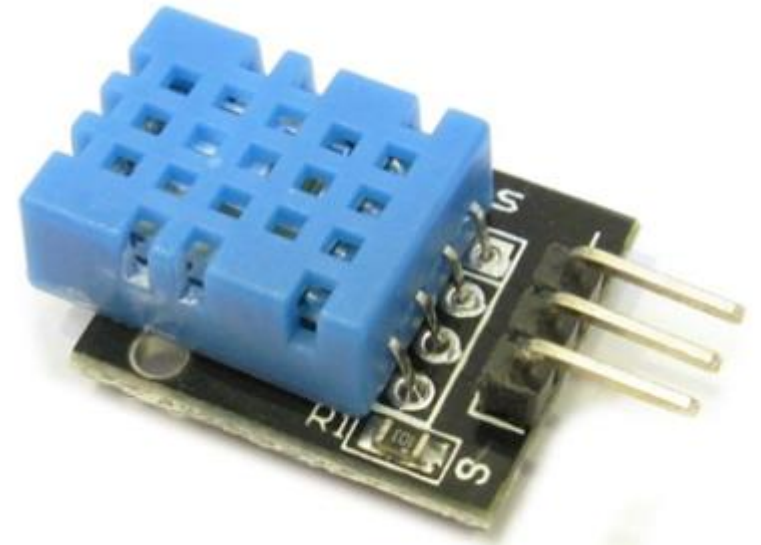


# 온습도 센서 실험

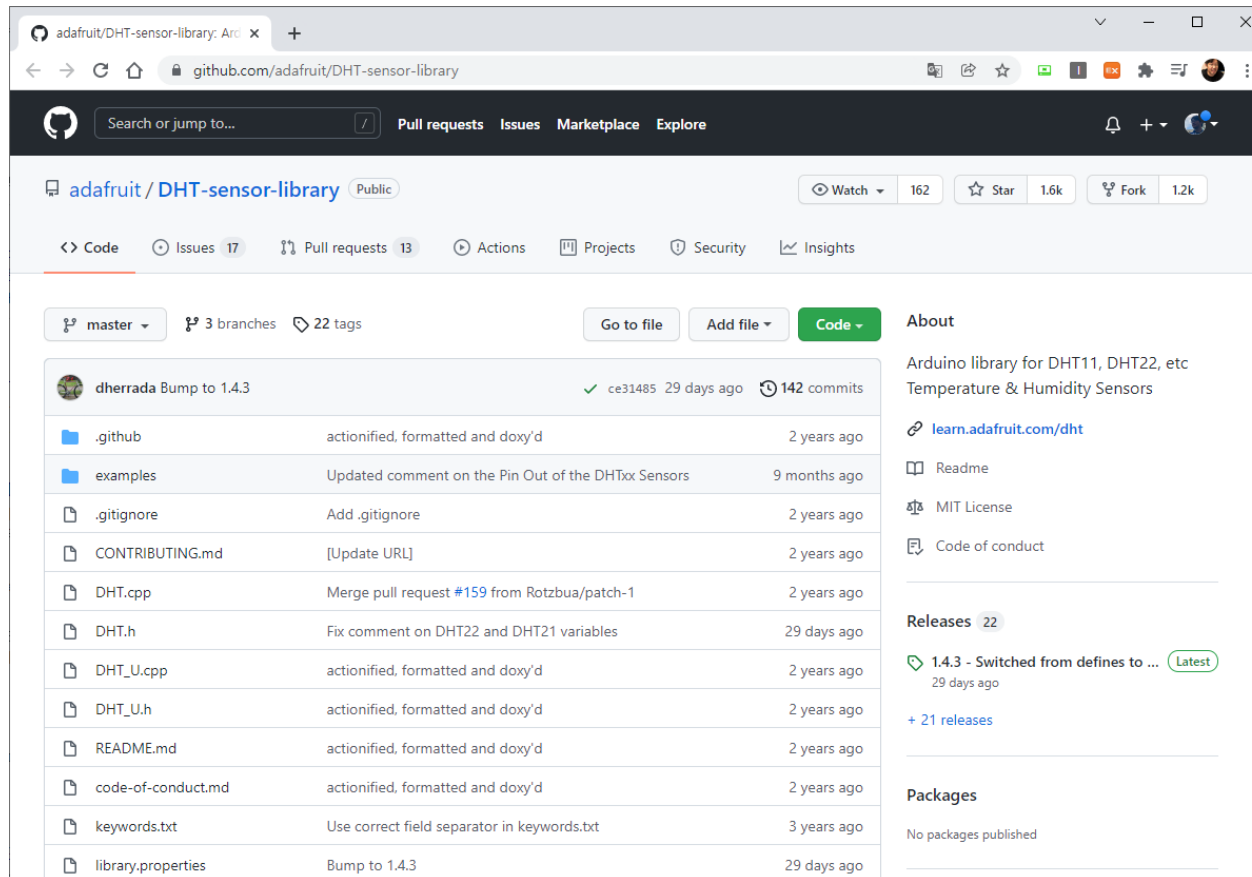
# DHT11

- 동작 전압 (Power) 3~5 V
- 온도 측정 범위 (Temperature range) 0 ~ 50 °C ( $\pm 2$  °C)
- 습도 측정 범위 (Humidity range) 20 ~ 80 % ( $\pm 5$  %)
- 최대소비전력 (Max. current) 2.5 mA
- 데이터 주기 (sampling rate) 1 Hz



