

Valparaiso University

ValpoScholar

Symposium on Undergraduate Research and
Creative Expression (SOURCE)

Office of Sponsored and Undergraduate
Research

Spring 5-1-2020

Computational Simulations of Cell Diffusion in Matrix Environments

Nick Evans
nick.evans@valpo.edu

Bethany Luke
Valparaiso University, bethany.luke@valpo.edu

Follow this and additional works at: <https://scholar.valpo.edu/cus>

Recommended Citation

Evans, Nick and Luke, Bethany, "Computational Simulations of Cell Diffusion in Matrix Environments" (2020). *Symposium on Undergraduate Research and Creative Expression (SOURCE)*. 890.
<https://scholar.valpo.edu/cus/890>

This Poster Presentation is brought to you for free and open access by the Office of Sponsored and Undergraduate Research at ValpoScholar. It has been accepted for inclusion in Symposium on Undergraduate Research and Creative Expression (SOURCE) by an authorized administrator of ValpoScholar. For more information, please contact a ValpoScholar staff member at scholar@valpo.edu.

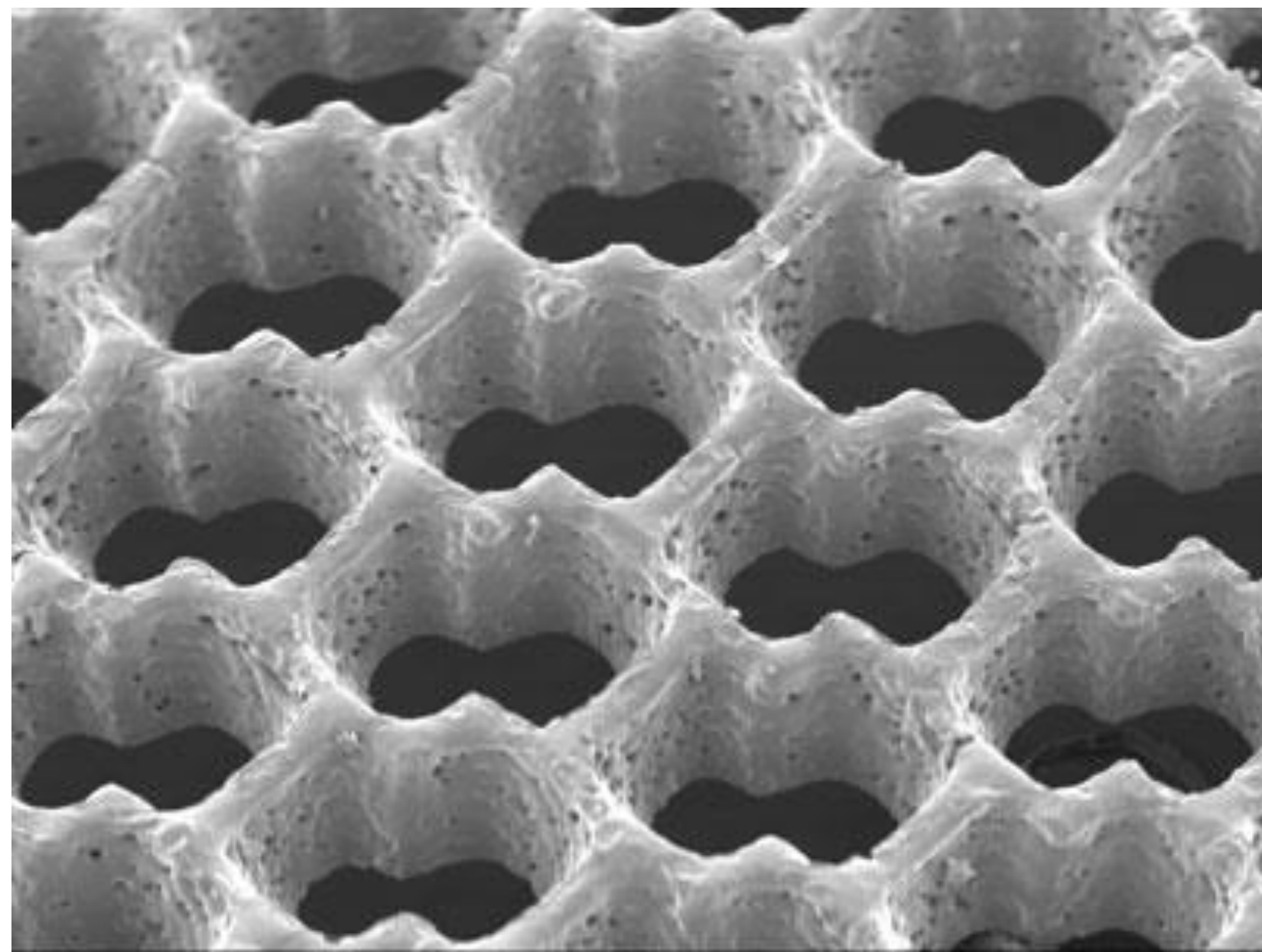
Computational Simulations of Cell Diffusion in Matrix Environments

