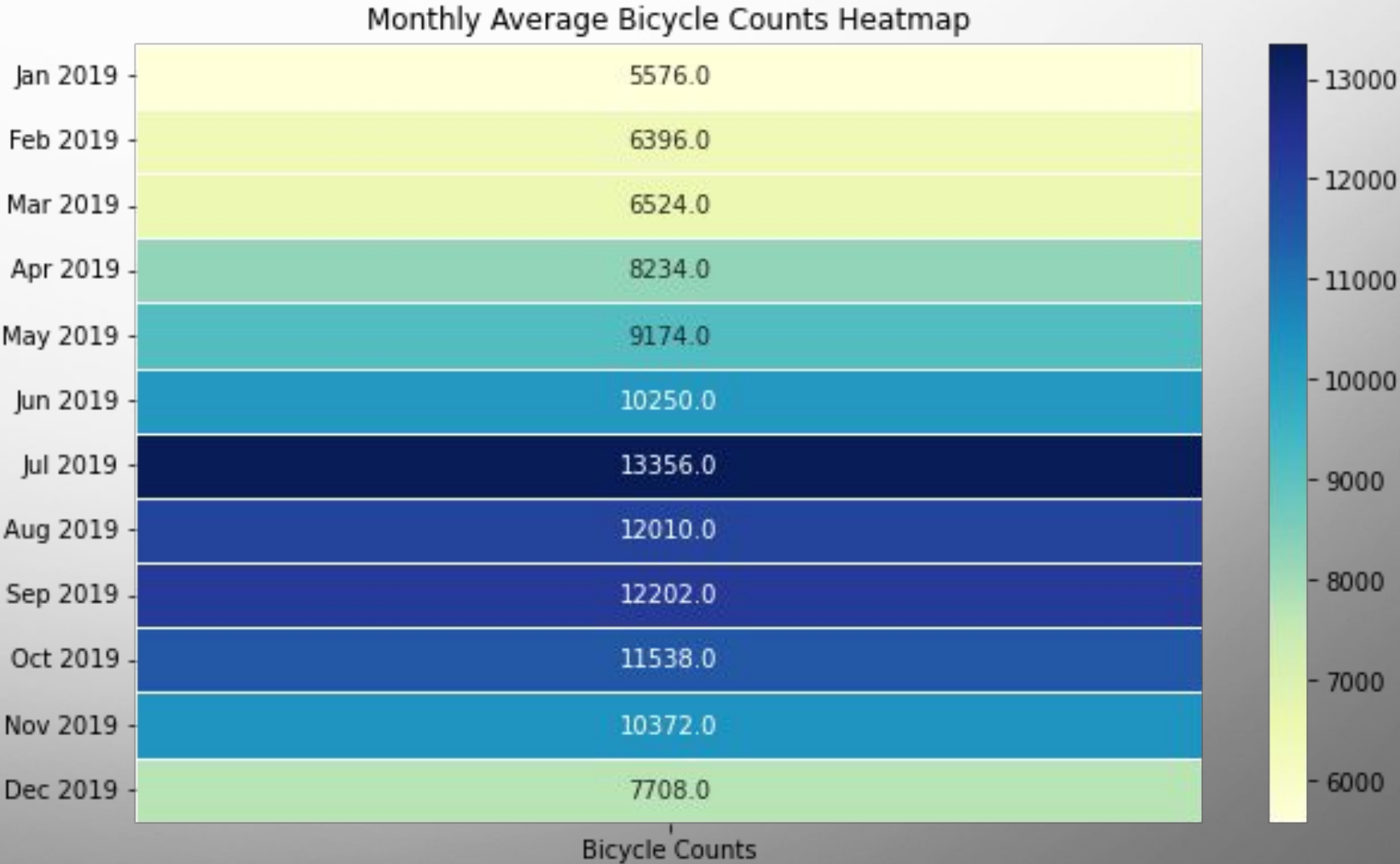c. Does rainfall significantly impact bicycle counts?