# DHT11 라이브러리 사용

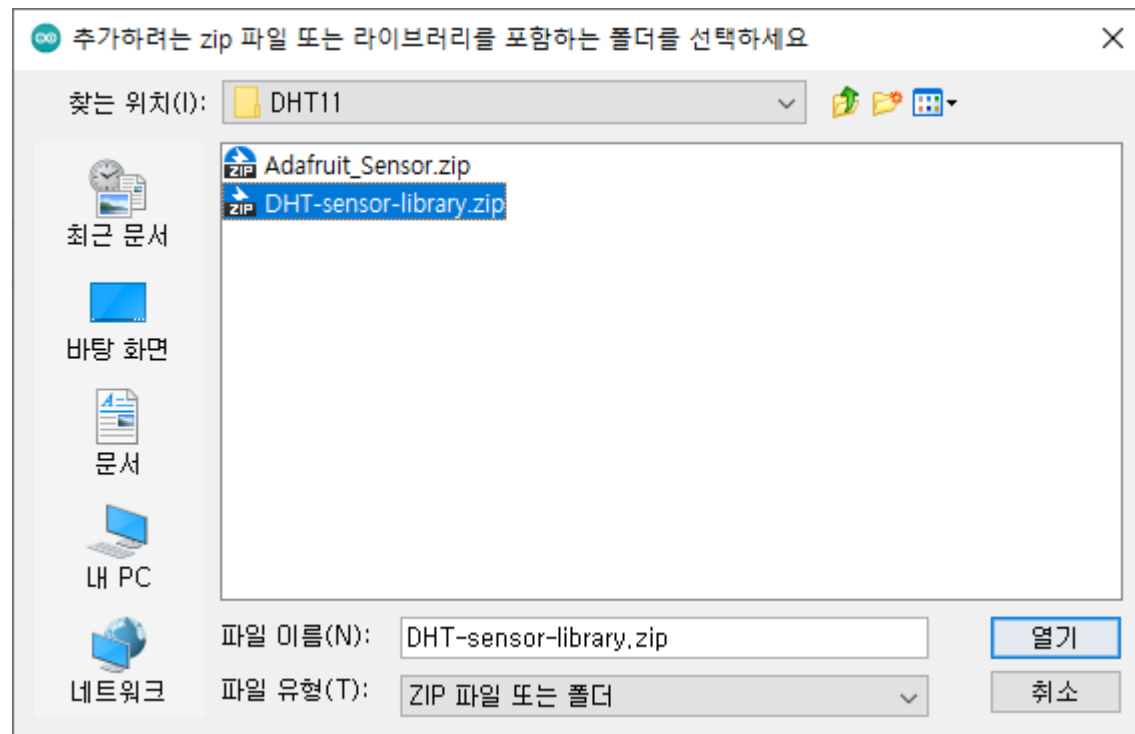
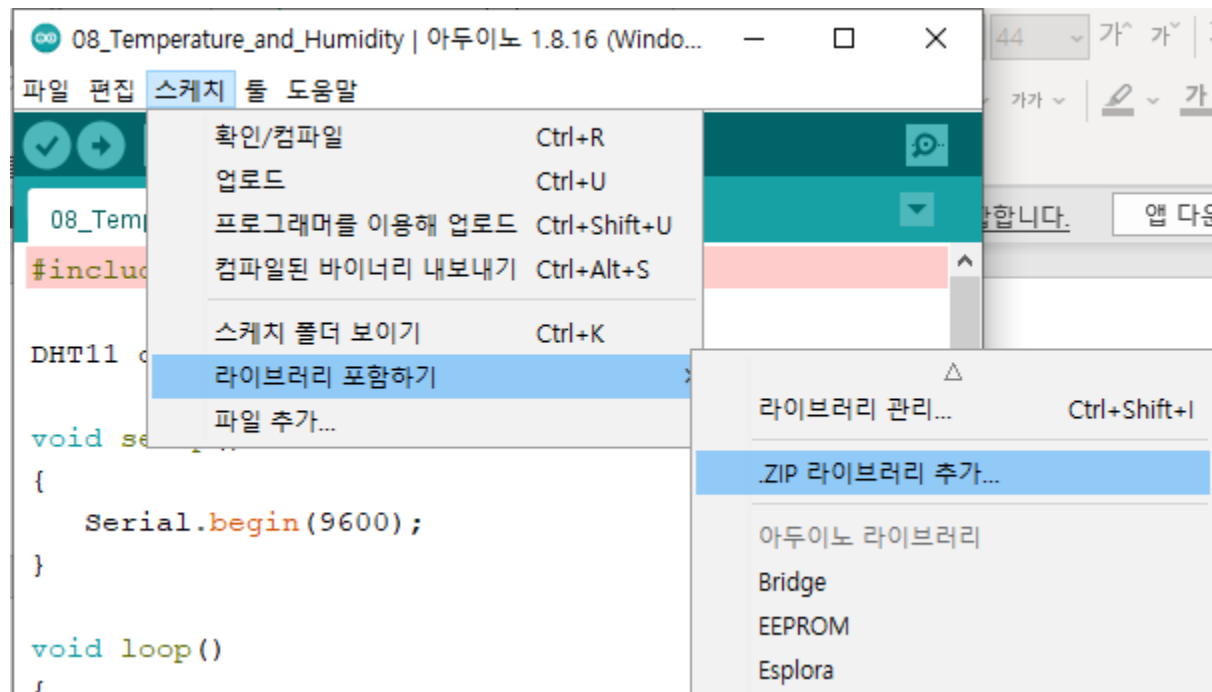
- <https://github.com/adafruit/DHT-sensor-library>



