Detailed Walkthrough of the Code

# Loading and Combining the Data

The code begins by defining a list of file paths. Each file path points to a CSV file containing temperature records for a particular year. The years span from 1986 to 2005, giving a 20-year dataset.  
  
Using a list comprehension, each CSV file is read into a pandas DataFrame. All of these DataFrames are then concatenated into a single large table. This combined table, called ‘data’, now holds all temperature readings for all stations across all years.  
  
The table structure typically begins with metadata columns such as ‘STATION\_NAME’, ‘STATE’, latitude, and longitude. Following those, there are twelve columns for the months January through December, each containing the average temperature recorded at that station during that month.

# Step 1: Calculating Seasonal Averages

The first analysis calculates the average temperature for each season across the entire dataset. Seasons are defined in the standard Australian format:

* Summer (December–February),
* Autumn (March–May),
* Winter (June–August),
* Spring (September–November).

For each season, the code selects the relevant month columns from the dataset, calculates the average temperature per station, and then averages those values across all stations. The result is a single number for each season representing the overall seasonal average temperature across Australia for the period covered.  
  
For example, the output might show:  
Summer: 28.45°C  
Winter: 12.10°C

# Step 2: Finding Stations with the Largest Temperature Range

The second analysis looks at how much temperatures swing between extremes at each station. For every station entry, the code finds the maximum and minimum temperatures recorded across all months. It then computes the difference between these two values, which is the temperature range for that station.  
  
After doing this for every station, the program identifies which station or stations experienced the largest range overall. If two or more stations tie for the maximum range, all of them are listed.  
  
The results include not just the range, but also the exact maximum and minimum temperatures. For example:  
Alice Springs Airport: Range 37.80°C (Max: 45.20°C, Min: 7.40°C)  
Marble Bar: Range 37.80°C (Max: 46.10°C, Min: 8.30°C)

# Step 3: Measuring Temperature Stability

The third analysis focuses on temperature stability, which is measured using the standard deviation of monthly values. A low standard deviation means that the station’s temperatures are fairly consistent throughout the year, while a high standard deviation indicates large seasonal fluctuations.  
  
The code computes the standard deviation for each station and then identifies two extremes:  
- The station with the lowest standard deviation (the most stable climate).  
- The station with the highest standard deviation (the most variable climate).  
  
For example:  
Most Stable: Hobart: StdDev 2.35°C  
Most Variable: Birdsville: StdDev 9.87°C

# Step 4: Bringing the Results Together

Once the three analyses are complete, the script stores their results in variables. At this stage, the program now knows:  
- The average temperature for each of the four seasons across Australia.  
- The station with the largest annual temperature ranges and their details.  
- The most stable and most variable stations, based on standard deviation.  
This summary captures both broad patterns (seasonal averages across the whole country) and local extremes (stations with the highest variability or range).

# Step 5: Writing the Results to Files

The final part of the script saves everything into three plain-text files:  
  
1. average\_temp.txt  
 Contains one line per season, such as:  
 Summer: 28.45°C  
 Winter: 12.10°C  
  
2. largest\_temp\_range\_station.txt  
 Lists the stations with the largest temperature range:  
 Alice Springs Airport: Range 37.80°C (Max: 45.20°C, Min: 7.40°C)  
 Marble Bar: Range 37.80°C (Max: 46.10°C, Min: 8.30°C)  
  
3. temperature\_stability\_stations.txt  
 Highlights the most stable and most variable stations:  
 Most Stable: Hobart: StdDev 2.35°C  
 Most Variable: Birdsville: StdDev 9.87°C  
  
The script finally prints out the file paths so that the generated files can be easily downloaded or viewed.

# Two Example Outputs

## Example Output Set A

**average\_temp.txt**  
Summer: 29.12°C  
Autumn: 18.74°C  
Winter: 12.06°C  
Spring: 21.65°C  
  
**largest\_temp\_range\_station.txt**  
Birdsville: Range 38.10°C (Max: 46.20°C, Min: 8.10°C)  
  
**temperature\_stability\_stations.txt**  
Most Stable: Hobart: StdDev 2.28°C  
Most Variable: Marble Bar: StdDev 10.04°C

## Example Output Set B

**average\_temp.txt**  
Summer: 28.41°C  
Autumn: 18.21°C  
Winter: 11.73°C  
Spring: 21.02°C  
  
**largest\_temp\_range\_station.txt**  
Oodnadatta: Range 36.95°C (Max: 45.30°C, Min: 8.35°C)  
Tarcoola: Range 36.95°C (Max: 44.80°C, Min: 7.85°C)  
  
**temperature\_stability\_stations.txt**  
Most Stable: Albany: StdDev 2.44°C  
Most Variable: Wyndham: StdDev 9.77°C