

# Analysis Script Execution and Result Directory Mapping

Overview of the Python-Based Correlation Analysis Pipeline

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## 1. Purpose

This document describes how each Python analysis script is executed and how its outputs are organized into corresponding result directories.

The purpose of this guide is to provide a **clear one-to-one mapping** between:

- analysis scripts,
  - console execution steps, and
  - generated result folders and files.
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## 2. Analysis Directory Overview

All analysis scripts and input data are located in a single working directory.

**Figure 1.** Overall directory structure containing Python analysis scripts, input video, and result folders.

이름	수정한 날짜	유형
guide	2025-12-22 오후 2:08	파일 폴더
results_compare	2025-12-18 오후 11:55	파일 폴더
results_horizontal	2025-12-20 오전 1:01	파일 폴더
results_radial_autocorr	2025-12-19 오후 4:40	파일 폴더
results_vertical	2025-12-16 오전 9:27	파일 폴더
sample	2025-12-22 오후 1:53	파일 폴더
analyze_horizontal_continuity	2025-12-15 오후 9:41	Python File
analyze_radial_autocorr_profile	2025-12-18 오후 9:47	Python File
analyze_vertical_vbridge	2025-12-13 오후 5:29	Python File
compare_autocorr_vs_QFlink	2025-12-18 오후 11:55	Python File
make_center_from_boundary	2025-12-12 오전 10:34	Python File
sphere_center_preview_manual	2025-12-22 오후 1:50	Microsoft Edge F
sphere_center_radius.npy	2025-12-22 오후 1:50	NPY 파일
tails_pattern	2025-12-11 오후 9:34	GOM 미디어 파

Key elements:

- Python scripts (\*.py)
- Input video file (tails\_pattern.mov)
- Result directories:
  - results\_horizontal/
  - results\_vertical/
  - results\_radial\_autocorr/
  - results\_compare/

### 3. Horizontal Spatial Continuity Analysis

#### 3.1 Script Execution

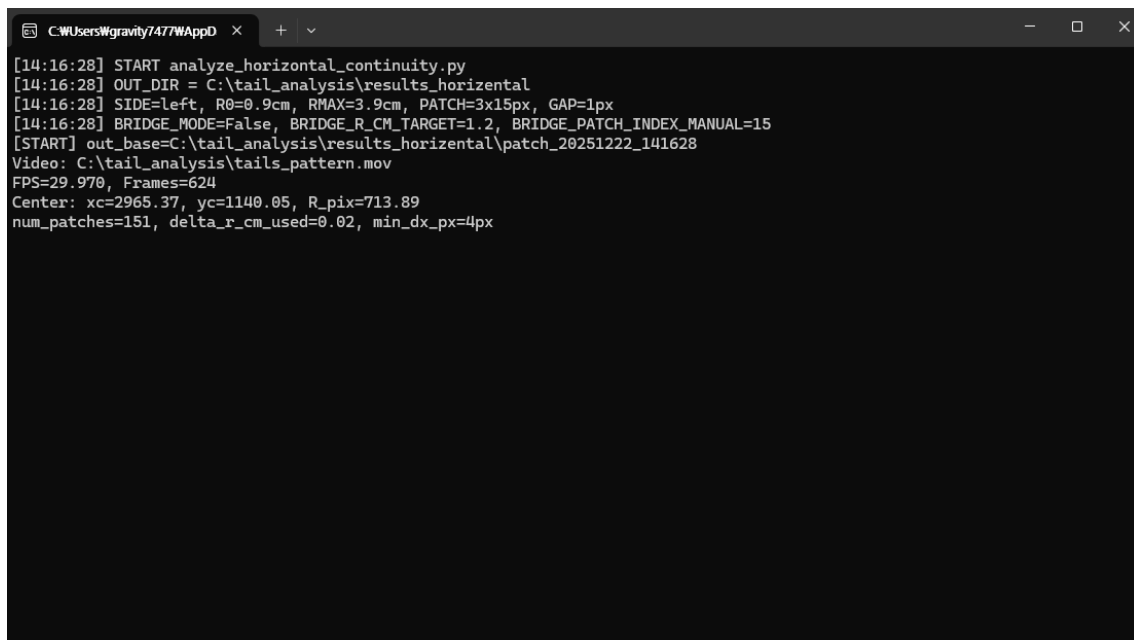
The horizontal spatial continuity analysis is performed by executing:

`analyze_horizontal_continuity.py`

When executed, the script:

- loads the input video `tails_pattern.mov`,
- reads the sphere center and radius from `sphere_center_radius.npy`,
- initializes patch-based sampling along the horizontal (radial) direction.