The screenshot shows the GitHub repository page for `adafruit/DHT-sensor-library`. The repository is public and has 162 watchers, 1.6k stars, and 1.2k forks. It contains 3 branches and 22 tags. The main branch is `master`. The repository description is "Arduino library for DHT11, DHT22, etc Temperature & Humidity Sensors". The repository includes a README, MIT License, and Code of conduct. The latest release is 1.4.3, which was switched from defines to ... 29 days ago. The repository also has 21 releases in total. The file list shows the following files and their commit history:

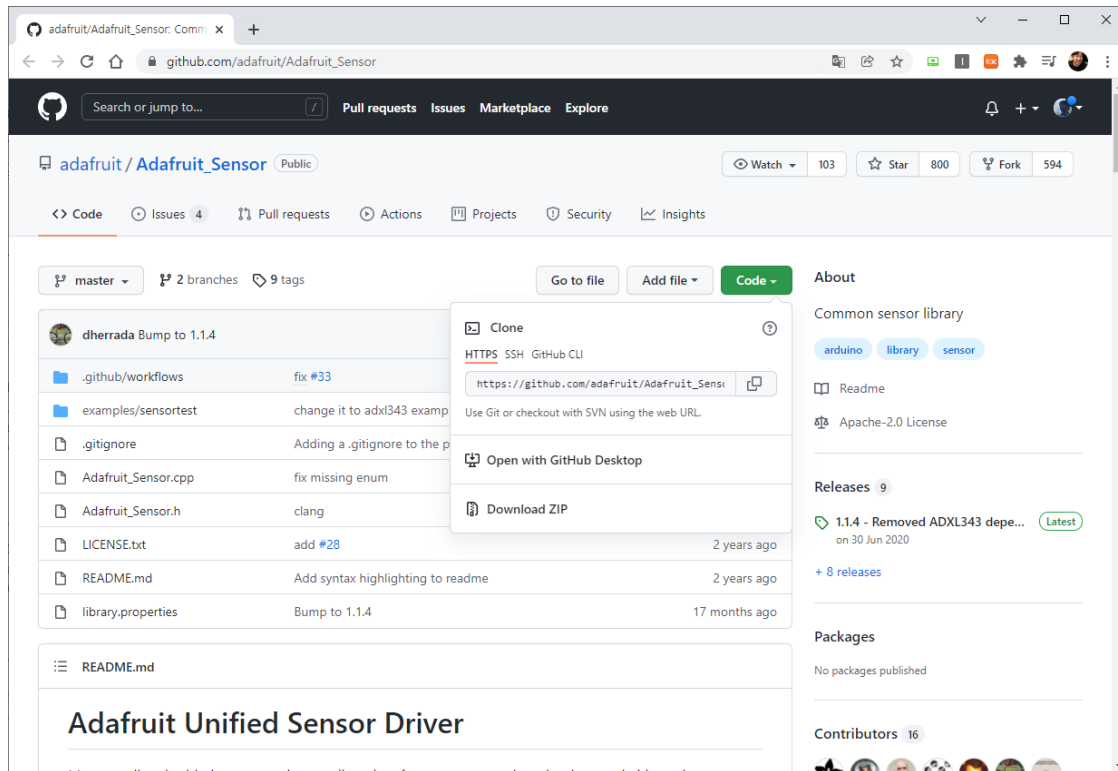
File	Commit History	Time Ago
<code>.github</code>	actionified, formatted and doxy'd	2 years ago
<code>examples</code>	Updated comment on the Pin Out of the DHTxx Sensors	9 months ago
<code>.gitignore</code>	Add .gitignore	2 years ago
<code>CONTRIBUTING.md</code>	[Update URL]	2 years ago
<code>DHT.cpp</code>	Merge pull request #159 from Rotzbua/patch-1	2 years ago
<code>DHT.h</code>	Fix comment on DHT22 and DHT21 variables	29 days ago
<code>DHT_U.cpp</code>	actionified, formatted and doxy'd	2 years ago
<code>DHT_U.h</code>	actionified, formatted and doxy'd	2 years ago
<code>README.md</code>	actionified, formatted and doxy'd	2 years ago
<code>code-of-conduct.md</code>	actionified, formatted and doxy'd	2 years ago
<code>keywords.txt</code>	Use correct field separator in keywords.txt	3 years ago
<code>library.properties</code>	Bump to 1.4.3	29 days ago

