PhD Diary February 11th 2019

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Contents

1 TODO Tasks [2/6]

1.1 TODO Follow up on sensitivity analysis

1.2 TODO Network based diffusion

- There's a python library for just this! [6]
- Another nice introduction which can be re-purposed [1]

1.3 TODO Investigate reaction-based diffusion

1.4 DONE Give talk on wheat domestication paper

1.5 DONE Do florescence screening of plants with Jeroen

1.6 TODO Kitagawa et al. [3] compare diffusive results

Table 1: Estimating the fluorescence from figure

ABA um	T H	Cell -2	Cell -1	Cell 0	Cell +1	Cell +2
0	0	0	0	1	0	0
0	14	0.08	0.15	0.3	0.2	0.1
1	0	0	0	1	0	0
1	14	0.08	0.19	0.3	0.23	0.1
5	0	0	0	1	0	0
5	14	0.08	0.23	0.45	0.3	0.1
10	0	0	0	1	0	0
10	14	0.08	0.2	0.6	0.3	0.1
50	0	0	0	1	0	0
50	14	0	0.1	0.8	0.1	0

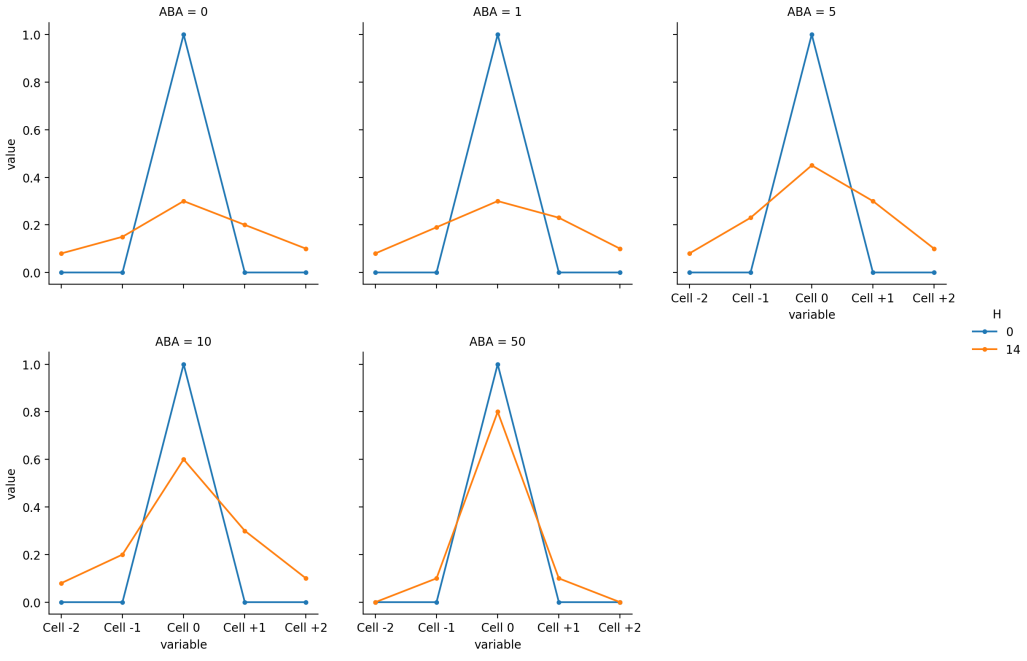

Figure 1: Moss Results

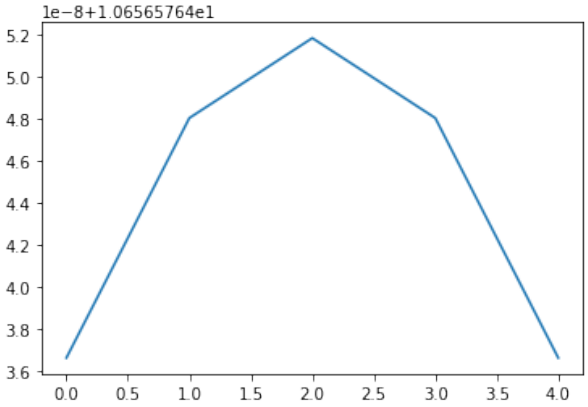

Figure 2: Diffusion at 14hrs

1.7 TODO Kitagawa and Fujita [2], compare diffusive results

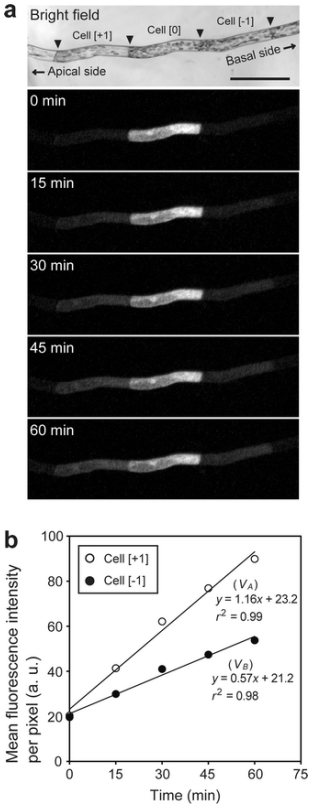

Figure 3: Moss Imaging Example to comapre data to, from [2]

Table 2: Estimating the fluorescence from figure

T	Cell -1	Cell+1
0	20	20
15	25	40
30	40	60
45	45	76
60	50	90

N.B. The paper doesn't mean T_0 is actually that: "The time-lapse imaging was started within 30 min of photoconversion"

1.7.1 This is curious, [2] shows directional behaviour

1.8 TODO ODEs [4]

1.9 TODO For simulations have someone else check units?

1.10 TODO Change solutions to be inter-cellular, not intra

Realisation: I've been focusing on how things move within cells and really what I should focus on is the relationship of the diffusion!

1.11 TODO Seems like an interesting chapter on diffusion equations in bio/chem [5]

References

[1] An Introduction to Graph Theory and Network Analysis (with Python codes), April 2018.

[2] Munenori Kitagawa and Tomomichi Fujita. Quantitative imaging of directional transport through plasmodesmata in moss protonemata via single-cell photoconversion of Dendra2. *Journal of Plant Research*, 126(4): 577–585, July 2013. ISSN 1618-0860. doi: 10.1007/s10265-013-0547-5. 00014.

[3] Munenori Kitagawa, Takumi Tomoi, Tomoki Fukushima, Yoichi Sakata, Mayuko Sato, Kiminori Toyooka, Tomomichi Fujita, and Hitoshi Sakakibara. Abscisic Acid Acts as a Regulator of Molecular Trafficking through Plasmodesmata in the Moss iPhyscomitrella patens/i. *Plant and Cell Physiology*, December 2018. ISSN 0032-0781. doi: 10.1093/pcp/pcy249.

[4] Nykamp, DQ. An introduction to ordinary differential equations - Math Insight. https://mathinsight.org/ordinary_differential_equation_introduction. 00000.

[5] Ianik Plante and Francis A. Cucinotta. Monte-Carlo Simulation of Particle Diffusion in Various Geometries and Application to Chemistry and Biology. *Theory and Applications of Monte Carlo Simulations*, March 2013. doi: 10.5772/53203.

[6] Giulio Rossetti, Letizia Milli, Salvatore Rinzivillo, Alina Sîrbu, Dino Pedreschi, and Fosca Giannotti. NDlib: A python library to model and analyze diffusion processes over complex networks. *International Journal of Data Science and Analytics*, 5(1):61–79, February 2018. ISSN 2364-4168. doi: 10.1007/s41060-017-0086-6. 00004.