Nick Evans

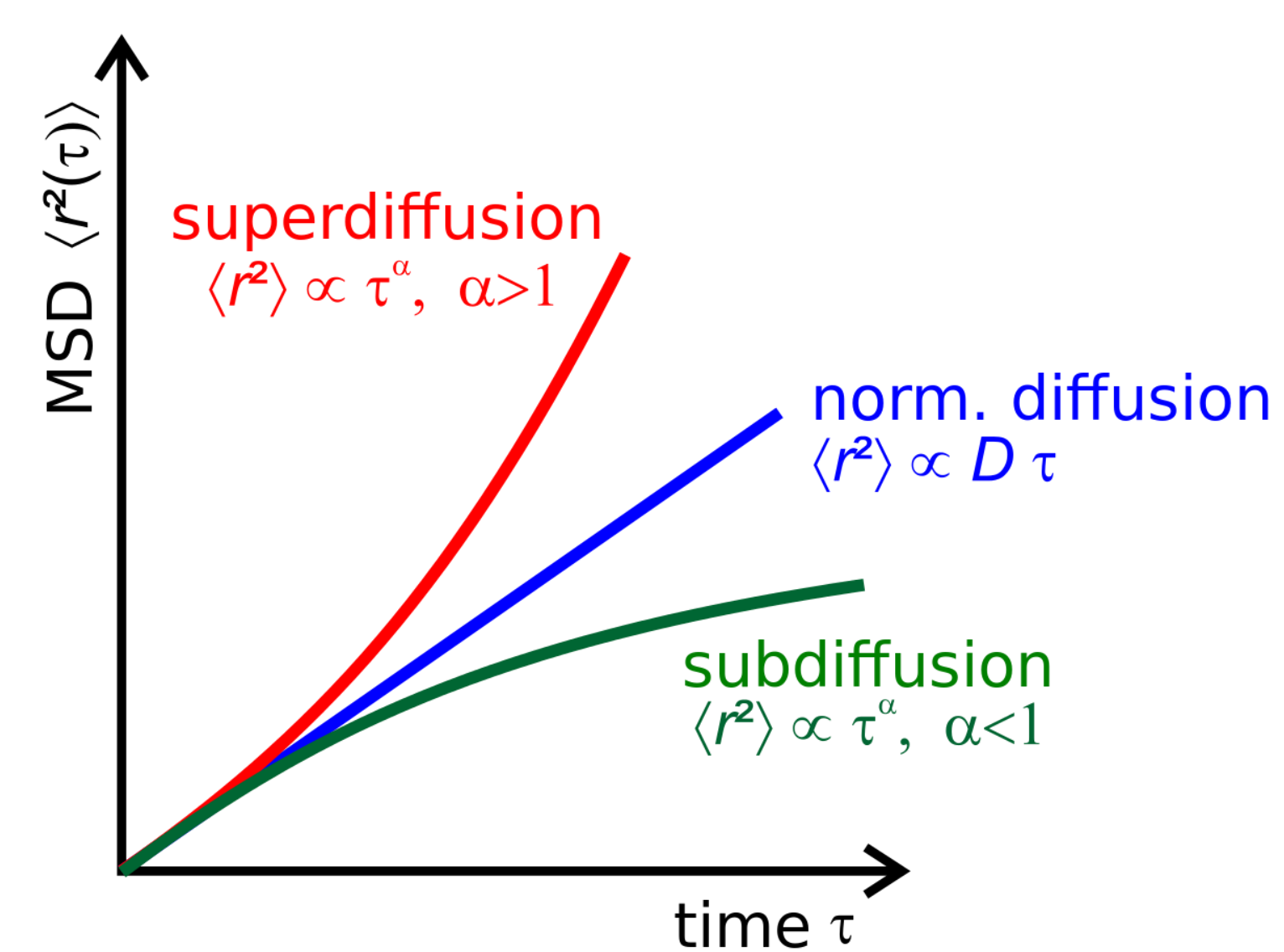
Valparaiso University Department of Mechanical Engineering and Bioengineering

