### **📊 Data Structure of Track Files (MaggotTrack)**

Below is a structured table summarizing the **objects, arrays, and properties** in each track file. This should help clarify how the data is organized and how different fields relate.

### **🔍 Track File Data Hierarchy**

| **Data Level** | **Data Name** | **Type** | **Size** | **Description** |
| --- | --- | --- | --- | --- |
| **Top-Level** | track | MaggotTrack (Object) | 1×1 | Main object storing maggot trajectory data |
| **Inside track** | pt | MaggotTrackPoint (Array of Objects) | 1×npts | Stores movement & shape data for each tracked point |
|  | dr | DerivationRules (Object) | 1×1 | Stores time derivative rules |
|  | so | MaggotSegmentOptions (Object) | 1×1 | Stores segmentation options for maggot detection |
|  | npts | double | 1×1 | Total number of points in this track |
|  | nt | double | 1×1 | Track index |
|  | startFrame | double | 1×1 | First frame number of this track |
|  | endFrame | double | 1×1 | Last frame number of this track |
|  | locInFile | double | 1×1 | Position in the original file (potentially unused) |
|  | isrun | logical | 1×npts | Boolean array: 1 = running, 0 = not running |
|  | iscollision | logical | 1×npts | Boolean array: 1 = collision detected, 0 = no collision |
|  | dq | struct | 1×1 | Stores additional derived quantities |
|  | run | double | 1×npts | Stores movement-related segment data |
|  | reorientation | double | 1×npts | Stores reorientation events |
| **Inside pt** | targetArea | double | 1×1 | Area of detected maggot in pixels |
|  | threshold | double | 1×1 | Threshold value used for detection |
|  | htValid | logical | 1×1 | Boolean flag: 1 = valid head-tail tracking, 0 = invalid |
|  | head | single | 2×1 | X, Y position of head |
|  | mid | single | 2×1 | X, Y position of midpoint |
|  | tail | single | 2×1 | X, Y position of tail |
|  | contour | single | 2×N | Boundary contour points |
|  | spine | single | 2×11 | Spine coordinates |
|  | imOffset | double | 1×2 | Image offset for cropping |
|  | imData | array | variable | Raw image data (if stored) |
|  | loc | single | 2×1 | X, Y location of maggot in this frame |
|  | ind | double | 1×1 | Index reference (potentially unused) |
|  | area | double | 1×1 | Same as targetArea (redundant) |
|  | cov | double | 3×1 | Covariance matrix for shape analysis |
|  | locInFile | double | 1×1 | Position in the original dataset (potentially unused) |
|  | et | double | 1×1 | Elapsed time for this frame (matches elapsedTime) |

### **📌 Key Takeaways**

* **The track object is the top-level container.**
* **pt is an array of MaggotTrackPoint objects**, each representing a tracked frame.
* **et values in pt align with elapsedTime in the master file** → Good for time alignment.
* **loc provides the actual 2D X, Y position of the maggot** over time.
* **Many fields are related to image-based segmentation** (targetArea, contour, spine, etc.).