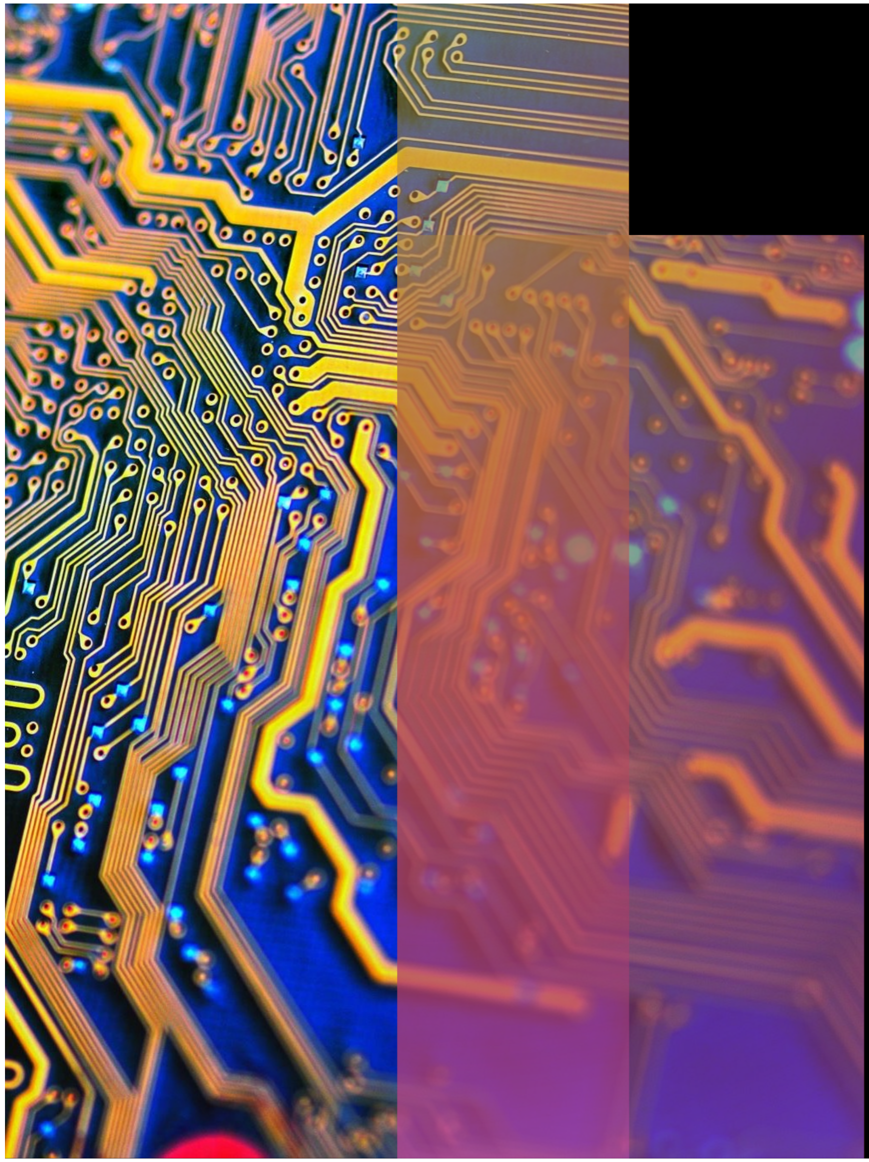


Analysis of GPS receiver information

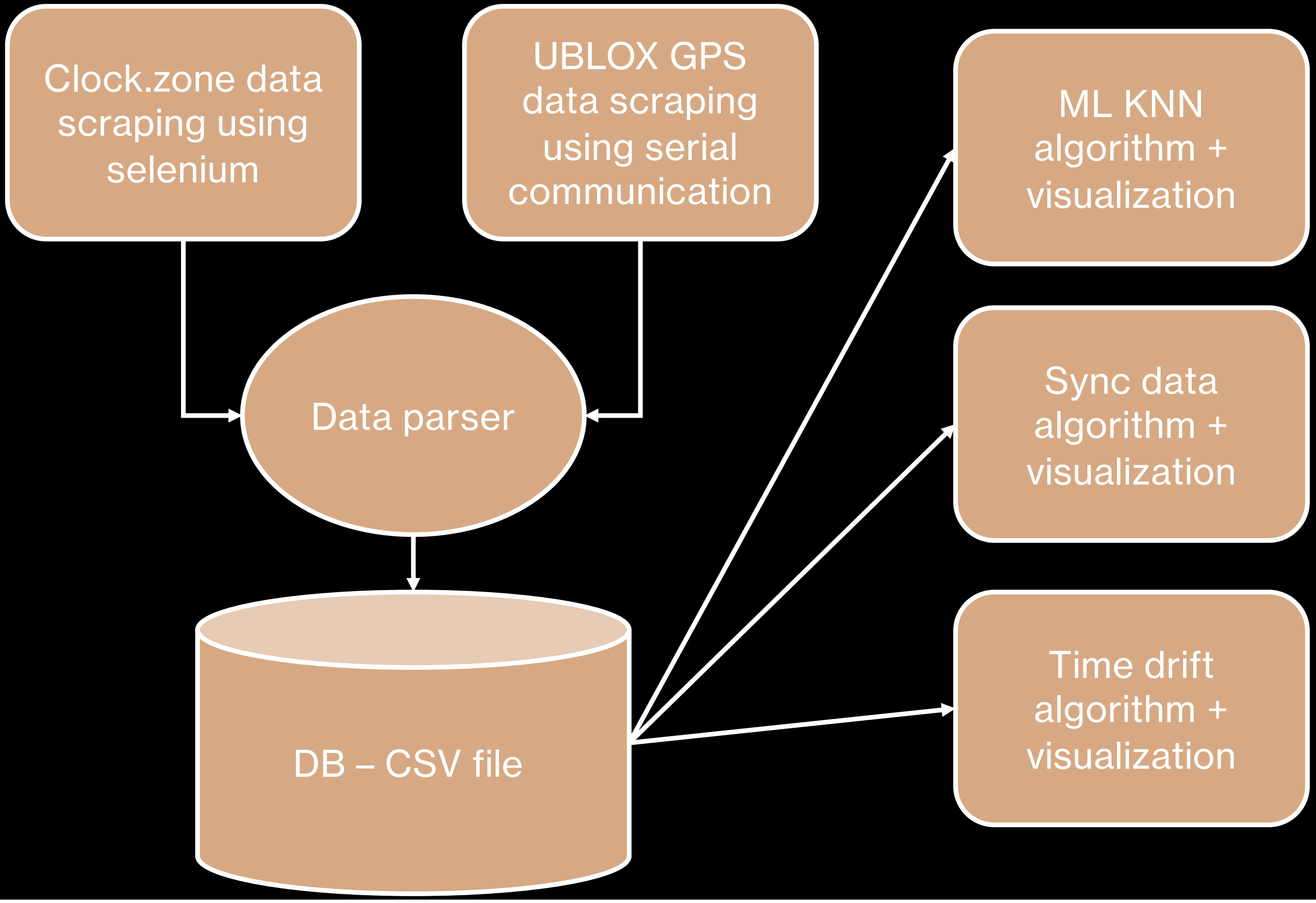
Resources

https://clock.zone/- universal clock time

https://content.u-blox.com/sites/default/files/NEO-M8-FW3_DataSheet_UBX-15031086.pdf – UBLOX GPS receiver datasheet

Real-time data reading

Working method


Clock.zone data scraping using selenium
UBLOX GPS data scraping using serial communication
Data parser
DB – CSV file
ML KNN algorithm + visualization
Sync data algorithm + visualization
Time drift algorithm + visualization