# DHT11 라이브러리 사용

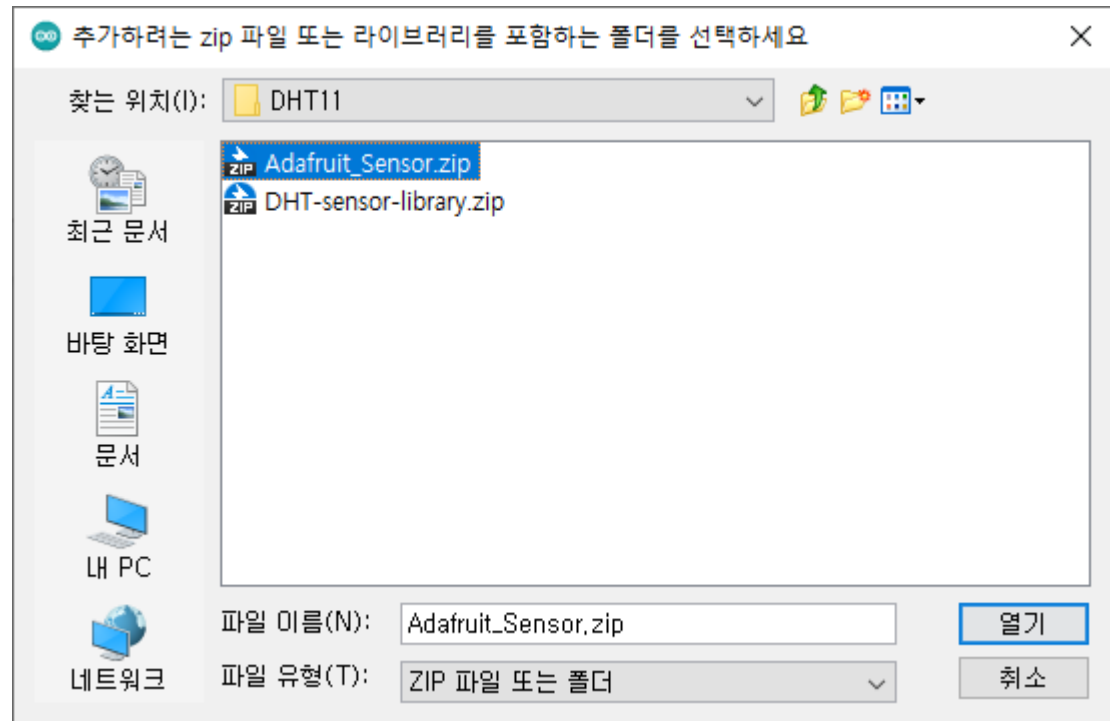
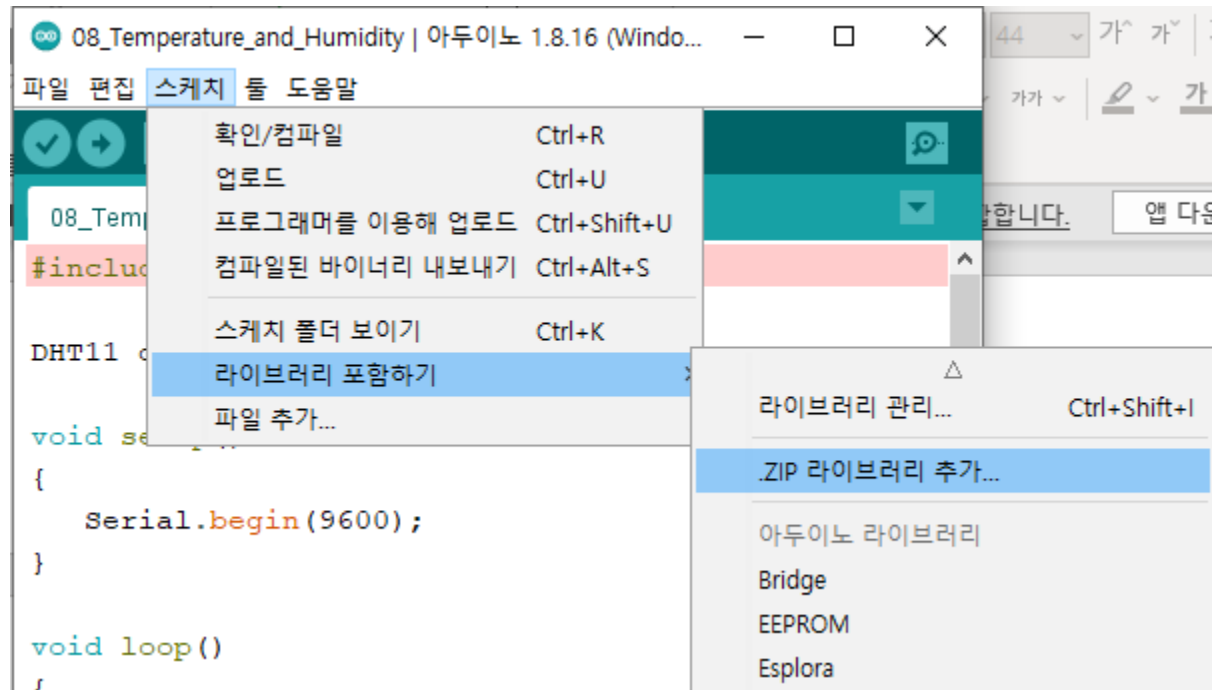


