

Code description for reproducing Results:

- **Matlab Folder summary:**

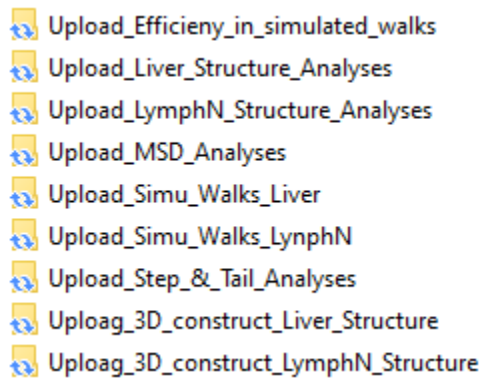
- A) Folder: 'Upload Step & Tail Analyses' for code on Step length analyses" and "Tail analyses" of Scaled and Non-scaled step lengths, for both Liver and Lymph Node data:
- B) Folder: 'Upload MSD Analyses' for MSD analyses of all data sets of both Liver and Lymph Node
- C) Folder: 'Upload 3D_construct Liver Structure' for constructing 3D digital data file of the Liver.
- D) Folder: 'Uploag_3D_construct_LymphN_Structure' for constructing 3D digital data file of the Lymph node.
- E) Folder: 'Upload Liver Structure Analyses' for (1) Branch length analyses, (2) Tail analyses, (3) Branch angles, and (4) Straightness index of the Liver

Subfolder: 'Liver_Network_graph_&_3D_images_100_&_512' for creating (1) 100x100x44 digital structure, (2) 512x512x44 digital structure, and (3) 100x100x44 Network graph.

- F) Folder: 'Upload LymphN Structure Analyses' for (1) Branch length analyses, (2) Tail analyses, (3) Branch angles, and (4) Straightness index of the Lymph node

Subfolder: 'LN_Network_graph_&_3D_images_100_&_512' for creating (1) 100x100x44 digital structure, (2) 512x512x44 digital structure, and (3) 100x100x44 Network graph.

- G) Folder: 'Upload Simu Walks Liver' for running simulations on the Liver structure and produce MSD analyses for both Brownian and Levy step lengths:
- H) Folder: 'Upload Simu Walks LynphN' for running simulations on the LN structure and produce MSD analyses for both Brownian and Levy step lengths.
- I) Folder: 'Upload Efficieny in simulated walks' for running simulations to compute efficiency; the "time-to-a-fixed target" on structure (1D) (top), and no-structure (bottom two) for both Levy and Brownian step lengths. (RANDOM_1 & RANDOM_1 are alternative programs.)



- You need to run code from the respective folder itself, because,

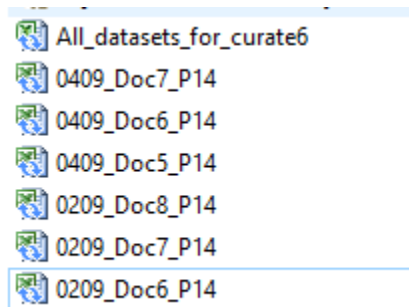
- (1) the essential functions, linked to code, are stored in the same folder, and
- (2) the data relevant to code is also stored in the same folder.

- Parameter estimations are displayed on the Matlab command panel, together with NLL, AIC and BIC and other relevant metrics.
- See below for details.

%%%

- A) Folder: **Upload Step & Tail Analyses** for code on **Step length analyses** and **Tail analyses** of **Scaled** and **Non-scaled** step lengths, for both **Liver and Lymph Node data**:

This folder contains the following data files:
















Liver data: Data file "A_datasets...." contains data from Lfa1WT, Lfa1KO, Wk1, Wk4, New1326, Py14, OT1 data files linked to the programs in the folder.














