

# KADIR HAS UNIVERSITY

## EPIDEMIOLOGY AND PUBLIC HEALTH RESEARCH GROUP (EPIKHAS)

EPIKHAS, Epidemiology and Public Health Research Group of Kadir Has University, aims to develop mathematical models and simulations for the spread of epidemics, early detection of epidemics and vaccination strategies. Our research group in Kadir Has University in Istanbul, Turkey is lead by 3 experts: 1 Professor and 2 Associate Professors in Mathematics, Epidemiology and Data Science. We are aiming to be a regional center for mathematical epidemiology and support graduate students interested in studying and pursuing careers in this area. We have published articles on the time evolution of seasonal epidemics and vaccination strategies, organized a workshop to gather researchers in this area and conducted a research project on the determination of efficient vaccination strategies. Our current research is directed towards early detection of seasonal epidemics and on the evaluation of interventions in homogeneous and age structured societies, with numerical methods.

**Fields of Interest** - We focus on theoretical foundations of the epidemic models, their validation using large volume and variety of data and the determination of optimal vaccination strategies.

**Our Experience** - Our research areas on epidemics consists of the following:

- Determination of the epidemic parameters on incomplete data; robustness and sensitivity of the estimation,
- Efficiency of health care measures and vaccinations strategies,
- Early detection of epidemics based on aggregate data,
- Flooding, partial flooding methods in networks.

**Our research group consists** of successful academicians published in respected journals in the areas of epidemiology, multi-criteria decision making, heuristics, data mining and data fusion. Previously, two of our team members completed a research project about determination of efficient vaccination strategies for influenza type epidemics using genetic algorithms. A team member recently received a significant research grant from National Research Funding Institution of Turkey (TUBITAK) with a project on finite metric spaces and their graph representations. Another team member was a researcher in “EPP2006: NOAA Interdisciplinary Scientific Environmental Technology (ISET) Cooperative Education and Research Center” project in USA, conducting information technology research on data fusion and mining for climate studies.

### Related Publications:

- 1- Bilge, A.H. and F. Samanlıoğlu, “Determination of Epidemic Parameters from Early Phase Fatality Data: A case study of the 2009 A(H1N1) pandemic in Europe”, International Journal of Biomathematics, 11(2), 1850021 (12 pages) (2018).
- 2- Samanlıoğlu, F. and A.H. Bilge, “An Overview of the 2009 A(H1N1) Pandemic in Europe: Efficiency of the Vaccination and Healthcare Strategies”, Journal of Healthcare Engineering, Volume 2016, Article ID 5965836, 13 pages, doi:10.1155/2016/5965836 (2016).
- 3- Bilge, A.H., F. Samanlıoğlu and O. Ergonul, “On the Uniqueness of Epidemic Models Fitting a Normalized Curve of Removed Individuals”, Journal of Mathematical Biology, 71(4), 767-794 (2015).
- 4- Erdogan, M, K. Gunel, T. Koc, H. U. Sokun and T. Dag, "Routing with (p-percent) partial flooding for opportunistic networks," 2010 Future Network & Mobile Summit, Florence, 1-8 (2010).

### Other Targeted Research Projects:

- 1- Bilge, A.H. and F. Samanlıoğlu, T. Dag, “Decision support systems for the prevention of seasonal epidemics”; (National reesearch project proposal).
- 2- Samanlıoğlu, F. and A.H. Bilge, “Determination of Efficient Vaccination Strategies for Influenza Type Epidemics using Genetic Algorithms”, (Journal article in preparation, based on a research project)
- 3- Samanlıoğlu, F. and A.H. Bilge, “Determination of Efficient Vaccination Strategies in an Age Structured Population”, (Journal article in preparation).

**Our role as a partner** - We are interested in taking an active role and collaborate in design, development and implementation phases of potential research projects in these directions. Our expertise is in the area of mathematical characterization and exact and numerical solutions of the differential equation characterizing the spread of epidemics; we are currently incorporating data analysis to mathematical models in the research project “Decision support systems for the prevention of seasonal epidemics” by combining hospital and school data to develop an early warning system for epidemics. We are particularly interested in finding partners in the H2020 calls:

- 1) SC1-BHC-13-2019: Mining big data for early detection of infectious disease threats driven by climate change and other factors
- 2) SC1-BHC-32-2019: Towards a next generation influenza vaccine to protect citizens worldwide – an EU-India collaboration

### **Contact –**

Funda SAMANLIOĞLU, Ph.D.  
fsamanlioglu@khas.edu.tr  
Department of Industrial  
Engineering,  
Kadir Has University

Ayşe Humeyra BİLGE, Ph.D.  
(Mathematics)  
ayse.bilge@khas.edu.tr  
Department  
of Industrial Engineering  
Kadir Has University

Tamer DAĞ, Ph.D.  
tamer.dag@khas.edu.tr  
Department of Computer  
Engineering  
Kadir Has University