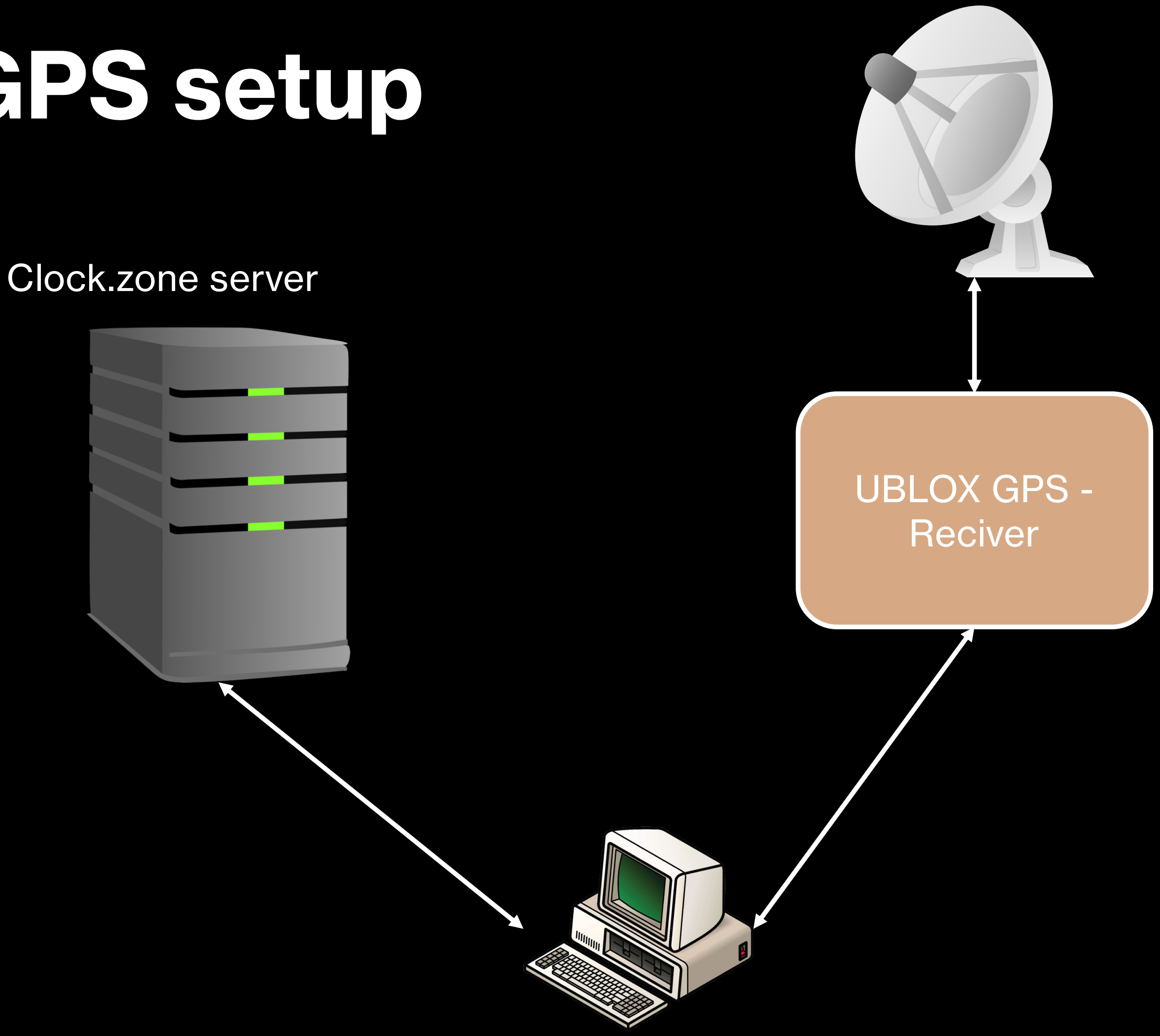
Clock.zone Web scraping

```
from selenium import webdriver
from selenium.webdriver.common.by import By
from selenium.webdriver.support.ui import WebDriverWait
from selenium.webdriver.support import expected_conditions as EC
```

Clock.zone Web scraping

```
with webdriver.Chrome() as driver:
    try:
        remove_file('test.csv')
        driver.get(website_URL)

        clock_element = WebDriverWait(driver,
        1).until(EC.visibility_of_element_located((By.ID, 'MyClockDisplay')))
        clock_stats_element = WebDriverWait(driver,
        1).until(EC.visibility_of_element_located((By.CLASS_NAME, 'clock-stats')))

        while True:
                current_time = datetime.now()
                web_timestamp = parsing_timestamp(clock_element)
                sync_precision = parsing_sync_precision(clock_stats_element)
                write_to_csv("test.csv", current_time, web_timestamp,sync_precision)
                time.sleep(0.5)

    except KeyboardInterrupt:
    pass
```