Rainfall leads to decreased bicycle counts

2. Temporal Patterns in Bicycle Usage:
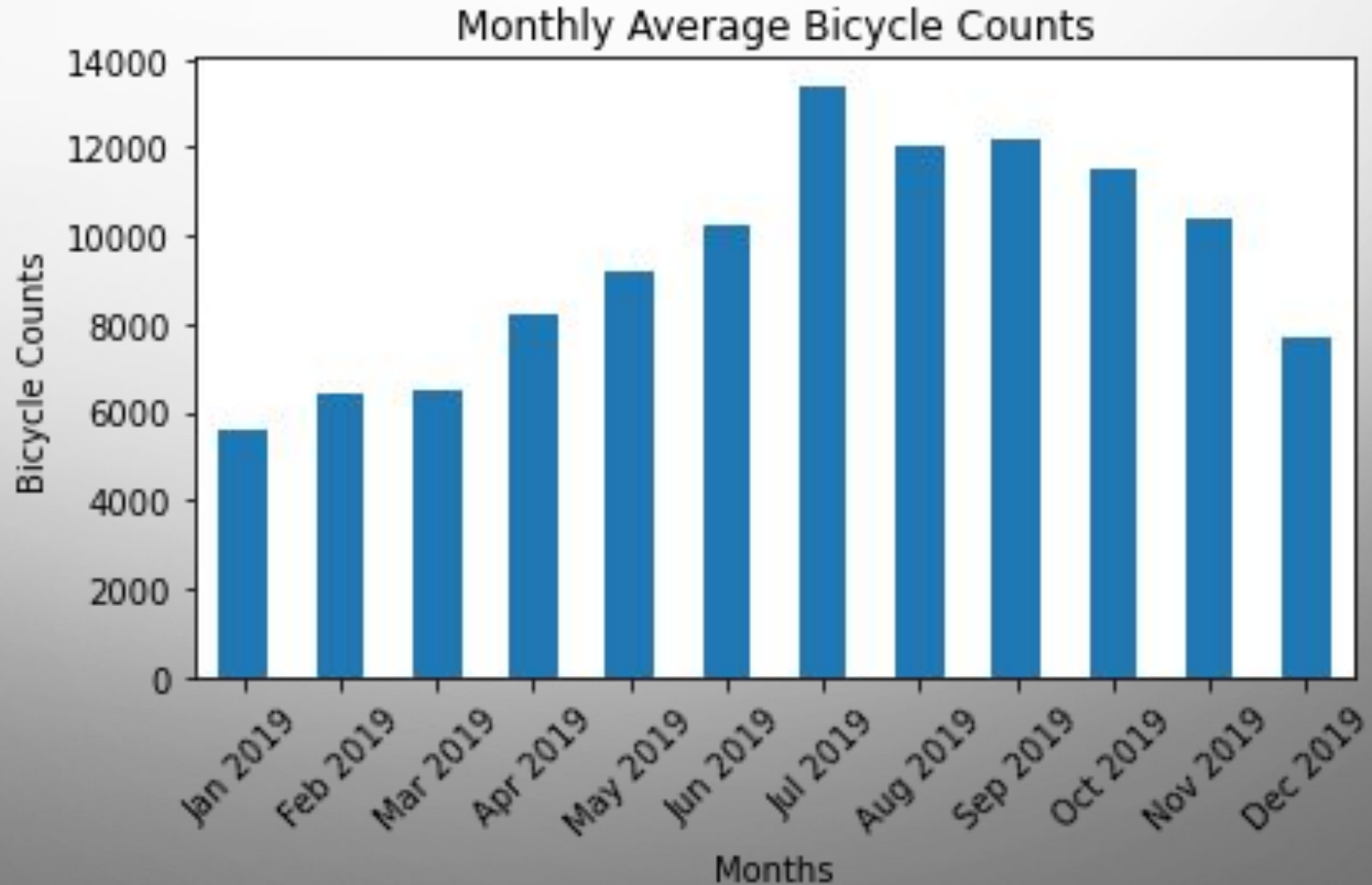### a. Are there any seasonal or monthly variations in bicycle counts?

Bicycle Counts

Month	
Jan 2019	5576
Feb 2019	6396
Mar 2019	6524
Apr 2019	8234
May 2019	9174
Jun 2019	10250
Jul 2019	13356
Aug 2019	12010
Sep 2019	12202
Oct 2019	11538
Nov 2019	10372
Dec 2019	7708

Monthly Average Bicycle Counts Heatmap

Month	Bicycle Counts
Jan 2019	5576.0
Feb 2019	6396.0
Mar 2019	6524.0
Apr 2019	8234.0
May 2019	9174.0
Jun 2019	10250.0
Jul 2019	13356.0
Aug 2019	12010.0
Sep 2019	12202.0
Oct 2019	11538.0
Nov 2019	10372.0
Dec 2019	7708.0

