

# Diffusion of innovation within an agent-based model: Spinsons, independence and advertising

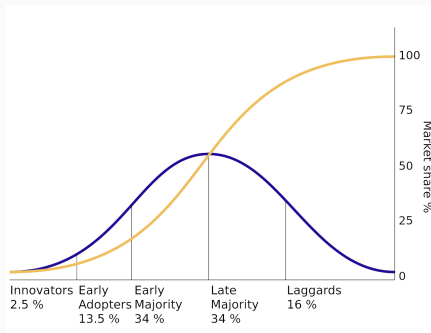
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Maria Kowalczyk, Anna Szymanek, Patryk Wielopolski

Wrocław University of Technology and Science

# Introduction and motivation

Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread.



**Figure 1:** The diffusion of innovations according to E. Rogers. Source: [https://en.wikipedia.org/wiki/Diffusion\\_of\\_innovations#/media/File:Diffusion\\_of\\_ideas.svg](https://en.wikipedia.org/wiki/Diffusion_of_innovations#/media/File:Diffusion_of_ideas.svg)

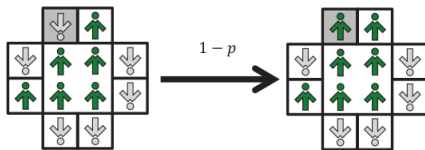
# Diffusion of innovation model

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Model parameters

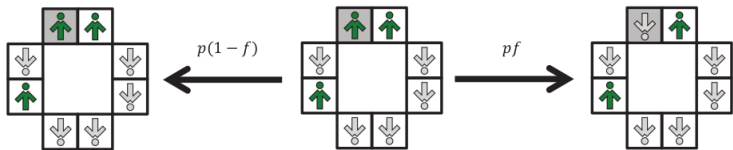
- Conformity  $p$
- Independence  $f$
- Advertising  $h$

# Conformity

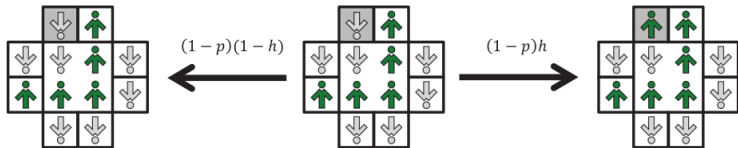


**Figure 2:** Schema of conformity  $p$ . Source: [1].

# Independence

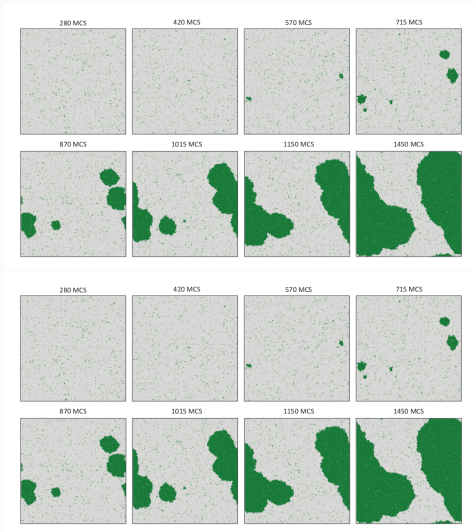


**Figure 3:** Schema of independence  $f$ . Source: [1].



**Figure 4:** Schema of advertising  $h$ . Source: [1].

# 2D Lattice simulation



**Figure 5:** Up - publication; down - ours.



## Concentration in time

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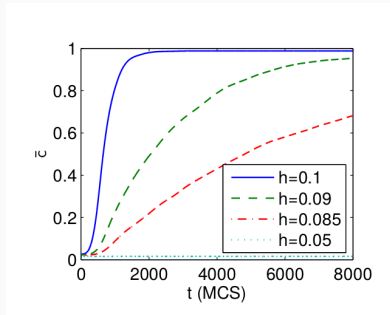
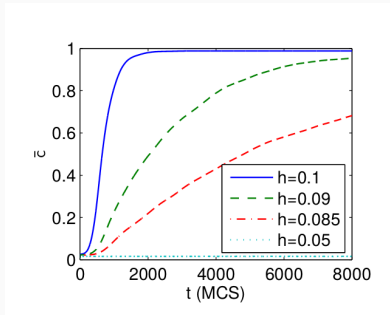
Concentration