BACKGROUND

Tissue Scaffolds



Mean-squared displacement (MSD): an average measurement of the distance a cell travels throughout the scaffold.



HYPOTHESIS

We hypothesize that cell diffusion will be confined when in a high local fiber fraction.

RESULTS

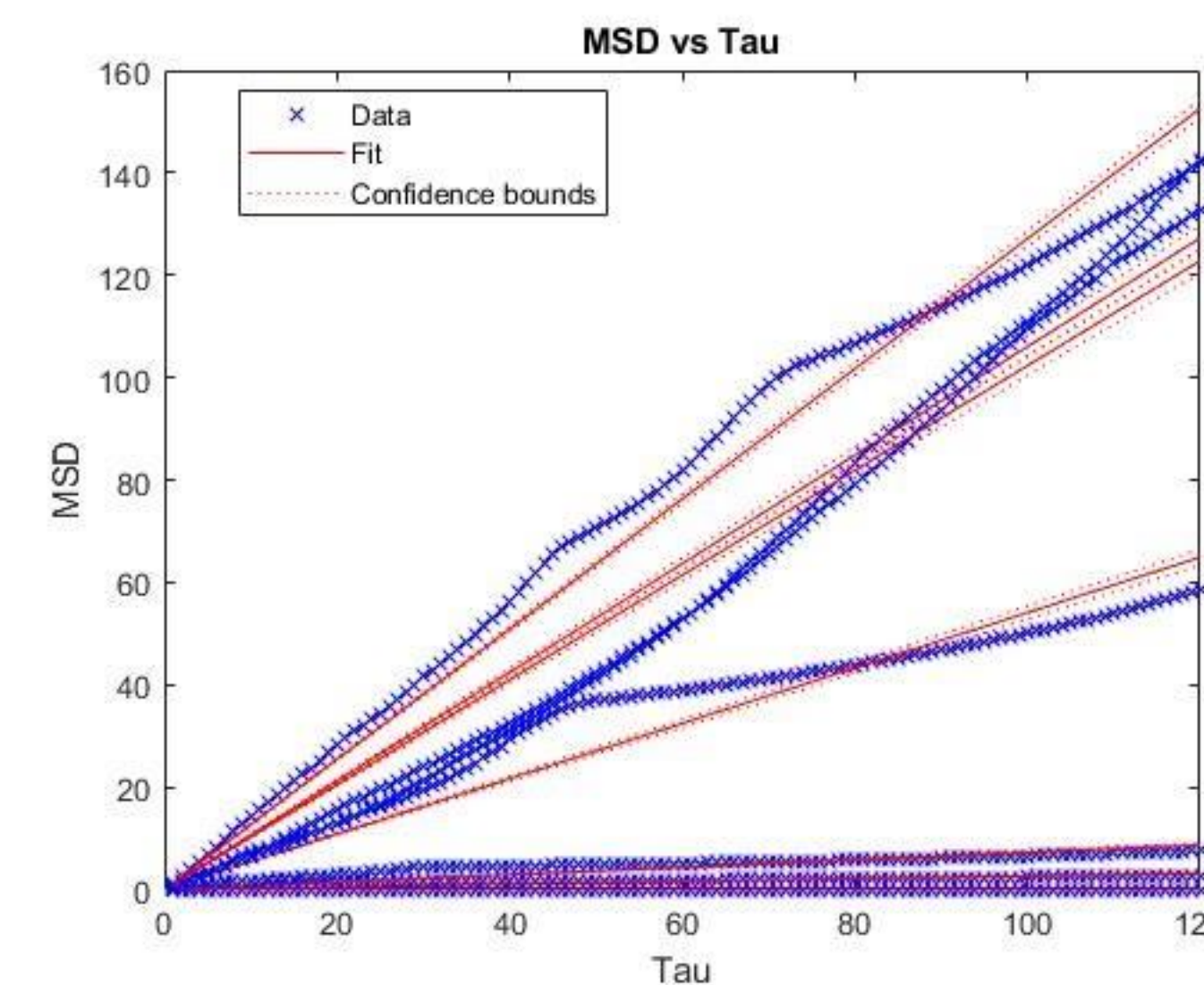