# DHT11 라이브러리 사용

- adafruit\_sensor.h no such file 에러 발생
- [https://github.com/adafruit/Adafruit\\_Sensor](https://github.com/adafruit/Adafruit_Sensor) 라이브러리 추가

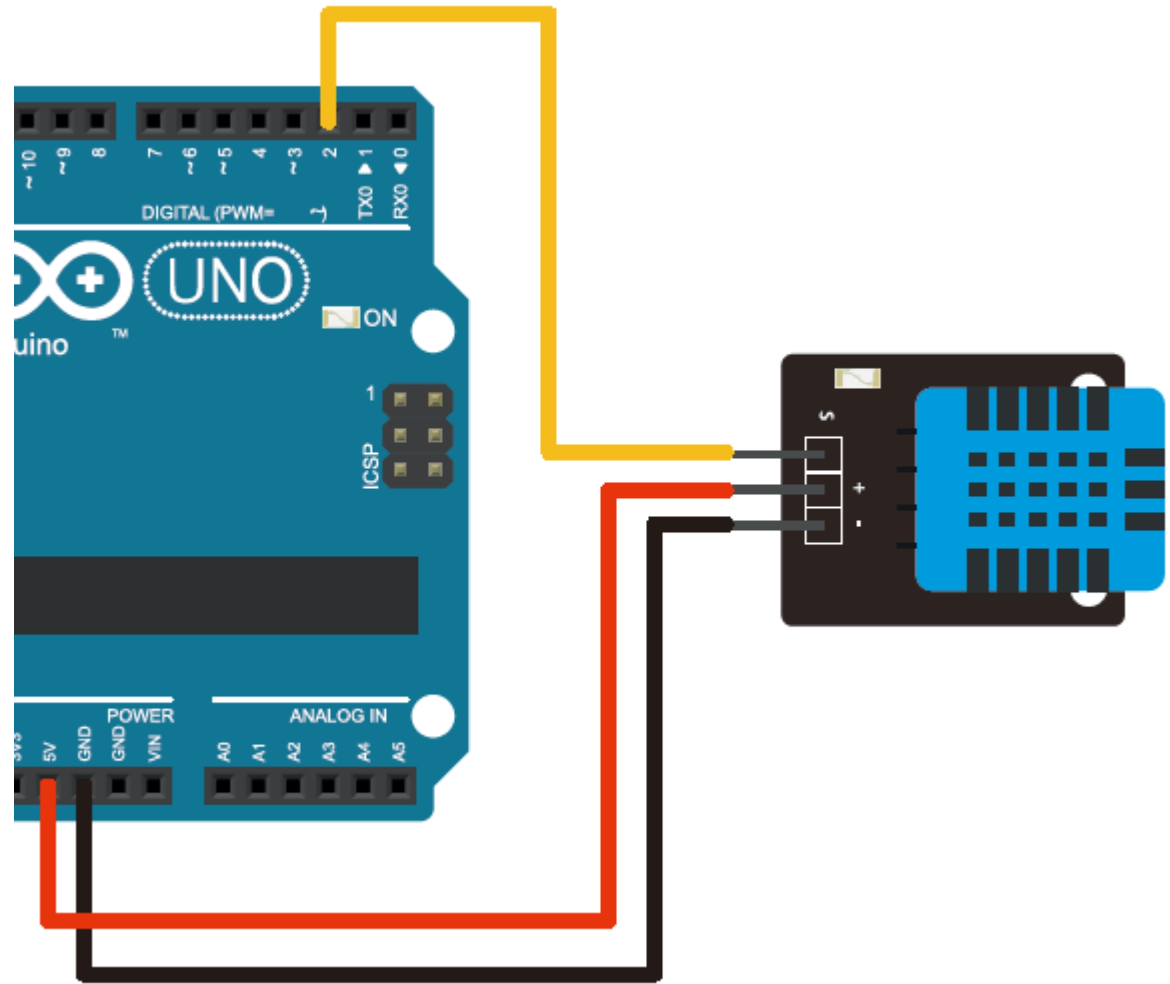


# DHT11 라이브러리 사용



# DHT11 아두이노 테스트

- S(signal) : 아두이노 2번핀
- + : VCC(5V)
- - : GND(0V)