$$c_t = \frac{N_{\uparrow}(t)}{N}$$

where

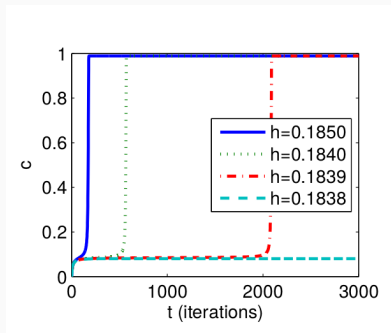
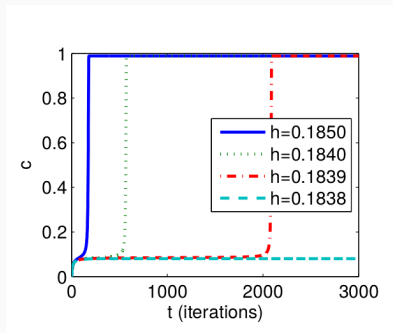
- $N_{\uparrow}(t)$  - number of adopted people, i.e. spinsons with opinion = 1
- $N$  - number of people in network

## 2D Lattice results



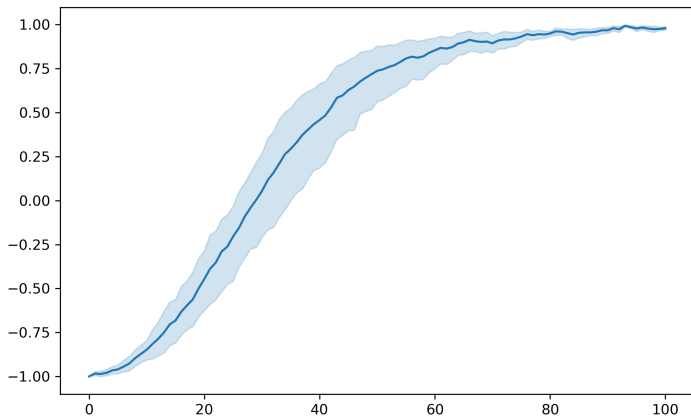
**Figure 6:** Left - publication; right - ours.

# Complete graph results



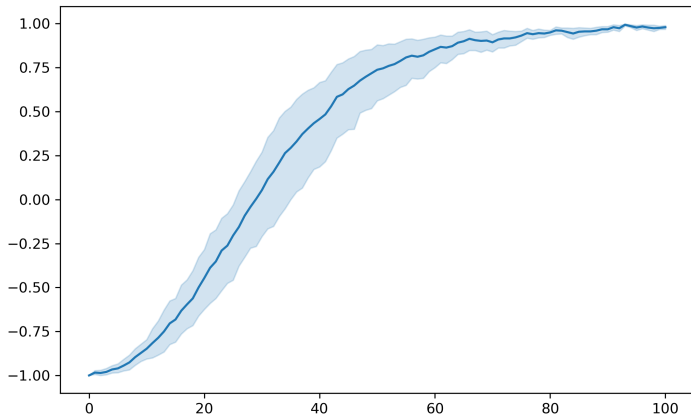
**Figure 7:** Left - publication; right - ours.

# Watts-Strogatz results



**Figure 8:** Our work - simulation.

# Barabasi-Albert results



**Figure 9:** Our work - simulation.

# Comparison of models

## Market penetration level

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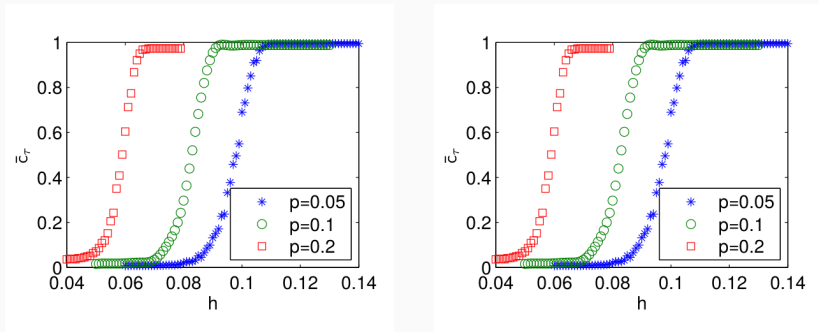


# Valley of death

Valley of death is a metaphor of way from the laboratory to the market when in reality many innovators fail. Contrary to aggregate models, such as Bass model, this kind of phenomena can be explained by agent-based models.