**Figure 2.** Console output during execution of `analyze_horizontal_continuity.py`.



```
[14:16:28] START analyze_horizontal_continuity.py
[14:16:28] OUT_DIR = C:\tail_analysis\results_horizontal
[14:16:28] SIDE=left, R0=0.9cm, RMAX=3.9cm, PATCH=3x15px, GAP=1px
[14:16:28] BRIDGE_MODE=False, BRIDGE_R_CM_TARGET=1.2, BRIDGE_PATCH_INDEX_MANUAL=15
[START] out_base=C:\tail_analysis\results_horizontal\patch_20251222_141628
Video: C:\tail_analysis\tails_pattern.mov
FPS=29.970, Frames=624
Center: xc=2965.37, yc=1140.05, R_pix=713.89
num_patches=151, delta_r_cm_used=0.02, min_dx_px=4px
```

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## 3.2 Generated Results























Upon completion, a new timestamped subdirectory is created inside:

`results_horizontal/`

This directory contains:

- horizontal continuity maps,
- run-length histograms,
- radial profiles of correlation strength and time lag,
- summary text files and NumPy data files.

**Figure 3.** Files generated in the results\_horizontal directory after horizontal continuity analysis.

이름	수정한 날짜	유형	크기
 continuity_QF_link	2025-12-22 오후 2:17	Microsoft Edge P...	10...
 continuity_sign_strip	2025-12-22 오후 2:17	Microsoft Edge P...	14...
 continuity_tauF_link	2025-12-22 오후 2:17	Microsoft Edge P...	14...
 p0_vs_pk_pack.npz	2025-12-22 오후 2:17	NPZ 파일	9...
 patch_geometry	2025-12-22 오후 2:17	Microsoft Edge P...	18...
 patch_r_cm.npy	2025-12-22 오후 2:17	NPY 파일	2...
 patch_x_px.npy	2025-12-22 오후 2:17	NPY 파일	2...
 patch_y_px.npy	2025-12-22 오후 2:17	NPY 파일	2...
 Q0_vs_r	2025-12-22 오후 2:17	Microsoft Edge P...	10...
 QF_link.npy	2025-12-22 오후 2:17	NPY 파일	2...
 QF_vs_r	2025-12-22 오후 2:17	Microsoft Edge P...	10...
 r_link.npy	2025-12-22 오후 2:17	NPY 파일	2...
 run_log	2025-12-22 오후 2:17	텍스트 문서	7...
 runlen_hist_all	2025-12-22 오후 2:17	Microsoft Edge P...	15...
 runlen_hist_split	2025-12-22 오후 2:17	Microsoft Edge P...	10...
 runlen_pack.npz	2025-12-22 오후 2:17	NPZ 파일	9...
 sign_link.npy	2025-12-22 오후 2:17	NPY 파일	2...
 summary	2025-12-22 오후 2:17	텍스트 문서	34...
 tau0_vs_r	2025-12-22 오후 2:17	Microsoft Edge P...	15...
 tauF_link.npy	2025-12-22 오후 2:17	NPY 파일	2...
 tauF_vs_r	2025-12-22 오후 2:17	Microsoft Edge P...	15...
 v_vs_r	2025-12-22 오후 2:17	Microsoft Edge P...	10...