# DHT11 아두이노 테스트

예제 : 08\_Temperature\_and\_Humidity

```
#include "DHT.h"

#define DHTPIN 2
#define DHTTYPE DHT22 // DHT 22 (AM2302), AM2321

DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  Serial.println(F("DHTxx test!"));

  dht.begin();
}

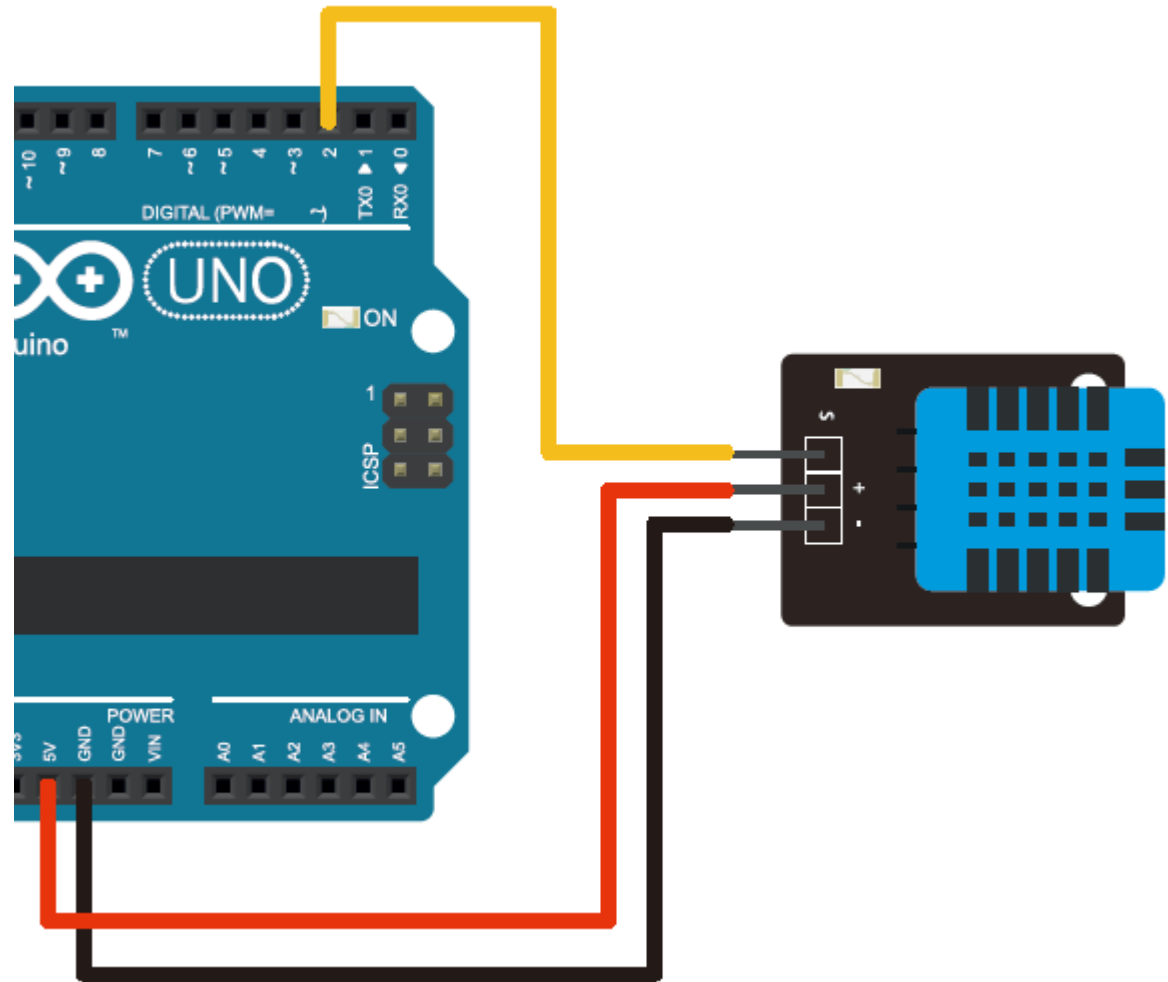
void loop() {
  delay(2000);

  // Reading temperature or humidity takes about 250 milliseconds!
  // Sensor readings may also be up to 2 seconds 'old' (its a very slow sensor)
  float h = dht.readHumidity();
  // Read temperature as Celsius (the default)
  float t = dht.readTemperature();
  // Read temperature as Fahrenheit (isFahrenheit = true)
  float f = dht.readTemperature(true);

  // Check if any reads failed and exit early (to try again).
  if (isnan(h) || isnan(t) || isnan(f)) {
    Serial.println(F("Failed to read from DHT sensor!"));
    return;
  }

  // Compute heat index in Fahrenheit (the default)
  float hif = dht.computeHeatIndex(f, h);
  // Compute heat index in Celsius (isFahreheit = false)
  float hic = dht.computeHeatIndex(t, h, false);

  Serial.print(F("Humidity: "));
  Serial.print(h);
  Serial.print(F("% Temperature: "));
  Serial.print(t);
  Serial.print(F("°C "));
  Serial.print(f);
  Serial.print(F("°F Heat index: "));
  Serial.print(hic);
  Serial.print(F("°C "));
  Serial.print(hif);
  Serial.println(F("°F"));
}
```