LN data: Data files "0409_Doc..." contains 6 sets of LN data

Following Matlab code produces the **Step length analyses** and **Tail analyses** of the above for **Scaled** and **Nonscaled**:

Non-scaled:

-  Para_est_steps_Non_Scaled_0209_Doc6_P14
-  Para_est_steps_Non_Scaled_0209_Doc7_P14
-  Para_est_steps_Non_Scaled_0209_Doc8_P14
-  Para_est_steps_Non_Scaled_0409_Doc5_P14
-  Para_est_steps_Non_Scaled_0409_Doc6_P14
-  Para_est_steps_Non_Scaled_0409_Doc7_P14
-  Para_est_steps_Non_Scaled_Lfa1KO
-  Para_est_steps_Non_Scaled_Lfa1WT
-  Para_est_steps_Non_Scaled_New1326
-  Para_est_steps_Non_Scaled_OT1
-  Para_est_steps_Non_Scaled_Py14
-  Para_est_steps_Non_Scaled_W1
-  Para_est_steps_Non_Scaled_W4

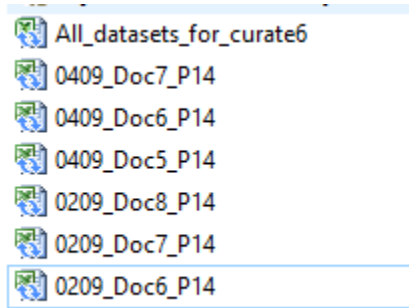
Scaled:

-  Para_est_steps_Scaled_0209_Doc6_P14
-  Para_est_steps_Scaled_0209_Doc7_P14
-  Para_est_steps_Scaled_0209_Doc8_P14
-  Para_est_steps_Scaled_0409_Doc5_P14
-  Para_est_steps_Scaled_0409_Doc6_P14
-  Para_est_steps_Scaled_0409_Doc7_P14
-  Para_est_steps_Scaled_Lfa1KO
-  Para_est_steps_Scaled_Lfa1WT
-  Para_est_steps_Scaled_New1326
-  Para_est_steps_Scaled_OT1
-  Para_est_steps_Scaled_Py14
-  Para_est_steps_Scaled_W1
-  Para_est_steps_Scaled_W4

%%%

- B) Folder: **'Upload MSD Analyses'** for **MSD analyses** of all data sets of both **Liver and Lymph Node**

This contains the following data files:



Liver data: Data file "A_datasets...." contains data from Lfa1WT, Lfa1KO, Wk1, Wk4, New1326, Py14, OT1 data files linked to the programs in the folder.

LN data: Data files "0409_Doc..." contains 6 sets of LN data






















Following Matlab code produces the **"MSD analyses"**:

A screenshot of a file explorer window showing a folder containing 13 data files. The files are listed as follows: 'MSD_0209_Doc6_P14', 'MSD_0209_Doc7_P14', 'MSD_0209_Doc8_P14', 'MSD_0409_Doc5_P14', 'MSD_0409_Doc6_P14', 'MSD_0409_Doc7_P14', 'MSD_Lfa1KO', 'MSD_Lfa1WT', 'MSD_NewAll', 'MSD_OT1', 'MSD_Py14', 'MSD_Wk1', and 'MSD_Wk4'. Each file has a small icon representing a document with a blue border.


%%%

C) Folder: **'Upload 3D construct Liver Structure'** for constructing 3D digital data file of the Liver.


The data files:

 17_1207_evans_blue_10_percent_liver_2_0002_1
 17_1207_evans_blue_10_percent_liver_2_0002_2
 17_1207_evans_blue_10_percent_liver_2_0002_3
 17_1207_evans_blue_10_percent_liver_2_0002_4
 17_1207_evans_blue_10_percent_liver_2_0002_5
 17_1207_evans_blue_10_percent_liver_2_0002_6
 17_1207_evans_blue_10_percent_liver_2_0002_7
 17_1207_evans_blue_10_percent_liver_2_0002_8
 17_1207_evans_blue_10_percent_liver_2_0002_9
 17_1207_evans_blue_10_percent_liver_2_0002_10
 17_1207_evans_blue_10_percent_liver_2_0002_11
 17_1207_evans_blue_10_percent_liver_2_0002_12
 17_1207_evans_blue_10_percent_liver_2_0002_13
 17_1207_evans_blue_10_percent_liver_2_0002_14
 17_1207_evans_blue_10_percent_liver_2_0002_15
 17_1207_evans_blue_10_percent_liver_2_0002_16
 17_1207_evans_blue_10_percent_liver_2_0002_17
 17_1207_evans_blue_10_percent_liver_2_0002_18
 17_1207_evans_blue_10_percent_liver_2_0002_19
 17_1207_evans_blue_10_percent_liver_2_0002_20
 17_1207_evans_blue_10_percent_liver_2_0002_21
.....

