Project 6: Model for the Spread of Infectious Diseases

Carlo von Carnap

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Final project *Computergestütztes wissenschaftliches Rechnen*,
Salvatore R. Manmana

Supervisor: Emily Klass

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1.1 Infectious Disease Modelling

2 Methodology

2.1 Random Number Generator `MT19937`

3 Implementation

3.1 Usage of the Libraries `cvc_numerics.h` and `cvc_rng.h`

3.2 Structure and Workflow of the Main Program

Generation of Random Numers by a Static RNG

Implementation of the Modelling Grid

The above mentioned grid itself is realized as a $(L+2) \times (L+2)$ heap section of integer values, with L being the sidelength of the quadratic grid where the actual spread of the infection takes place. While this section is technically one-dimensional, it will for simplicity reasons be here refered to as a two-dimensional structure of the given shape. Inside the grid, the following integer values have been used to model the different states of the people within the simulation:

- **0:** this person is susceptible S to the infection
- **1:** the person is infected I
- **2:** the person is recovered R and currently not susceptible
- **-1:** the person is vaccinated V and does not participate in the spread

The grid has been implemented with an edge of ghosts at the top, bottom, left and right border, that are neither infectious nor subject to any updates of the grid — they will permanently take the value **0**.

Functions acting on the Modelling Grid

Structure of the Main Function and General Workflow

3.3 Naming of Variables

4 Results and Discussion

4.1 Model for the Spread of Infectious Diseases

4.2 Expected Ratio of Infected People averaged over Time

4.3 Vaccinated People without Participation in the Spread

4.4 Time Evolution of the Expected Ratio of Infected People

While previously the average of the ratio of infected individuals has been taken over time, the focus should now be layed on the time development of th einfection rate $\langle I \rangle_t$ for $N = 20$ samples. As grid size $L = 64$ was chosen for appropriate balance between running time and accuracy, the number of simulation steps again was set to $T = 1000$.