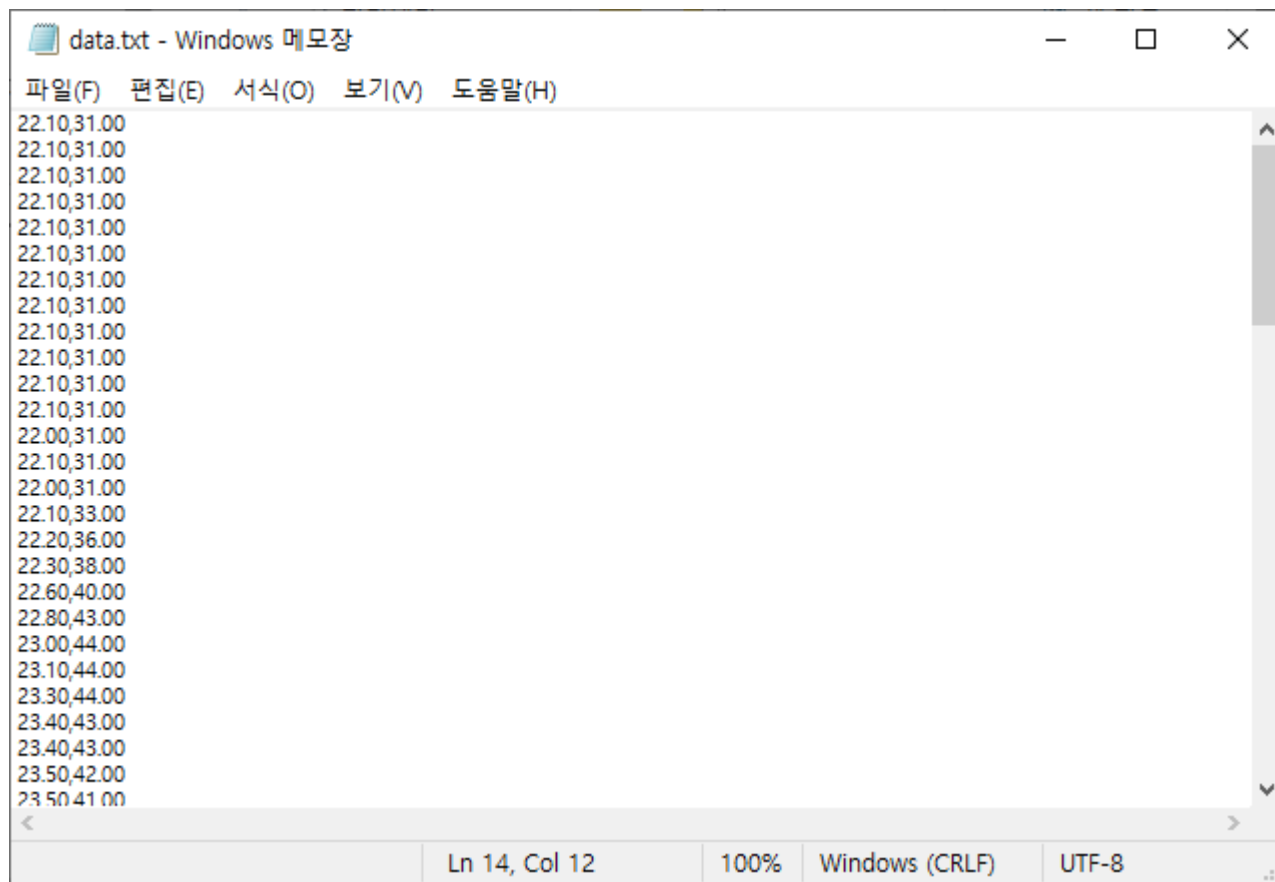
# DHT11

## 시계열 데이터 분석(time series analysis)

- STEP1 : 출력 데이터 정리
  - 온도 RAW데이터, 습도 RAW데이터만 시리얼모니터에 출력

# DHT11 시계열 데이터 분석(time series analysis)

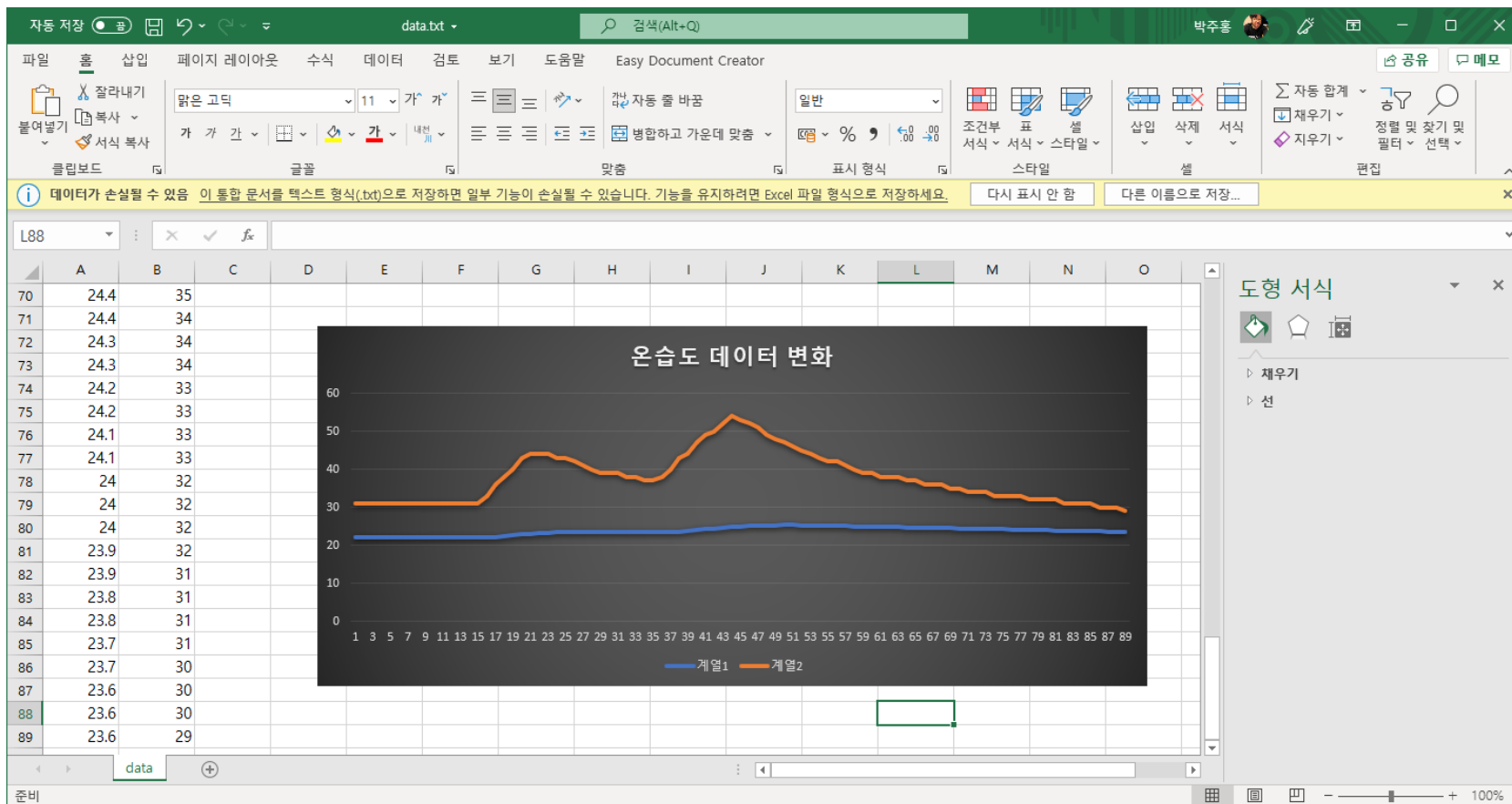
- STEP2 : 출력 데이터 저장(data.txt)



```
data.txt - Windows 메모장
파일(F) 편집(E) 서식(O) 보기(V) 도움말(H)
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.10,31.00
22.00,31.00
22.10,31.00
22.00,31.00
22.10,33.00
22.20,36.00