Figure 1: simulation of 15 cells diffusing throughout a 3D matrix environment for five days.

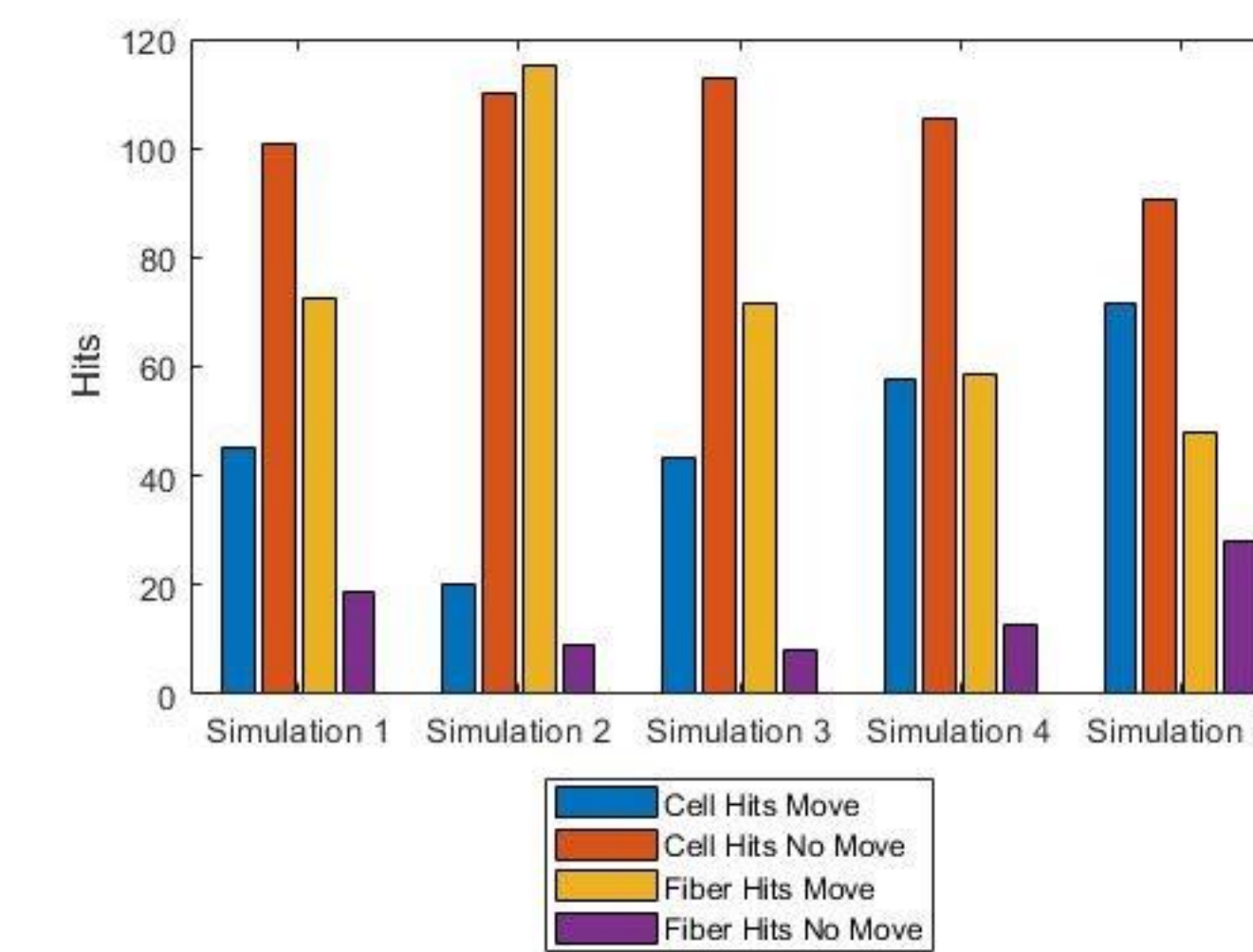


Figure 4: histogram showing five simulations that count the number of cell and fiber hits for cells that move and do not move.

