RESEARCHER PROFILE

Prof. Shlomo Havlin **EMAIL: HAVLINS@GMAIL.COM**

HORIZON EUROPE TOPIC(S) OF INTEREST:

IHI Call 5, Topic 1: ACCELERATING THE IMPLEMENTATION OF NEW APPROACH METHODOLOGIES AND OTHER INNOVATIVE NON-ANIMAL APPROACHES FOR THE DEVELOPMENT, TESTING AND PRODUCTION OF HEALTH TECHNOLOGIES

CONTRIBUTIONS TOWARD CALL TOPIC

Over the past few decades, I have been focusing on the study of complex systems, developing new models and analytical approaches to better understand and predict phenomena that characterizes complex systems. Over the last few years, with the dramatic increase in the availability of data, my lab focuses in developing and applying complex network theory on real complex systems. One of our main interests is studying physiological systems as a complex interacting system, using novel approaches that we developed. Our expertise in complex networks allowed us to find very important insights, and we believe that with our expertise in network science and our strong connections to vast medical data sources and future medical trials, in Israel and China, we will be able to make a breakthrough in understanding several topics:

1) Cancer and its relations to aging. We have gained a lot of experience in analyzing gene expression data and constructing gene networks, and with our preliminary results we may succeed.
2) Better understanding, diagnose and early detection of brain related diseases. We developed unique network science-based approaches to study brain connectivity and found fascinating network fingerprints of disease in Parkinson, sleep apnea and more.

Our lab has vast experience with European projects.

BRIEF PROFILE

Shlomo Havlin is a Professor in the Physics Department at Bar-Ilan University in Israel. He has carried out fundamental research in applications of statistical physics to areas such as complex networks, infrastructure resilience, geophysics, climate, medicine, biology, and others. Most recently, he has focused on interdependence between infrastructure networks such as the power grid and communications network; and novel methods for understanding traffic congestion in urban settings. Havlin has published over 800 scientific papers and is among the two most cited scientists in Israel with over 100,000 citations and an h-index of 136 (Google Scholar). For his works, he has been awarded the Lilienfeld Prize from the American Physical Society, the Rothschild Prize, the Order of the Star of Italy, and most recently, the Israel Prize for Physics and Chemistry.

RELEVANT PUBLICATIONS

List up to five relevant publications here

1. P. Ch. Ivanov, M. G. Rosenblum, C.-K. Peng, J. Mietus, S. Havlin, H. E. Stanley, A. L. Goldberger, "Scaling behavior of heartbeat intervals obtained by wavelet-based time-series analysis," Nature 383, 323 (1996). (**398** citations)
2. P. Ch. Ivanov, M. G. Rosenblum, L. A. N. Amaral, Z. Struzik, S. Havlin, A. L. Goldberger and H. E. Stanley, "Multifractality in human heartbeat dynamics," Nature 399, 461 (1999). (**1108** citations)
3. A. Bunde, S. Havlin, J. Kantelhardt, T. Penzel, J-H. Peter, K. Voigt, "Correlated and uncorrelated regions in heart-rate fluctuations during sleep," Phys. Rev. Lett. 85, 3736 (2000). (**393** citations)
4. Bashan, A., Bartsch, R., Kantelhardt, J. et al. Network physiology reveals relations between network topology and physiological function. Nat Commun 3, 702 (2012). 24. A Majdandzic et al "Spontaneous recovery in dynamical networks", Nature Physics 10 (1),
5. Asher, E.E., Plotnik, M., Günther, M. et al. Connectivity of EEG synchronization networks increases for Parkinson's disease patients with freezing of gait. Commun Biol4, 1017 (2021). https://doi.org/10.1038/s42003-021-02544-w

Bar-Ilan University
אוניברסיטת בר-אילן

BAR ILAN UNIVERSITY PROFILE

Established in 1955, Bar Ilan University (BIU) is currently one of Israel's largest universities with a total undergraduate and graduate student enrollment of 19,000. With more than 1,600 senior and junior faculty members, BIU has achieved an international reputation for academic and research excellence, especially, but not limited to the fields artificial intelligence, renewable energy, bio-medicine, brain sciences, cancer, cyber security, cognitive sciences, environment, quantum technologies, medicine, archaeology, nanotechnology and advanced materials.

Building on our past and current successes in FP6, FP7, H2020 and ERC projects, BIU is committed to strengthening its research and innovation infrastructure and supporting multidisciplinary innovative research initiatives with its 55 research centers and 60 endowed chairs. In addition, the Bar Ilan Center for Smart Cities and Bar Ilan's Institute of Nanotechnology and Advanced Materials (BINA) are recognized by the EU SMART SPECIALISATION PLATFORM as Digital Innovation Hubs.