Cell migration data analysis project (K.D. Duc, J. Newby and F. Lin)

The goal of this project is to apply both manual and automated cell segmentation and tracking methods for analyzing time series of cell migration images.

The example timelapse images provided are human blood neutrophil migration to a chemoattractant gradient in a microfluidic device.

Note that in the video, the gradient direction is to the right.
Let's simplify the calibration as 1 pix = 1 μm; 1 frame / min

For manual tracking, the suggested software is ImageJ with the Manual tracking plugin:

https://imagej.net/ij/
https://imagej.net/ij/plugins/track/track.html

For automated cell segmentaion and tracking, the suggested software is cellpose:

https://www.cellpose.org/

Use the manual tracking data as the reference control to evaluate the accuracy of the automated cell segmentation and tracking. Example quantitatve cell migration parameters from the cell tracking data can include but not limited to cell position, displacement, migration distance, migration speed and chemotactic index (ratio of displacement along the gradient direction to the migration distance).