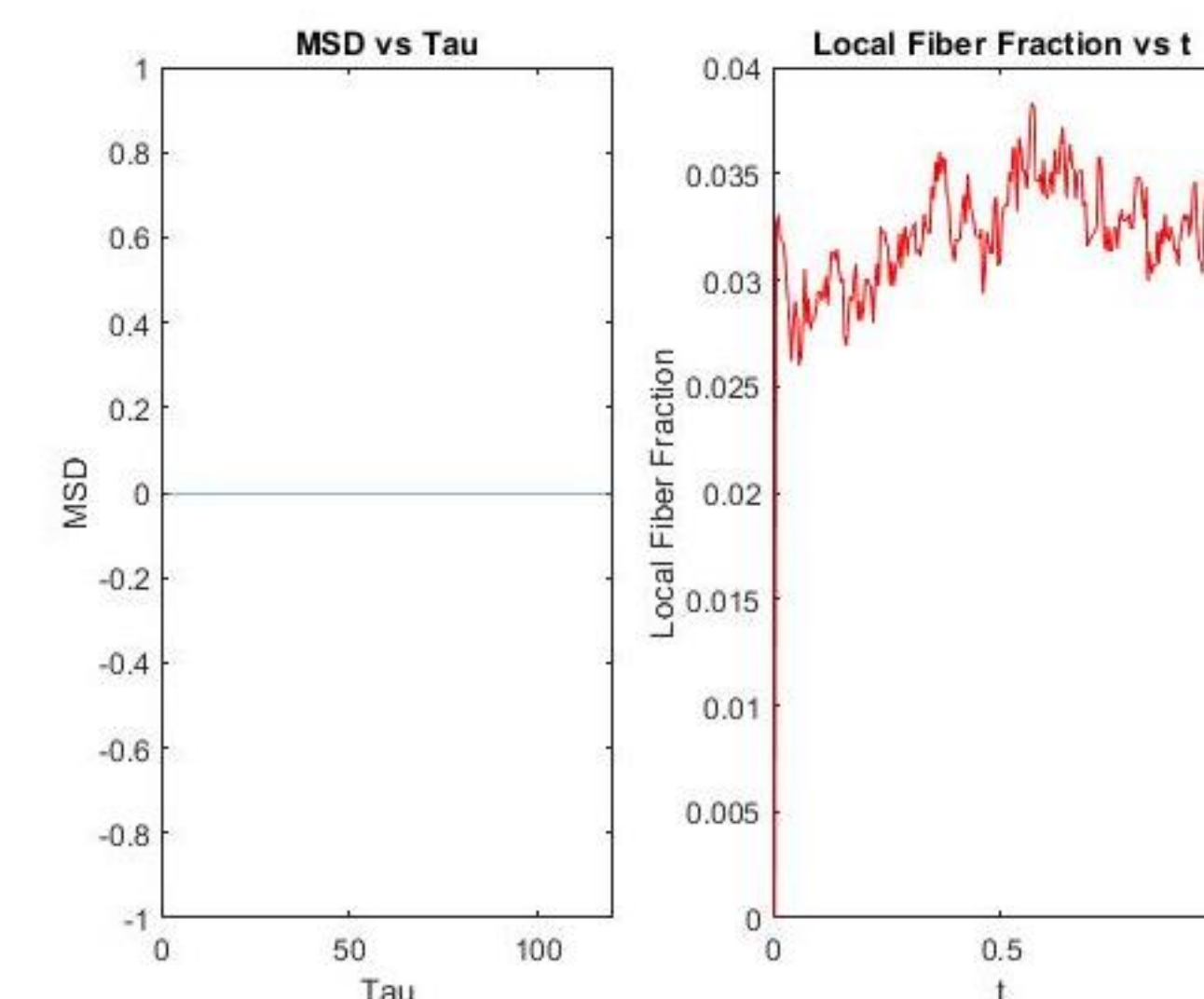


Figure 2: Comparing MSD and fiber fraction versus time for a cell that did not diffuse.