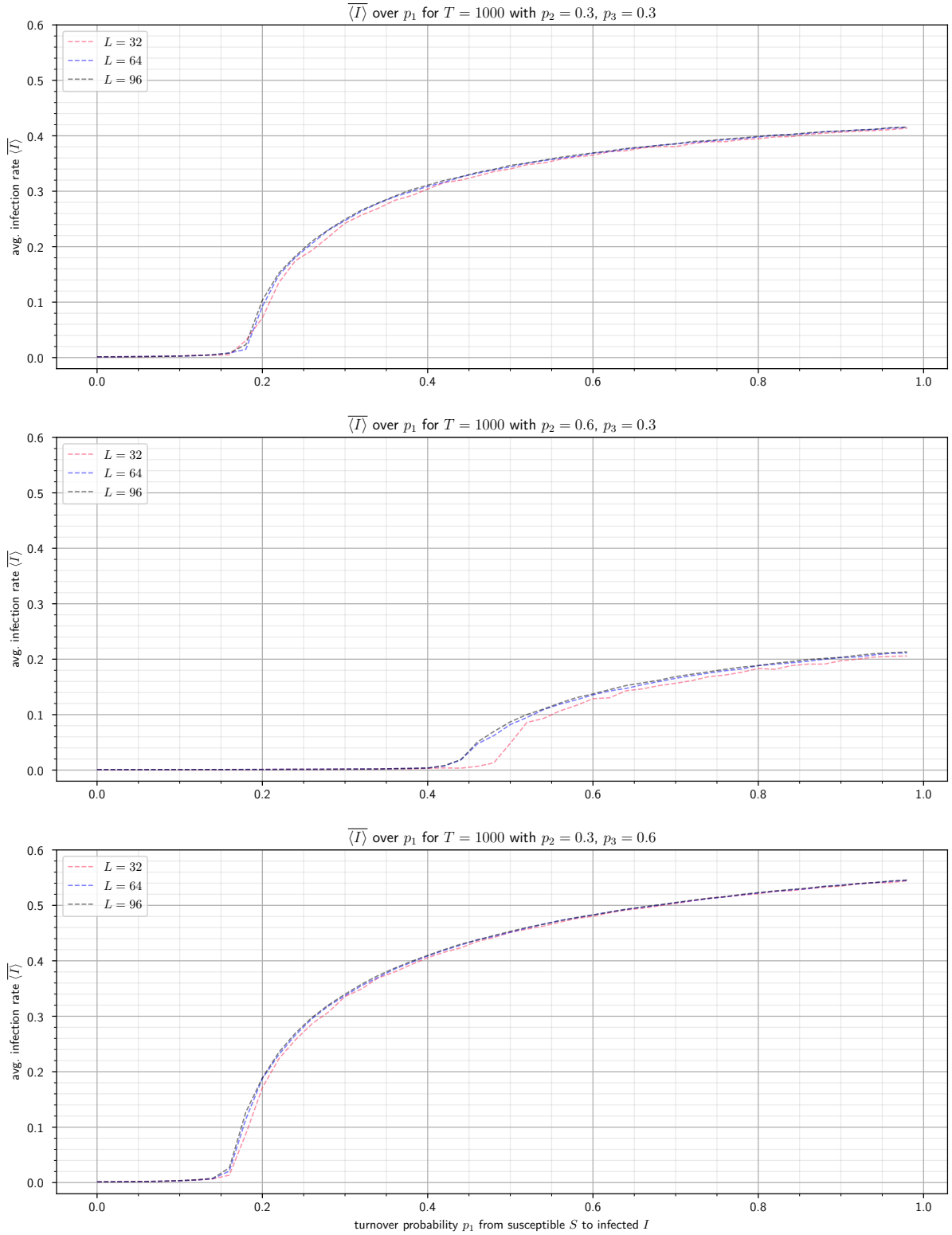

Abbildung 1: Graphic

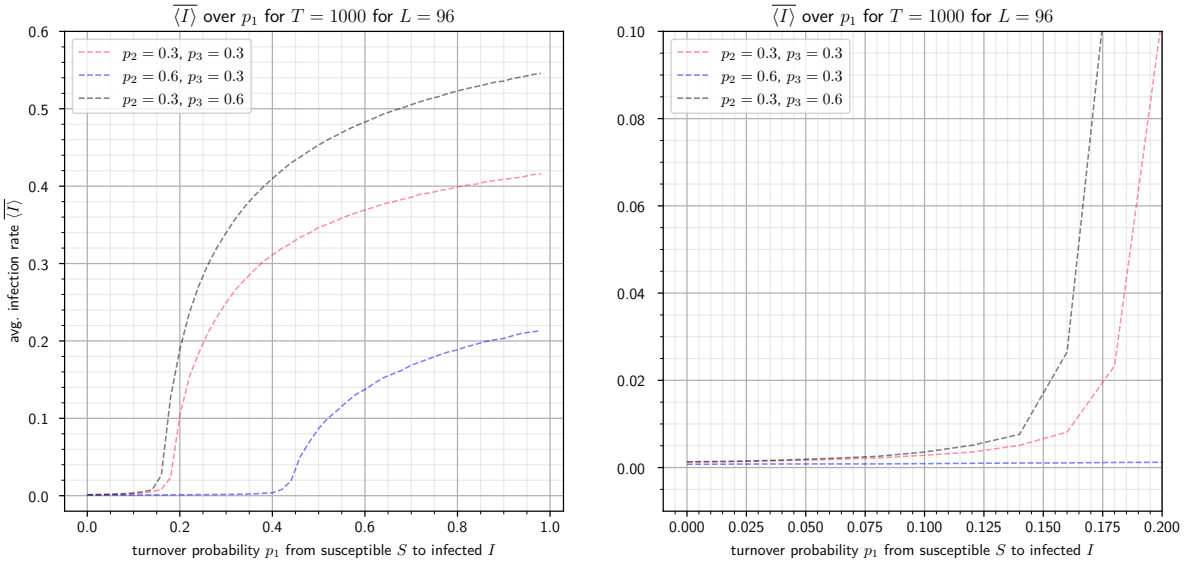

Abbildung 2: Graphic