Bicycle Counts

2. Temporal Patterns in Bicycle Usage:
a. Are there any seasonal or monthly variations in bicycle counts?
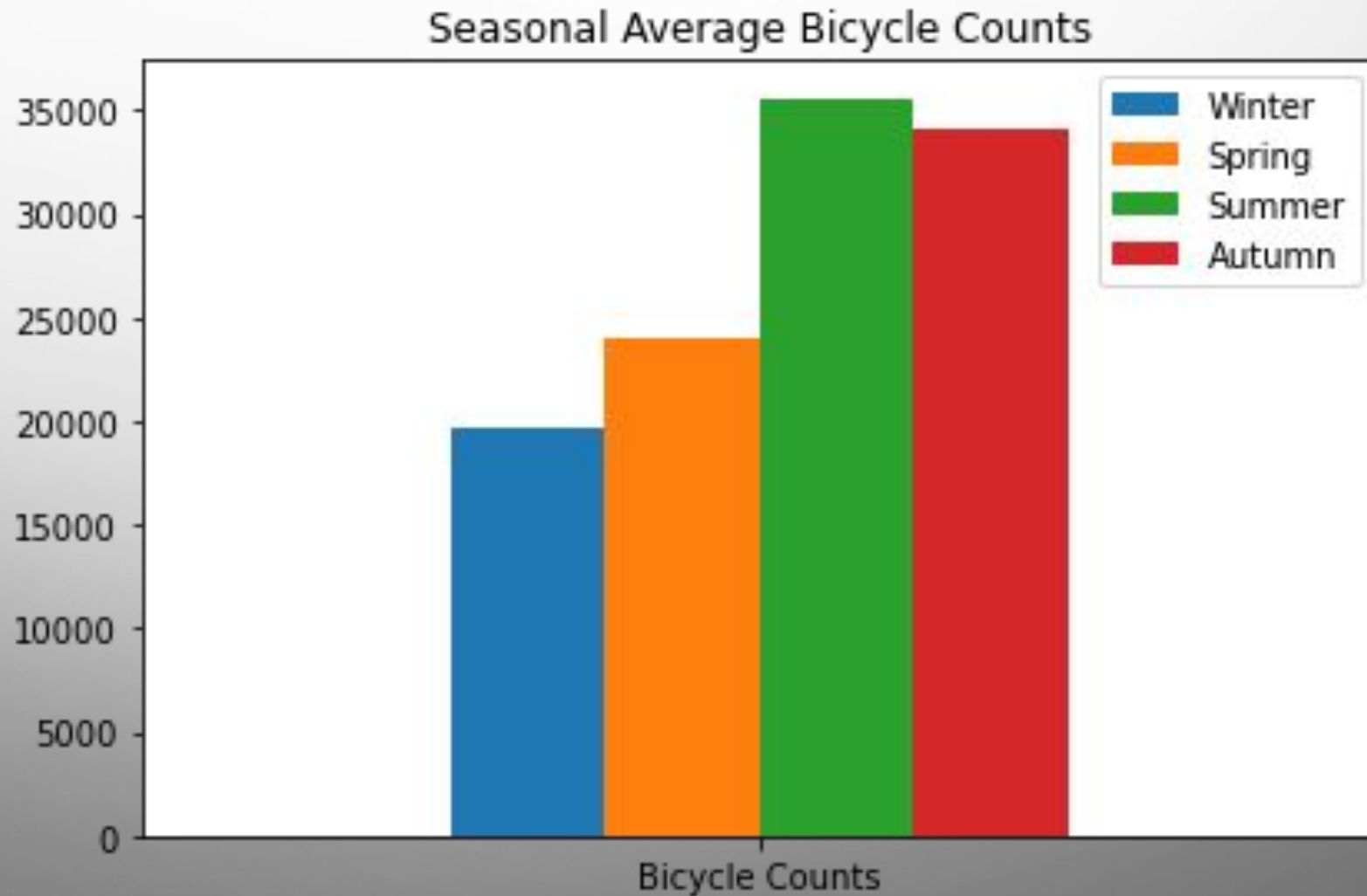
Peak bicycle usage occurs in July, August, and September

2. Temporal Patterns in Bicycle Usage:

a. Are there any seasonal or monthly variations in bicycle counts?

The order of bicycle usage by season: Summer, Autumn, Spring, Winter.