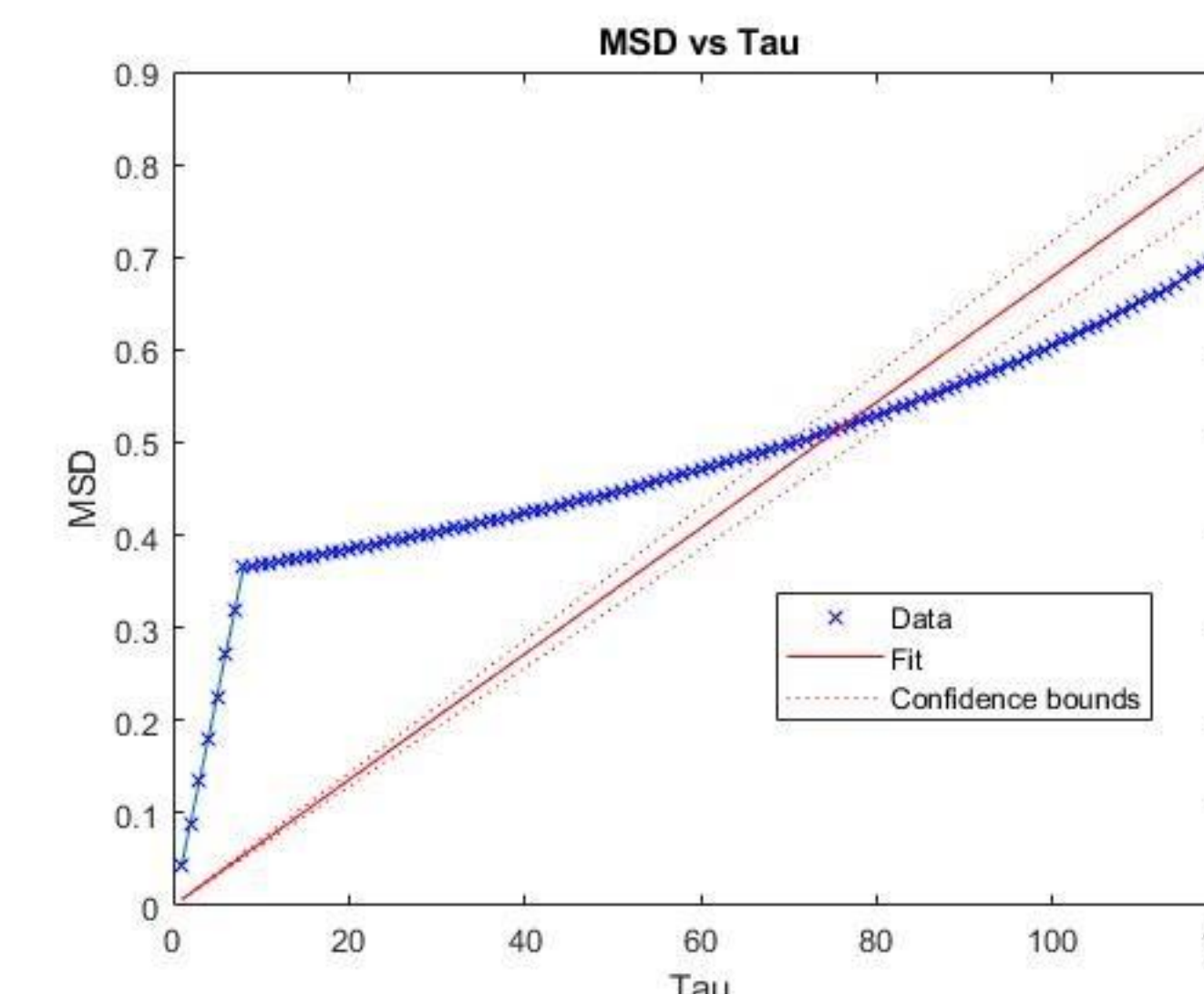


Figure 5: Comparing MSD versus time for a single cell.