22.30,38.00
22.60,40.00
22.80,43.00
23.00,44.00
23.10,44.00
23.30,44.00
23.40,43.00
23.40,43.00
23.50,42.00
23.50,41.00
Ln 14, Col 12 100% Windows (CRLF) UTF-8
```

# DHT11 시계열 데이터 분석(time series analysis)

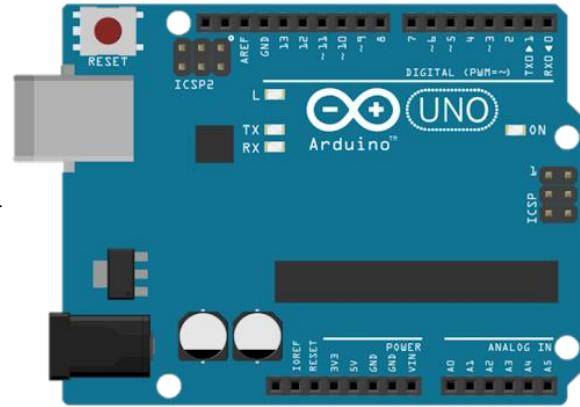
- STEP3 : 출력 데이터를 엑셀에서 읽기 & 그래프 분석



# 센서 응용(거리값 Visualization)



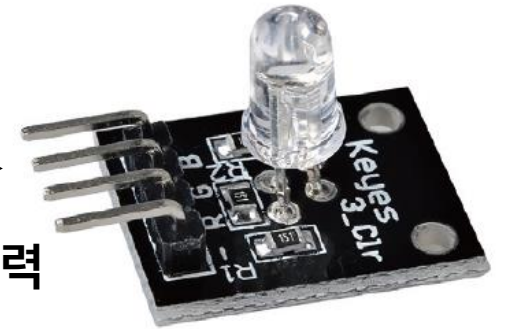
초음파 거리 측정



정보 출력(시리얼통신)



LED Level 출력



LED 레벨

255

0

0 cm

100 cm

거리값