## 4. Vertical Synchronous (Bridge) Analysis

### 4.1 Script Execution

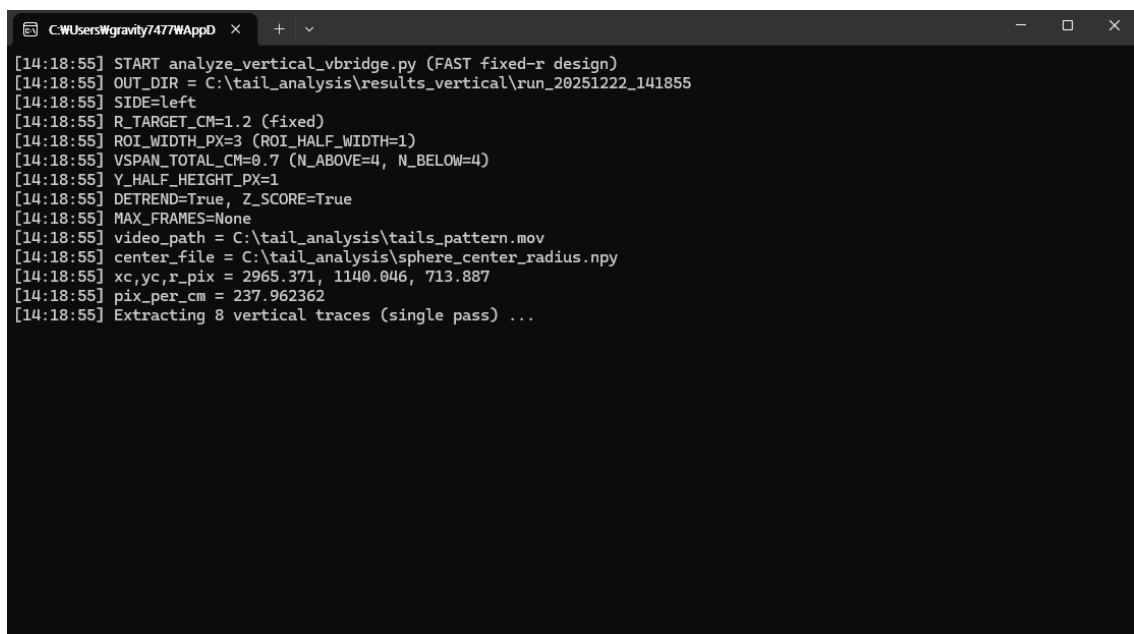
Vertical synchronous analysis at a fixed radial anchor is performed by executing:

`analyze_vertical_vbridge.py`

This script:

- uses a fixed radial position,
- extracts vertically separated intensity traces,
- computes zero-lag correlation matrices to assess temporal synchrony.

**Figure 4.** Console output during execution of `analyze_vertical_vbridge.py`.



```
[14:18:55] START analyze_vertical_vbridge.py (FAST fixed-r design)
[14:18:55] OUT_DIR = C:\tail_analysis\results_vertical\run_20251222_141855
[14:18:55] SIDE=left
[14:18:55] R_TARGET_CM=1.2 (fixed)
[14:18:55] ROI_WIDTH_PX=3 (ROI_HALF_WIDTH=1)
[14:18:55] VSPAN_TOTAL_CM=0.7 (N_ABOVE=4, N_BELOW=4)
[14:18:55] Y_HALF_HEIGHT_PX=1
[14:18:55] DETREND=True, Z_SCORE=True
[14:18:55] MAX_FRAMES=None
[14:18:55] video_path = C:\tail_analysis\tails_pattern.mov
[14:18:55] center_file = C:\tail_analysis\sphere_center_radius.npy
[14:18:55] xc,yc,r_pix = 2965.371, 1140.046, 713.887
[14:18:55] pix_per_cm = 237.962362
[14:18:55] Extracting 8 vertical traces (single pass) ...
```

### 4.2 Generated Results









The script generates a timestamped result directory inside:

results\_vertical/

This directory includes:

- vertical correlation matrices,
- trace previews,
- synchrony visualization plots,
- associated NumPy and text files.

**Figure 5.** Files generated in the results\_vertical directory after vertical synchrony analysis.

이름	수정한 날짜	유형	크기
 corr_matrix_vbridge.npy	2025-12-22 오후 2:19	NPY 파일	
 corr_matrix_vbridge	2025-12-22 오후 2:19	Microsoft Edge P...	2...
 corr_matrix_vbridge	2025-12-22 오후 2:19	알씨 PNG 파일	6...
 run_info	2025-12-22 오후 2:19	텍스트 문서	
 run_log	2025-12-22 오후 2:19	텍스트 문서	
 traces_preview	2025-12-22 오후 2:19	Microsoft Edge P...	4...
 traces_preview	2025-12-22 오후 2:19	알씨 PNG 파일	33...
 traces_vbridge.npy	2025-12-22 오후 2:19	NPY 파일	4...

