Maria Curie-Skłodowska University in Lublin   Lublin, 11.07.2022
Faculty of Mathematics, Physics and Computer Science

Summary of the doctoral dissertation of Dominika Jasińska
entitled *Markov dynamics on spaces of infinite configurations with marks*
prepared under the supervision of prof. dr hab. Jerzy Kozicki

The purpose of this thesis is to contribute to the development of the mathematical theory of evolution of large populations. This topic is important due to the numerous applications, incl. in biological, social and epidemiology.

This doctoral dissertation consists of six chapters. The first two are devoted to the description of biological and mathematical motivations and the introduction of mathematical theory.
The main results of the dissertation are presented in chapters 3, 4 and 5. They include research on modeling of infinite systems with age structure at the microscopic level. This is one of the first approaches to this issue. The dissertation presents two models given by the Kolmogorov operators. The first model describes the birth and death process, where the formation of a new particle depends on the others already existing in the population. In Chapters 3 and 4, the space is $X = R^d$ and the states are suitable probability measures that have correlation functions. The third chapter contains the solution of the evolution equation for the first and second correlation functions. Then a generalized version of the first model was introduced in which particles appear and disappear independently of each other. The corresponding Fokker-Planck equation was proved to have a global solution, a steady state was found and its temporary ergodicity was shown. In the further part of the work, the second model was considered, when X is a locally compact Polish space. In this case, it is not possible to use methods based on correlation functions. For this reason, appropriate metrics have been introduced in the configuration spaces. Then, the existence of the Markov process was proved, it was shown that the appropriate martingale problem is well posed, the steady state was found and its ergodicity was investigated.

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The results presented in the dissertation are based on the following articles:

1. D. Jasińska *A spatial individual-based contact model with age structure.* Annales Universitatis Mariae Curie-Sklodowska, sectio A–Mathematica, 71(1), (2017) 41
2. D. Jasińska, J. Kozicki *Dynamics of an infinite age-structured particle system.* Mathematical Methods in the Applied Sciences, (2021)
3. D. Jasińska, J. Kozicki *A Markov process for an infinite age-structured population.* Latin American Journal of Probability and Mathematical Statistics 19, (2022) 467-492