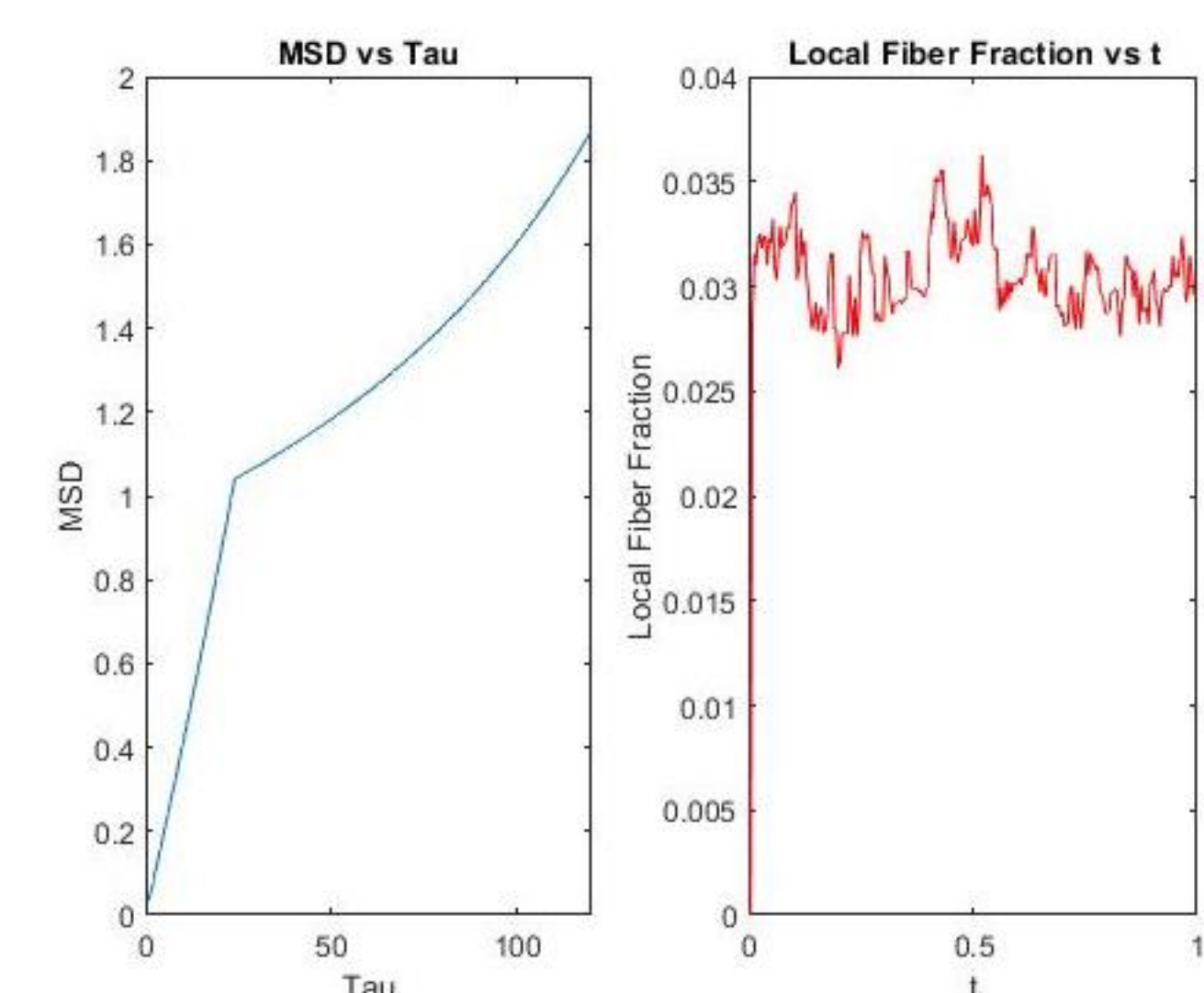


Figure 3: Comparing MSD and fiber fraction versus time for cell that experienced confinement.