## 5. Radial Temporal Persistence Analysis

### 5.1 Script Execution

Radial temporal persistence is analyzed by executing:

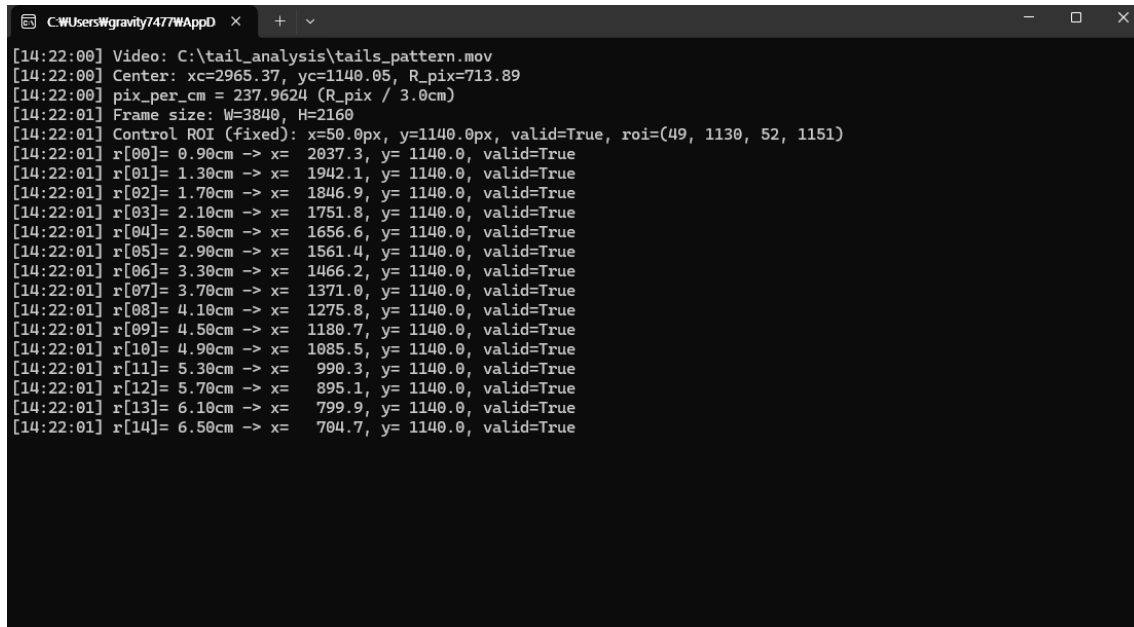
analyze\_radial\_autocorr\_profile.py

This script:

- samples intensity time series along the radial direction,
- computes temporal autocorrelation functions,

- evaluates time persistence as a function of radial distance.

Figure 6. Console output during execution of `analyze_radial_autocorr_profile.py`.



```
[14:22:00] Video: C:\tail_analysis\tails_pattern.mov
[14:22:00] Center: xc=2965.37, yc=1140.05, R_pix=713.89
[14:22:00] pix_per_cm = 237.9624 (R_pix / 3.0cm)
[14:22:01] Frame size: W=3840, H=2160
[14:22:01] Control ROI (fixed): x=50.0px, y=1140.0px, valid=True, roi=(49, 1130, 52, 1151)
[14:22:01] r[00]= 0.90cm -> x= 2037.3, y= 1140.0, valid=True
[14:22:01] r[01]= 1.30cm -> x= 1942.1, y= 1140.0, valid=True
[14:22:01] r[02]= 1.70cm -> x= 1846.9, y= 1140.0, valid=True
[14:22:01] r[03]= 2.10cm -> x= 1751.8, y= 1140.0, valid=True
[14:22:01] r[04]= 2.50cm -> x= 1656.6, y= 1140.0, valid=True
[14:22:01] r[05]= 2.90cm -> x= 1561.4, y= 1140.0, valid=True
[14:22:01] r[06]= 3.30cm -> x= 1466.2, y= 1140.0, valid=True
[14:22:01] r[07]= 3.70cm -> x= 1371.0, y= 1140.0, valid=True
[14:22:01] r[08]= 4.10cm -> x= 1275.8, y= 1140.0, valid=True
[14:22:01] r[09]= 4.50cm -> x= 1180.7, y= 1140.0, valid=True
[14:22:01] r[10]= 4.90cm -> x= 1085.5, y= 1140.0, valid=True
[14:22:01] r[11]= 5.30cm -> x= 990.3, y= 1140.0, valid=True
[14:22:01] r[12]= 5.70cm -> x= 895.1, y= 1140.0, valid=True
[14:22:01] r[13]= 6.10cm -> x= 799.9, y= 1140.0, valid=True
[14:22:01] r[14]= 6.50cm -> x= 704.7, y= 1140.0, valid=True
```