GPS setup



Setup

UBLOX GPS data scraping - NMEA messages data

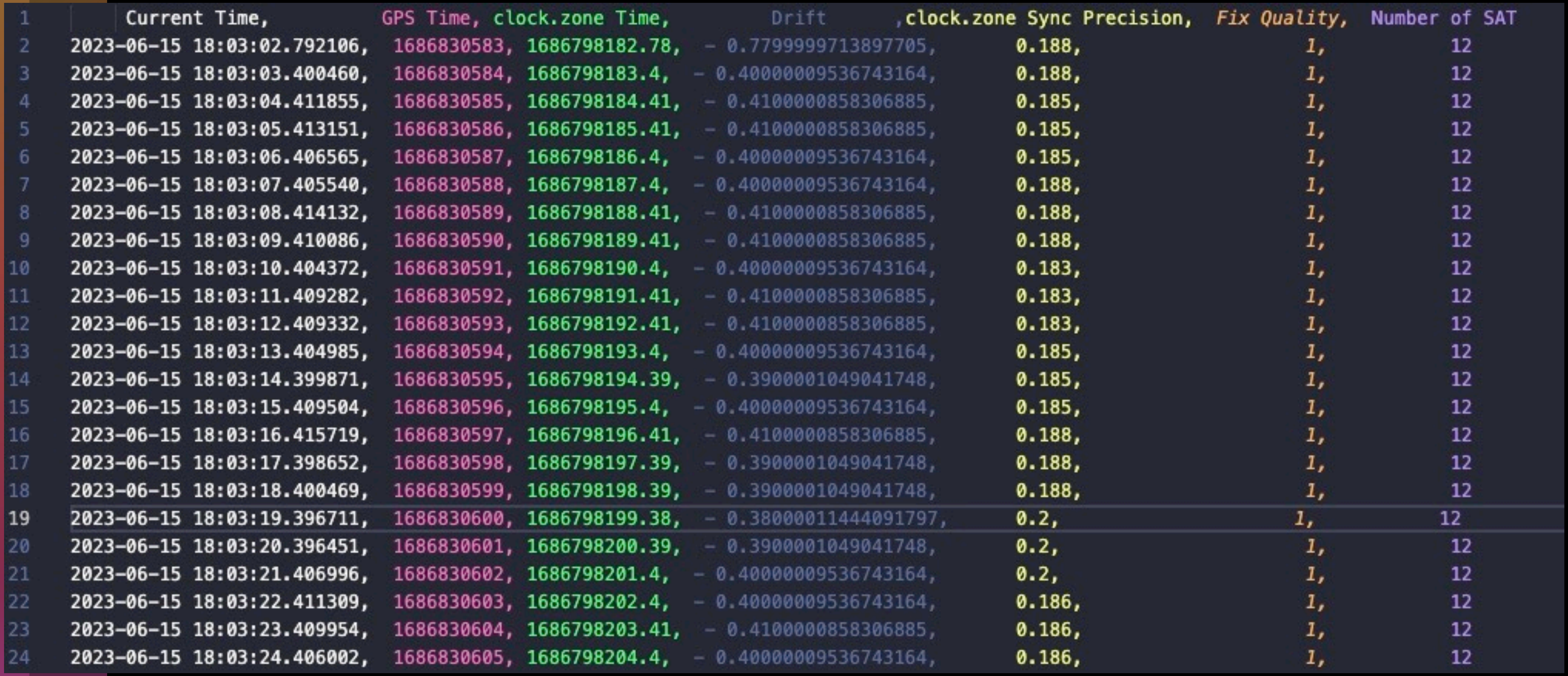
```
$GNRMC ,122642.00 ,A ,3151.39315 ,N ,03443.70047 ,E ,0.125 , ,010623 , , ,A ,V*1A

$GNGGA ,122642.00 ,3151.39315 ,N ,03443.70047 ,E ,1 ,09 ,1.25 ,39.1 ,M ,17.1 ,M , ,*7F
```

UBLOX GPS data scraping

```python
def get_all_ublox_data():
    baudrate = 9600
    serial_port = serial.Serial("/dev/tty.usbmodem112401", baudrate, timeout=1)
    serial_port.isOpen()

    output=''
    for i in range(3):
        ubr = serial_port.readline().decode().strip()
        output+= ubr + '\n'


    timestamp = None
    number_of_sat = None
    fix_quality = None

    for line in output.splitlines():
        splited_line = line.split(',')
        if splited_line[0] == '$GNRMC’:
                timestamp = splited_line[1]
        if splited_line[0] == '$GNGGA’:
                number_of_sat = splited_line[7]
                fix_quality = splited_line[6]

    return parse_to_UNIX(timestamp) ,fix_quality,number_of_sat
```