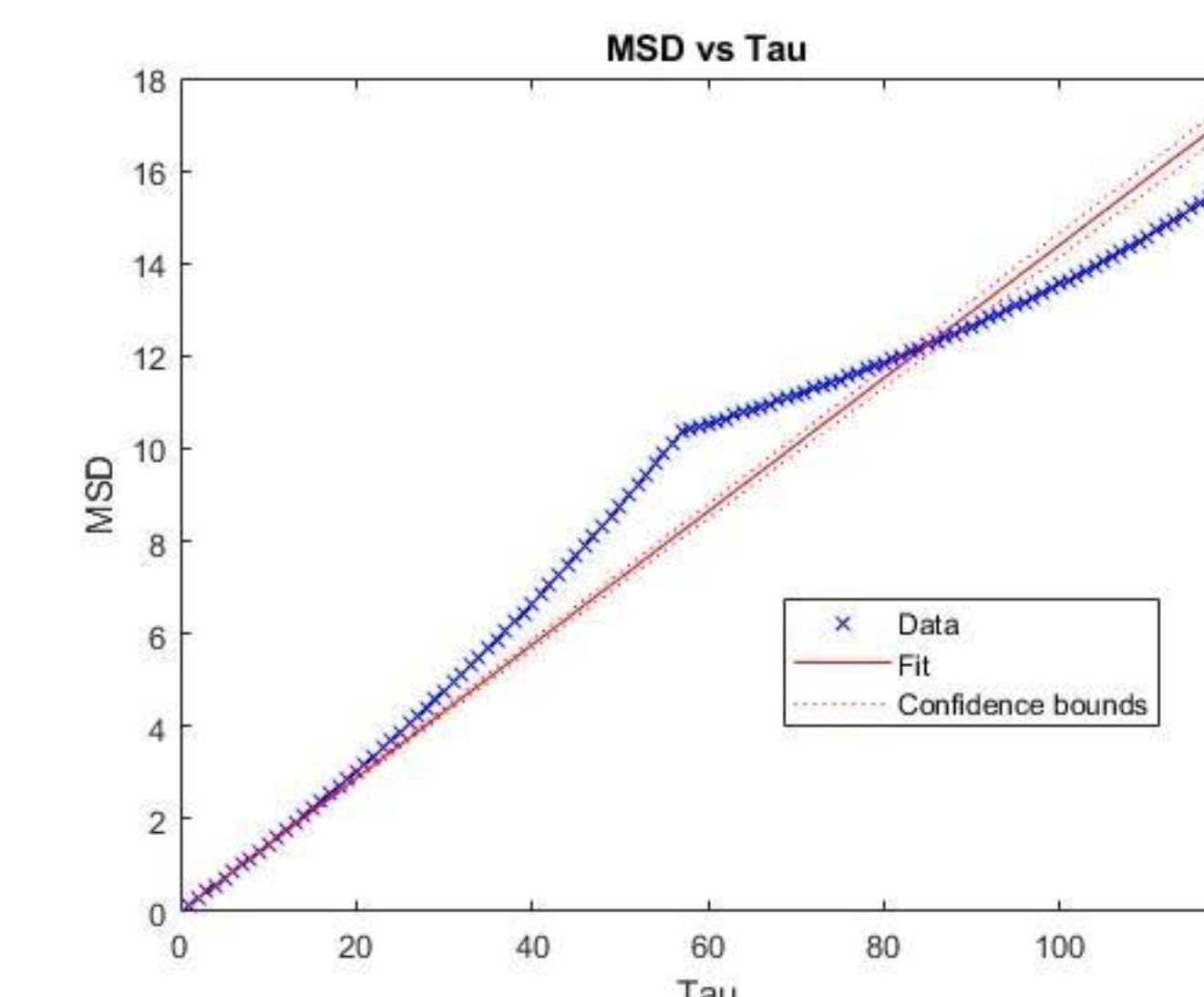


Figure 6: Comparing MSD versus time for a single cell using the updated code.

FUTURE WORK

Literature review

Adjust parameters

Rerun simulations based off new parameters

CONTACT

Author: Nick Evans
Nick.Evans@valpo.edu

Advisor: Bethany Luke
Bethany.Luke@valpo.edu