2. Temporal Patterns in Bicycle Usage:

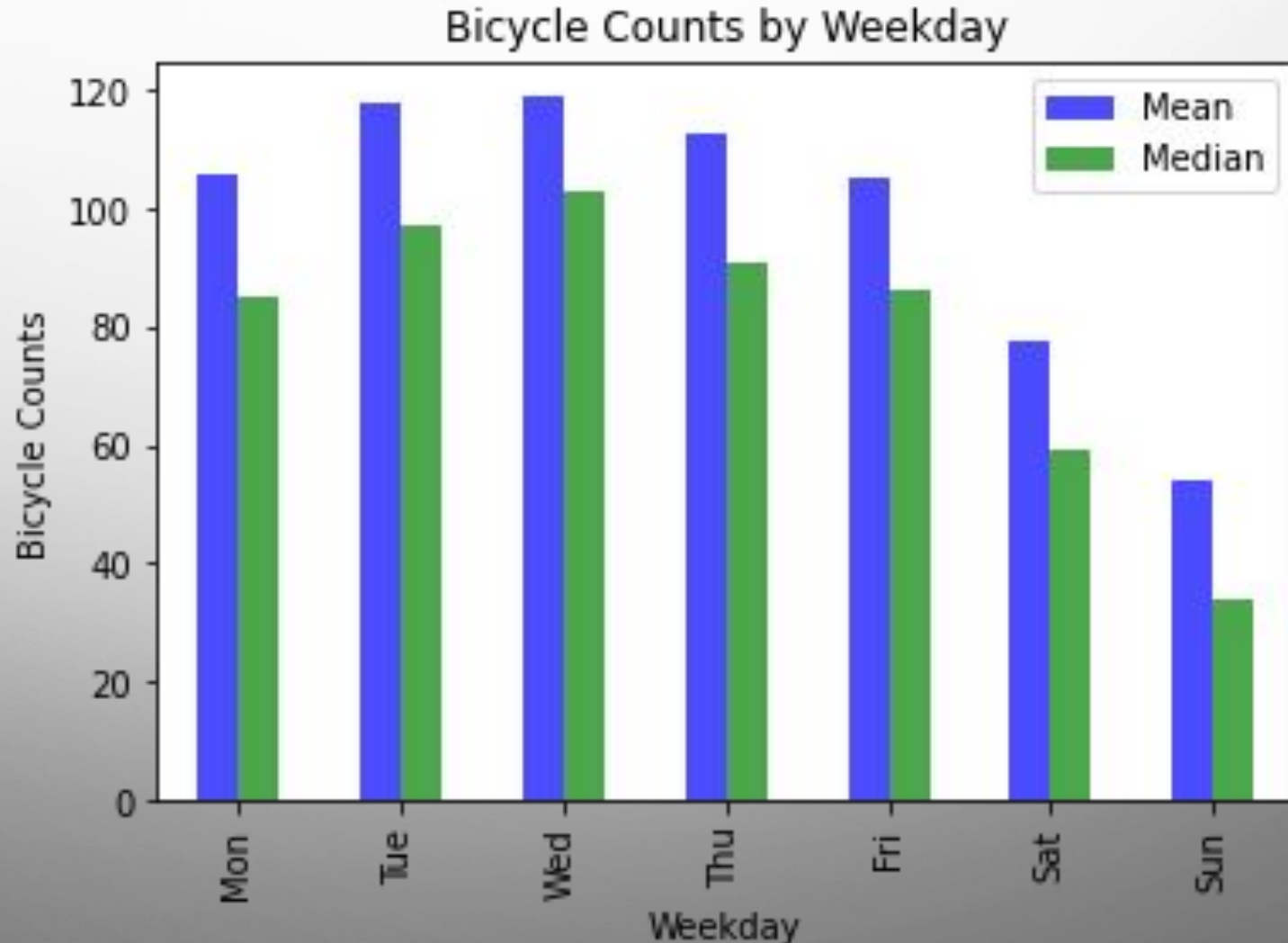b. How does bicycle usage vary between weekdays and weekends?