Simulate GNSS block

Data

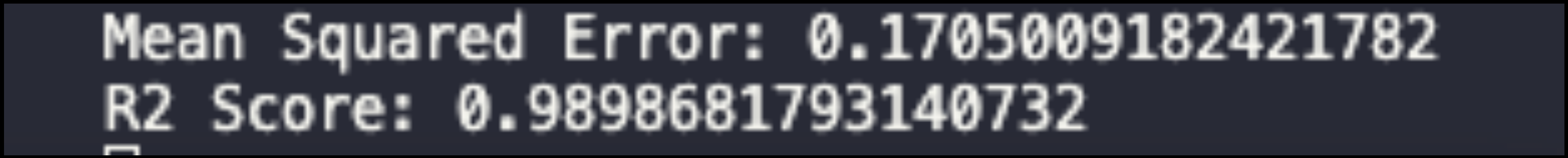


```
     Current Time,          GPS Time, clock.zone Time,          Drift       ,clock.zone Sync Precision,  Fix Quality,  Number of SAT
2023-06-15 18:03:02.792106,  1686830583, 1686798182.78,  - 0.7799999713897705,       0.188,                 1,          12
2023-06-15 18:03:03.400460,  1686830584, 1686798183.4,  - 0.40000009536743164,       0.188,                 1,          12
2023-06-15 18:03:04.411855,  1686830585, 1686798184.41,  - 0.4100000858306885,       0.185,                 1,          12
2023-06-15 18:03:05.413151,  1686830586, 1686798185.41,  - 0.4100000858306885,       0.185,                 1,          12
2023-06-15 18:03:06.406565,  1686830587, 1686798186.4,  - 0.40000009536743164,       0.185,                 1,          12
2023-06-15 18:03:07.405540,  1686830588, 1686798187.4,  - 0.40000009536743164,       0.188,                 1,          12
2023-06-15 18:03:08.414132,  1686830589, 1686798188.41,  - 0.4100000858306885,       0.188,                 1,          12
2023-06-15 18:03:09.410086,  1686830590, 1686798189.41,  - 0.4100000858306885,       0.188,                 1,          12
2023-06-15 18:03:10.404372,  1686830591, 1686798190.4,  - 0.40000009536743164,       0.183,                 1,          12
2023-06-15 18:03:11.409282,  1686830592, 1686798191.41,  - 0.4100000858306885,       0.183,                 1,          12
2023-06-15 18:03:12.409332,  1686830593, 1686798192.41,  - 0.4100000858306885,       0.183,                 1,          12
2023-06-15 18:03:13.404985,  1686830594, 1686798193.4,  - 0.40000009536743164,       0.185,                 1,          12
2023-06-15 18:03:14.399871,  1686830595, 1686798194.39,  - 0.3900001049041748,       0.185,                 1,          12
2023-06-15 18:03:15.409504,  1686830596, 1686798195.4,  - 0.40000009536743164,       0.185,                 1,          12
2023-06-15 18:03:16.415719,  1686830597, 1686798196.41,  - 0.4100000858306885,       0.188,                 1,          12
2023-06-15 18:03:17.398652,  1686830598, 1686798197.39,  - 0.3900001049041748,       0.188,                 1,          12
2023-06-15 18:03:18.400469,  1686830599, 1686798198.39,  - 0.3900001049041748,       0.188,                 1,          12
2023-06-15 18:03:19.396711,  1686830600, 1686798199.38,  - 0.38000011444091797,      0.2,                  1,          12
2023-06-15 18:03:20.396451,  1686830601, 1686798200.39,  - 0.3900001049041748,       0.2,                   1,          12
2023-06-15 18:03:21.406996,  1686830602, 1686798201.4,  - 0.40000009536743164,       0.2,                   1,          12
2023-06-15 18:03:22.411309,  1686830603, 1686798202.4,  - 0.40000009536743164,       0.186,                 1,          12
2023-06-15 18:03:23.409954,  1686830604, 1686798203.41,  - 0.4100000858306885,       0.186,                 1,          12
2023-06-15 18:03:24.406002,  1686830605, 1686798204.4,  - 0.40000009536743164,       0.186,                 1,          12
```