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## 5.2 Generated Results









The outputs are written to a timestamped directory inside:

`results_radial_autocorr/`

Generated files include:

- autocorrelation curves,
- radial autocorrelation maps,
- persistence metrics,
- summary logs and data tables.

**Figure 7.** Files generated in the results\_radial\_autocorr directory after radial autocorrelation analysis.

이름	수정한 날짜	유형	크기
 autocorr_curves	2025-12-22 오후 2:22	Microsoft Edge P...	14...
 autocorr_curves	2025-12-22 오후 2:22	알씨 PNG 파일	7...
 autocorr_map	2025-12-22 오후 2:22	Microsoft Edge P...	21...
 autocorr_map	2025-12-22 오후 2:22	알씨 PNG 파일	3...
 radial_profile	2025-12-22 오후 2:22	Microsoft Excel ...	...
 run_log	2025-12-22 오후 2:22	텍스트 문서	...
 S_vs_r	2025-12-22 오후 2:22	Microsoft Edge P...	14...
 S_vs_r	2025-12-22 오후 2:22	알씨 PNG 파일	6...

## 6. Comparative Analysis: Continuity vs Temporal Persistence

### 6.1 Script Execution

A final comparative analysis is performed using:

`compare_autocorr_vs_QFlink.py`

This script:

- automatically selects the **most recent** result directory from `results_horizontal/`,
- automatically selects the **most recent** result directory from `results_radial_autocorr/`,
- compares spatial continuity metrics with temporal persistence metrics.



**Figure 8.** Console output during execution of `compare_autocorr_vs_QFlink.py`.

```
C:\tail_analysis>py compare_autocorr_vs_QFlink.py
=====
COMPARE DONE
AUTOCORR: ./results_radial_autocorr/run_20251222_142200
CONT      : ./results_horizontal/patch_20251222_141628
OUT       : ./results_compare/run_20251222_144000
Metric    : QF AGG: median
Pearson   : 0.8789470526697702 Spearman: 0.9047619047619048
Pearson CI : (0.6260482865955996, 0.9911343705866561)
Spearman CI: (0.3924050632911392, 1.0)
=====
```

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## 6.2 Generated Results






Comparison results are stored in:

`results_compare/`

These files quantify:

- the correspondence between spatial continuity and temporal persistence,
- agreement between horizontal correlation structure and radial memory effects,
- summary plots and comparison statistics.

**Figure 9.** Files generated in the results\_compare directory after comparative analysis.

이름	수정된 날짜	유형	크기
 overlay	2025-12-22 오후 2:24	Microsoft Edge P...	1'
 overlay	2025-12-22 오후 2:24	알씨 PNG 파일	10
 scatter	2025-12-22 오후 2:24	Microsoft Edge P...	1
 scatter	2025-12-22 오후 2:24	알씨 PNG 파일	3
 summary	2025-12-22 오후 2:24	텍스트 문서	

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## 7. Summary of the Analysis Flow

The complete analysis pipeline proceeds as follows:

1. Execute make\_center\_from\_boundary.py → define sphere geometry
2. Execute analyze\_horizontal\_continuity.py → spatial continuity
3. Execute analyze\_vertical\_bridge.py → vertical temporal synchrony
4. Execute analyze\_radial\_autocorr\_profile.py → temporal persistence
5. Execute compare\_autocorr\_vs\_QFLink.py → continuity-persistence comparison

Each script produces outputs in a **dedicated result directory**, ensuring traceability and reproducibility.