Weekdays have higher bicycle usage compared to weekends

	mean	std	min	25%	50%	75%	max
Monday	105.502003	99.473523	0.0	13.0	85.0	171.0	562.0
Tuesday	118.040857	108.078964	0.0	16.0	97.0	191.0	595.0
Wednesday	119.005208	105.092921	0.0	20.0	103.0	185.0	634.0
Thursday	112.602764	101.130967	0.0	22.0	91.0	178.0	598.0
Friday	105.053486	91.961606	0.0	21.0	86.0	168.0	564.0
Saturday	77.769231	69.684250	0.0	18.0	59.0	122.0	359.0
Sunday	53.846632	55.439082	0.0	13.0	34.0	77.0	300.0

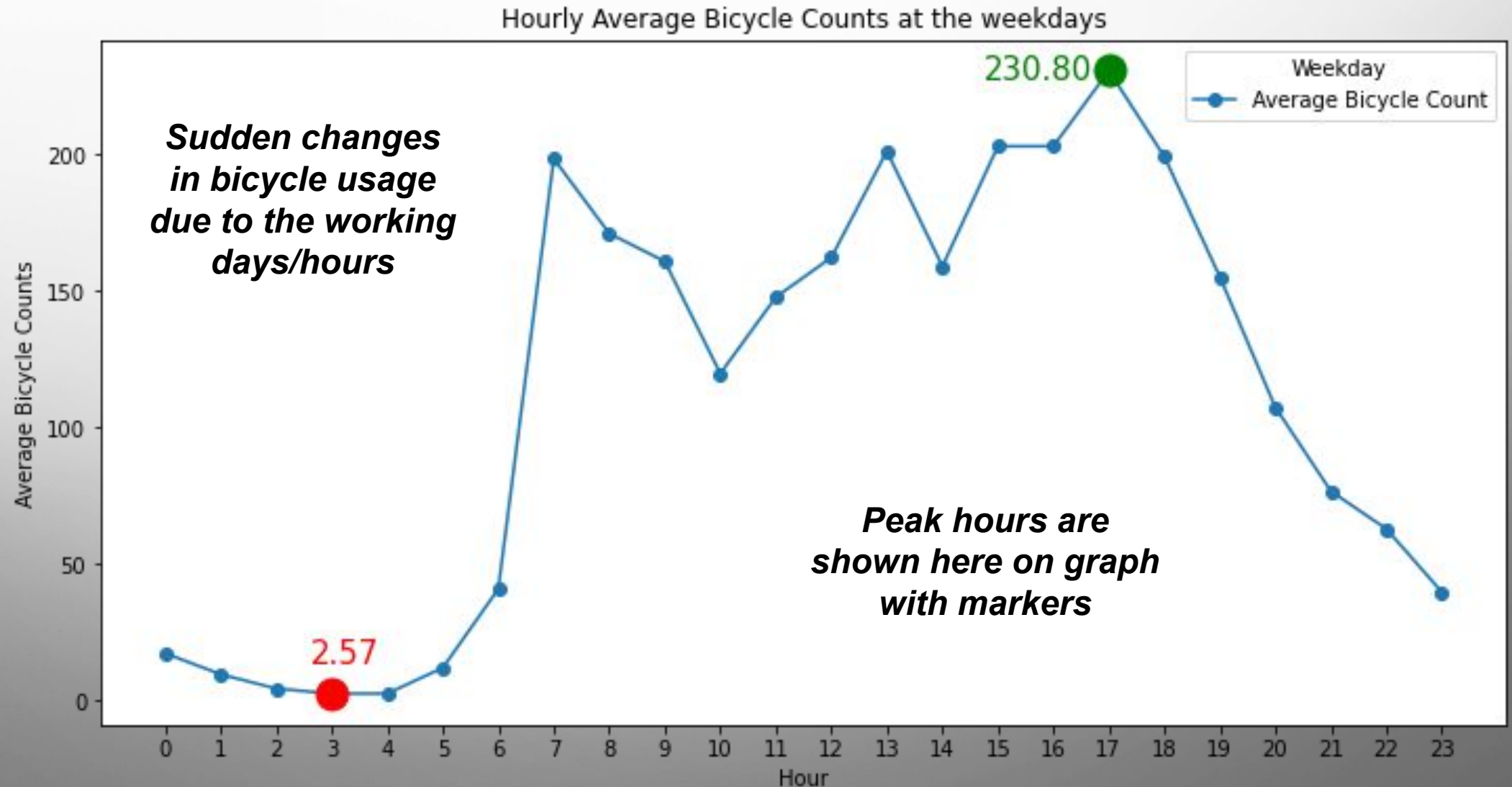## 2. Temporal Patterns in Bicycle Usage:

b. How does bicycle usage vary between weekdays and weekends?