KNN - machine learning method

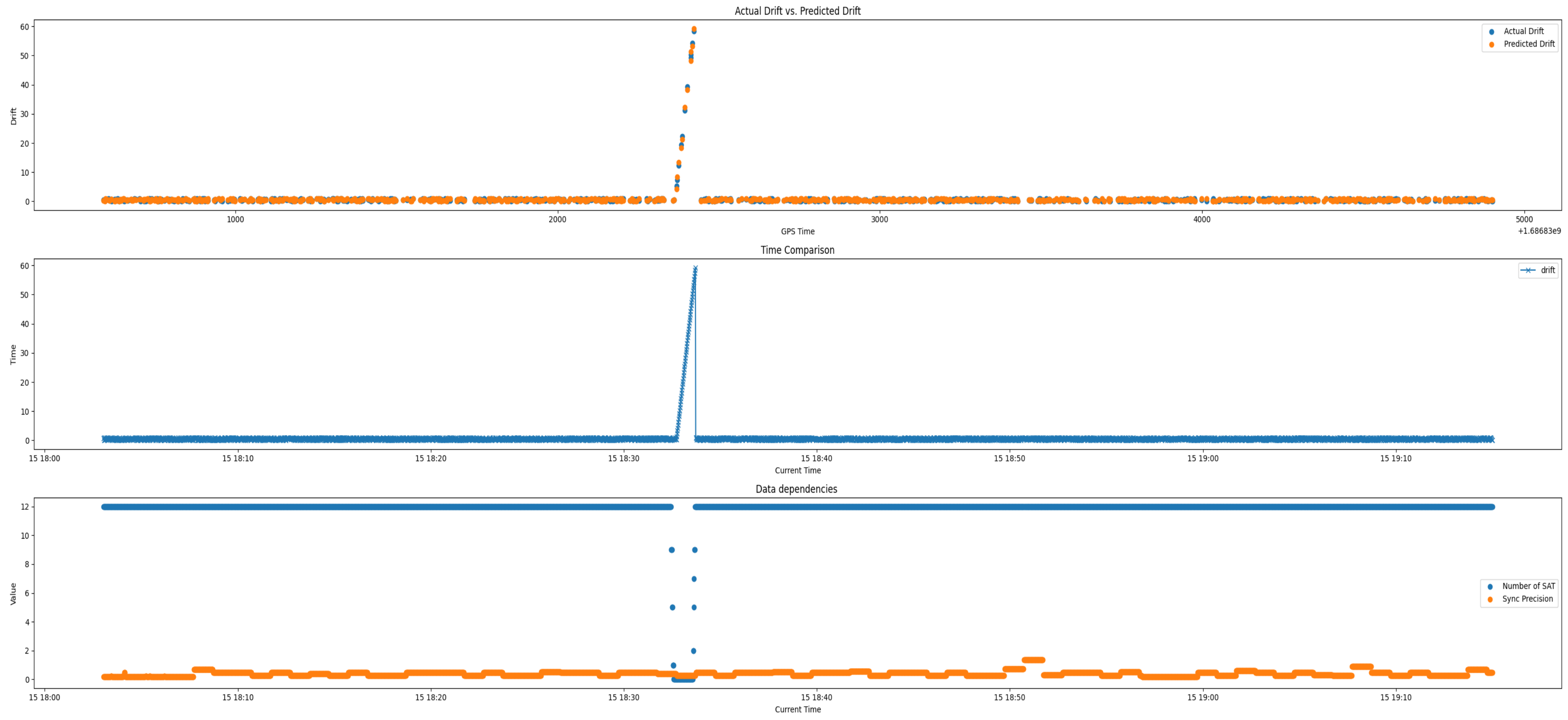
- The machine learning method used in our code is K-Nearest Neighbors (KNN) regression.
- In this case, it is applied for regression to predict the "Drift" variable based on the features "GPS Time" and "clock.zone Time".
- To evaluate the performance of the model, the mean squared error (MSE) and R-squared score (R2) are calculated. MSE measures the average squared difference between the predicted and actual values, with lower values indicating better performance. R2 score measures the proportion of variance in the target variable explained by the model, with higher values indicating a better fit.

KNN accuracy values



```
Mean Squared Error: 0.1705009182421782
R2 Score: 0.9898681793140732
```

EDA


Actual Drift vs. Predicted Drift
Drift
GPS Time
+1.68683e9
Actual Drift
Predicted Drift
0
10
20
30
40
50
60
1000
2000
3000
4000
5000
Time Comparison
Time
Current Time
drift
15 18:00
15 18:10
15 18:20
15 18:30
15 18:40
15 18:50
15 19:00
15 19:10
Data dependencies
Value
Current Time
Number of SAT
Sync Precision
0
2
4
6
8
10
12

Summary and insights

Thank you!