The following Matlab program file

 Creates_3D_Liver_Sinusoidal_struct_digital_file_from_raw_2D_images



















creates the following 3D digital file, needed for the analyses of structure.

 IMG_OPENED_3D


%%%

D) Folder: **'Uploug_3D_construct_LymphN_Structure'** for constructing **3D digital data file of the Lymph node.**


The data files:

 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z0
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z1
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z2
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z3
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z4
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z5
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z6
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z7
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z8
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z9
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z10
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z11
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z12
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z13
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z14
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z15
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z16
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z17
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z18
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z19
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z20
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z21
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z22
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z23
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z24
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z25
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z26
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z27
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z28
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z29
 Ccl19-creeyfpidtrctrlday5yfppdpniLN1_z30

The following Matlab program file


 Creates_3D_LN_struct_digital_file_from_raw_2D_images

creates the following 3D digital file, needed for the analyses of structure.

 IMG_OPENED_3D_LN

%%%


- E) Folder: **'Upload Liver Structure Analyses'** for (1) Branch length analyses, (2) Tail analyses, (3) Branch angles, and (4) Straightness index of the Liver


 Plot_Branch_lengths_Tail_Angles_Straightness_Liver


Subfolder: **'Liver_Network_graph_&_3D_images_100_&_512'**

The following Matlab program file creates

- (1) 100x100x44 digital structure
- (2) 512x512x44 digital structure
- (3) 100x100x44 Network graph


 Creates_100X100X44_sinusoidal_structure_digital_plot

 Creates_512X512X44_sinusoidal_structure_digital_plot

 Creates_Skeleton_sinusoidal_Graph_100x100x44

%%%

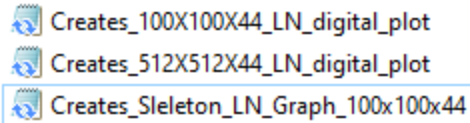
- F) Folder: **'Upload LymphN Structure Analyses'** for (1) Branch length analyses, (2) Tail analyses, (3) Branch angles, and (4) Straightness index of the Lymph node

 Plot_Branch_lengths_Tail_Angles_Straightness_LN

Subfolder: **'LN_Network_graph_&_3D_images_100_&_512'**

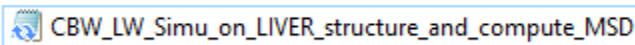
The following Matlab program file creates:

- (4) 100x100x44 digital structure
- (5) 512x512x44 digital structure
- (6) 100x100x44 Network graph



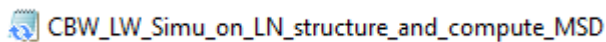
%%%

- G) Folder: **'Upload Simu Walks Liver'** for running simulations on the **Liver structure** and produce MSD analyses for both Brownian and Levy step lengths:



%%%

- H) Folder: **'Upload Simu Walks LynphN'** for running simulations on the **LN structure** and produce MSD analyses for both Brownian and Levy step lengths:



%%%

- I) Folder: **'Upload Efficiency in simulated walks'** for running simulations to compute **efficiency; the "time-to-a-fixed target" on structure (1D)** (top), and **no-structure (bottom two)** for both Levy and Brownian step lengths. (RANDOM_1 & RANDOM_2 are alternative programs.)