We can observe that phenomenon near the threshold values of  $p$  and  $h$ .

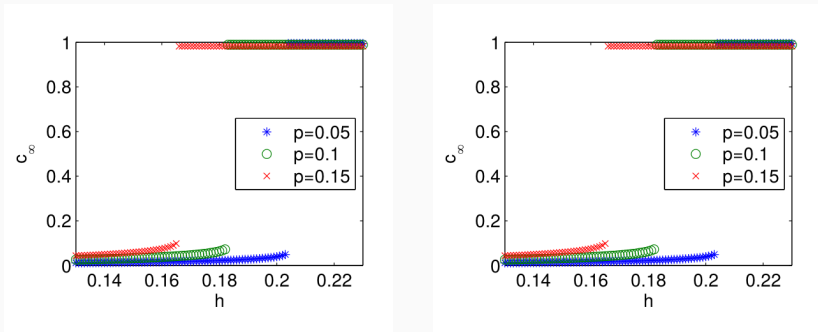
## 2D Lattice results



**Figure 10:** Left - publication; right - ours.

Comparison - Fig. 9 (left) Simulations

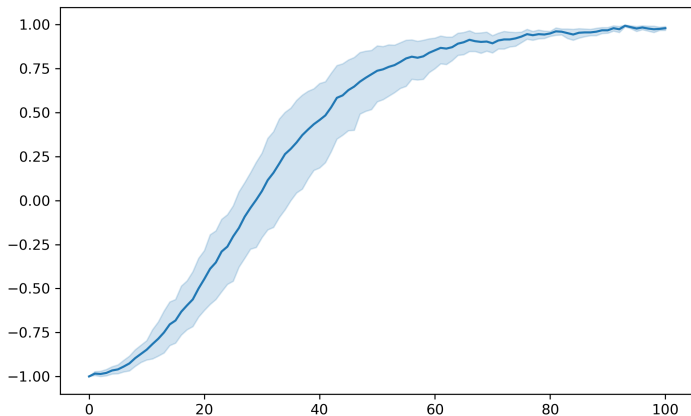
# Complete graph results



**Figure 11:** Left - publication; right - ours.

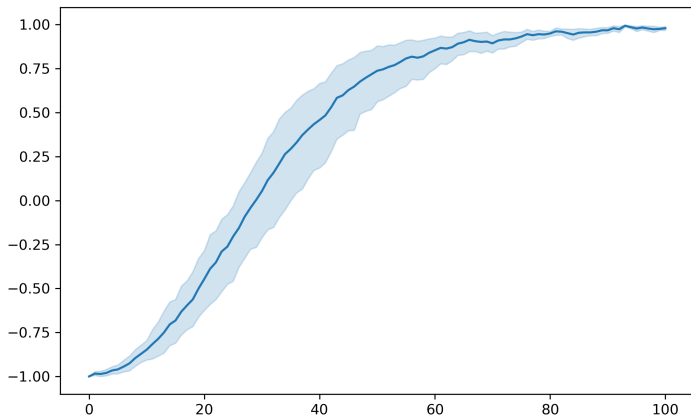
Comparison - Fig. 10 (right) Theoretical results

# Watts-Strogatz results



**Figure 12:** Our work - simulation.

# Barabasi-Albert results



**Figure 13:** Our work - simulation.

# Comparison of models

Try to find universal  $h$

	p		
Graph	0.05	0.1	0.2
2D Lattice grid			
Complete graph			
Watts-Strogatz			
Barabasi-Albert			

# Conclusions

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# Conclusions

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content...



# Contributions

Presentation:

- Patryk Wielopolski

Plots and analysis:

- Maria Kowalczyk
- Anna Szymanek

Simulations:

- Patryk Wielopolski



P. Przybyła, K. Sznajd-Weron, and R. Weron.

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*Advances in Complex Systems*, 17, 04 2014.

Thank you for your attention!