ERCIM "ALAIN BENSOUSSAN"
FELLOWSHIP PROGRAMME

Scientific Report

First name / Family name	Amir Mosavi
Nationality	Iran
Name of the *Host Organisation*	NTNU-IDI
First Name / family name of the *Scientific Coordinator*	Prof. Pinar Ozturk
Period of the fellowship	01/10/2017 to 28/09/2018

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

Conducting research in the realm of machine learning. My research strategy has been the investigation and comprehensive review on the trend of advancement in machine learning methods and technologies used in various applications areas such as prediction models.

While machine learning has greatly impacted a wide range of commercial applications, its use in the field of climate data and other earth sciences is still in the early stages. My research served as an up-to-date resource for climate data scientists analysing environmental datasets to answer questions of urgent societal interests. Furthermore, my research aimed at inspiring more computer scientists to focus on environmental applications, and earth scientists

to seek collaborations with researchers in machine learning to advance the frontiers in earth sciences. In this realm the advanced machine learning for climate data provides researchers and practitioners with a broad overview of some of the key challenges in the intersection of earth science, computer science, statistics, and related fields.

My research programme was designed to explore a wide range of topics providing a compilation of recent research in the application of machine learning in the field of climate change, providing an overview of methods to understand and predict the proliferation of biological species due to changes in environmental conditions. In fact, making predictions based on observational data was a theme of the proposed research which includes the use of network science to understand and discover teleconnections in extreme climate and weather events, as well as using structured estimation in high dimensions. Furthermore, the use of ensemble machine learning models to combine predictions of global climate models using information from spatial and temporal patterns was also explored.

The second, and third parts of my research was set to investigate the other research application areas i.e. economics and engineering sciences featuring in depth discussion on statistical downscaling with state-of-the-art scalable machine learning and novel deep learning technologies.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Peer-reviewed journal publications:

1. **Mosavi, A.**, Ozturk, P., and C. Kwok-wing, Flood Forecasting Using Machine Learning Methods (2018), MDPI Journal of Water. Status: under review.
2. Bahmani, A., **Mosavi, A.,** and P. Ozturk, (2018), Energy models for electricity demand prediction using machine learning: a

review. Elsevier Book Chapter in Computational Intelligence Energy Management Systems. Status: submission due Oct 15.

3. Mosavi, A., Ozturk, P., and O. Kisi, (2018), Drought Prediction Using Machine Learning Methods, MDPI Journal of Sustainability. Status: due submission in Sep.
4. Ijadi Maghsoodi, A., Mosavi, A., Ozturk, P., Rabczuk, T., and Kazimieras Zavadskas, E., (2018), Data-driven decision support systems in energy systems: state-of-the-art review. Elsevier Book Chapter in Computational Intelligence Energy. Management Systems. Status: submission due Oct 15.
5. Bahmani, A., Mosavi, A., and P. Ozturk, (2018) Energy consumption prediction using machine learning; a review. MDPI Journal of Energies. Status: due submission in Sep.
6. Hosseini Imani, M., Zalzar, S., Mosavi, A. and Shamshirband, S., 2018. Strategic Behavior of Retailers for Risk Reduction and Profit Increment via Distributed Generators and Demand Response Programs. Energies, 11(6), p.1602. Published.
7. Najafi, B., Faizollahzadeh Ardabili, S., Mosavi, A., Shamshirband, S. and Rabczuk, T., 2018. An Intelligent Artificial Neural Network-Response Surface Methodology Method for Accessing the Optimum Biodiesel and Diesel Fuel Blending Conditions in a Diesel Engine from the Viewpoint of Exergy and Energy Analysis. Energies, 11(4), p.860. Published.
8. Moeini, I., Ahmadpour, M., Mosavi, A., Alharbi, N. and Gorji, N.E., 2018. Modeling the time-dependent characteristics of perovskite solar cells. Solar Energy, 170, pp.969-973. Published.
9. Najafi, B., Faizollahzadeh Ardabili, S., Mosavi, A., Shamshirband, S. and Rabczuk, T., 2018., Using SVM-RSM and ELM-RSM approaches for optimizing the production, MDPI journal of Energies. status: under revision.
10. Using SVM-RSM and ELM-RSM approaches for optimizing the production process of Methyl and Ethyl Esters", for MDPI Journal of Energies: status: accepted.

III – ATTENDED CONFERENCES

Inter-academia conference, attending from September 23 to 27, 2018, taking place at Europa Royale, Kaunas, Lithuania (https://interacademia.ktu.edu/). The Proceedings book is published in the Lecture Notes in Networks and Systems book series (LNNS, volume 53), where I contributed with the two following chapters of mine:

> Chapter 35: A Hybrid Machine Learning Approach for Daily Prediction of Solar Radiation: https://link.springer.com/chapter/10.1007/978-3-319-99834-3_35
> Chapter 31: A Hybrid Neuro-Fuzzy Algorithm for Prediction of Reference Evapotranspiration: https://link.springer.com/chapter/10.1007/978-3-319-99834-3_31

The ERCIM Alain Bensoussan Fellowship programme is well acknowledged in the both chapters.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

Visiting Prof. Andras Benczur on behalf of SZTAKI from May 22 - May 30, 2018.

Prof. Andras Benczur leads an outstanding group of young scientists in the various fields of data science. His group is open for international collaboration and joint development. During my short visit to SZTAKI I could easily get involve and take part in their research

and the group was very welcoming and open to share information and initiate collaboration. SZTAKI is very fast expanding and it is considered as one of the best research institutes in Hungary and also in Europe. I would therefore recommend the new ERCIM fellows to visit this institute to gain world-class training specially in the fields of Big Data, IoT, Machine Learning, Theory of Computing and a Natural Language Technologies.