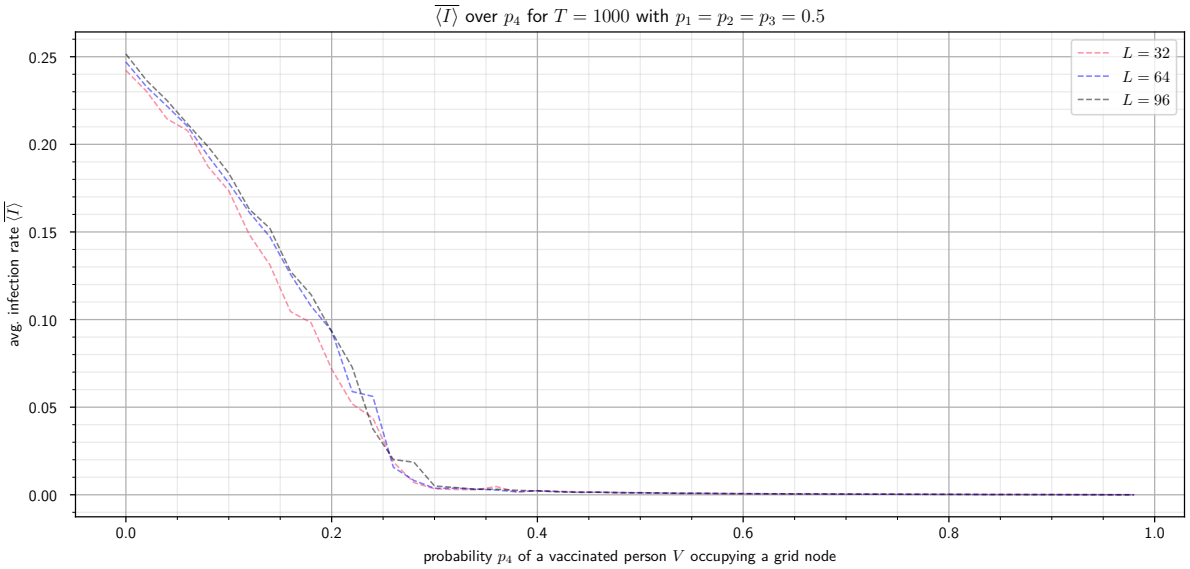

Abbildung 3: Graphic

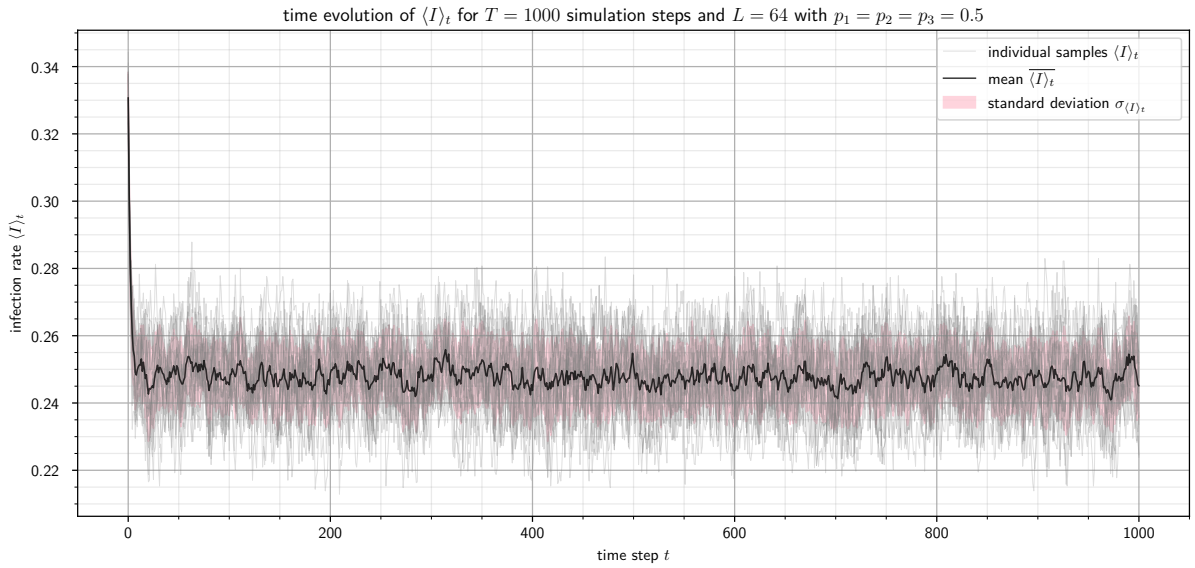

Abbildung 4: Graphic

5 Supplementary Materials