Mean and Media stats show that highest bicycle usage days are Wednesday, Tuesday, and Thursday respectively.
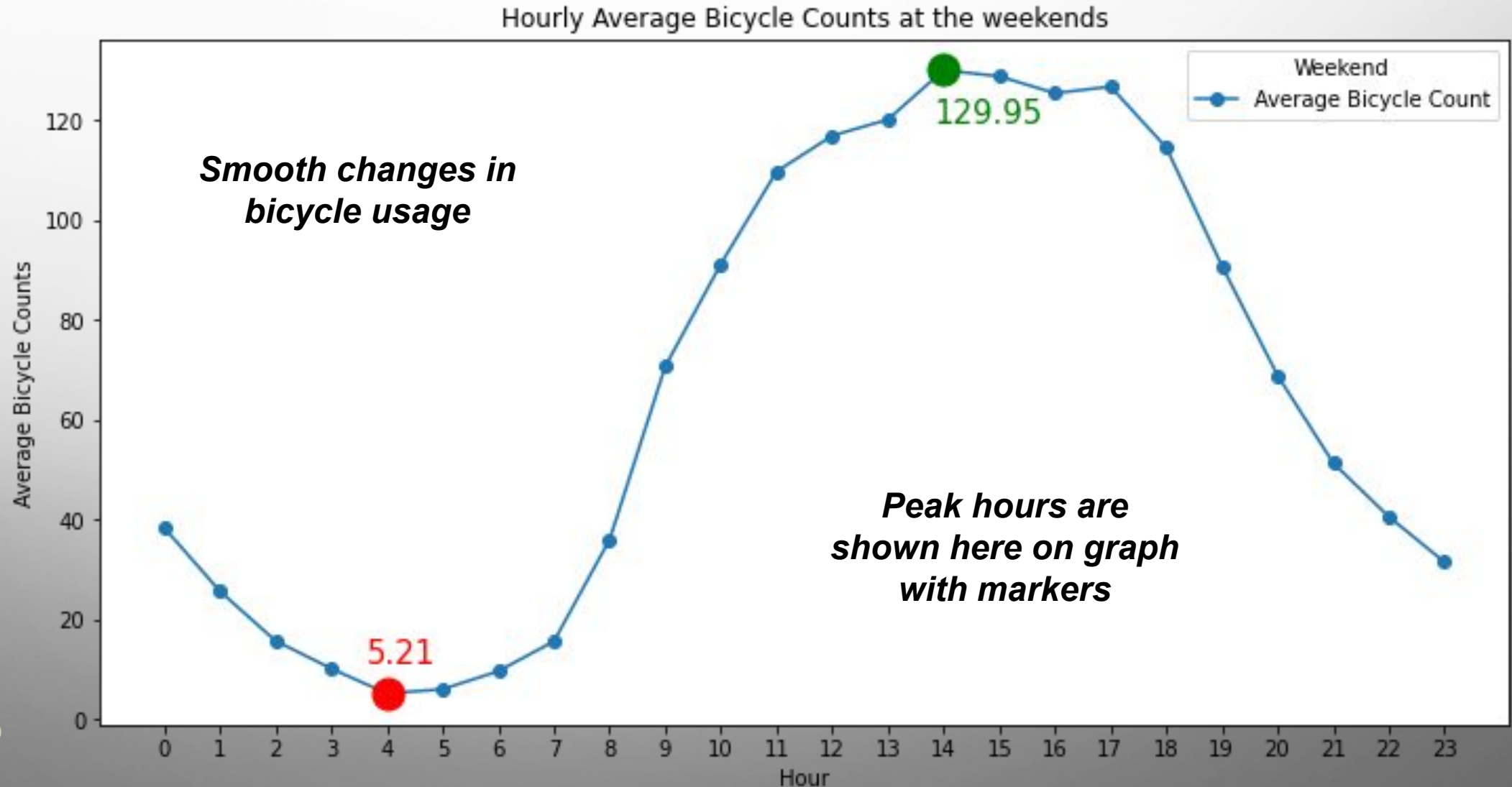
2. Temporal Patterns in Bicycle Usage:
c. Are there any distinct peak hours or periods of high bicycle usage throughout the weekdays and weekends?

Hourly Average Bicycle Counts at the weekdays

2. Temporal Patterns in Bicycle Usage:
c. Are there any distinct peak hours or periods of high bicycle usage throughout the weekdays and weekends?

Hourly Average Bicycle Counts at the weekends

THANK YOU!

MUHAMMETMYRAT YARMATOV

🏠 *Haagstraße 17, Erlangen, 91054 – Germany*

✉️ *medyarmatov@gmail.com*
muhammetmyrat.yarmatov@fau.de

📞 *+49 178 3714629*

in *linkedin.com/in/myarmatov/*