Machine learning has made great advances in many scientific and industrial applications. One application area that remains largely unexplored is that of animal breeding. Traditional data analysis methods in animal breeding are model-driven. They rely on genetic-based models to predict phenotypic traits. However, modern animal management systems and sensor technologies provide large amounts of data, throughout the lifespan of an animal, that are not suited for genetic analysis. Therefore, data-driven methods are necessary to explore the full potential of this rapidly accumulating data.
In this work, we use the case study of finisher pigs to investigate the benefits of machine learning for modelling the phenotypic variation throughout the lifespan of a pig. Data-driven models are used to combine genetic and non-genetic (phenotypic, environmental) factors for the prediction of growth patterns in finisher pigs. This novel approach is compared to traditional genotype-to-phenotype modelling, and to statistical curve fitting. Moreover, we asses the value of adding phenotypic and environmental data to genetic data for the prediction accuracy of future phenotypes. In addition to that, we establish a methodological framework suitable for future case studies, such as that of dairy cattle.

Scaling analysis of personal solar UVR exposure records

Suzana Blesić1,2,Đorđe Stratimirović3, Jelena Ajtić4, Caradee Wright5,6, Martin Allen7 1University of Belgrade, Institute for Medical Research, Belgrade, Serbia; 2Ca'Foscari University of Venice, Department of Environmenlas Sciences, Informatics and Statistics, Venice, Italy; 3University of Belgrade, Faculty of Dental Medicine, Belgrade, Serbia; 4University of Belgrade, Faculty of Veterinary Medicine, Belgrade, Serbia; 5South African Medical Research Council, Environment & Health Unit, Pretoria,

Personal sun exposure measurements provide important information to guide the development of sun awareness and disease prevention campaigns. We have investigated scaling properties of personal solar ultraviolet radiation exposure (pUVR) records using the Wavelet Transform (WT) spectral analysis. Personal UVR recordings were collected by UVR monitors designed to measure erythemal (or sunburning) UVR and calculate daily erythemal pUVR exposures. We have analyzed sun exposure recordings of school children, farmers, marathon runners and outdoor workers in South Africa, and outdoor workers and work site supervisors in New Zealand.
We found scaling behavior in all the analysed pUVR datasets. We found that the observed pUVR scaling changes from uncorrelated to long-range correlated with increasing duration of sun exposure. Peaks in the WT spectra that we found suggest the existence of characteristic times in sun exposure behavior that were to some extent universal across our dataset. Our study also showed that scaling measures enable group classification, as well as distinction between individual UVR exposures, otherwise unattainable by conventional statistical methods. In cases of continuous personal daily exposure, associated with high daily exposure indexes, the scaling analysis proved able to differentiate the high dose UVR exposure behavior from the continuous low risk outdoor behavior.

References:

1. S Blesic, Dj Stratimirovic, J Ajtic, C Wright, M Allen (2016) Novel approach to analysing large datasets of personal sun exposure measurements. Submitted to Journal of Exposure Science and Environmental Epidemiology.
2. V Nurse, CY Wright, M Allen, RL McKenzie (2015) Solar Ultraviolet Radiation Exposure of South African Marathon Runners during Competition Marathon Runs and Training Sessions: A Feasibility Study. Photochem. Photobiol. 91, 971.
3. CY Wright, M Makgabutlane (2015) Real-time measurement of outdoor worker's exposure to solar ultraviolet radiation in Pretoria, South Africa. South African Journal of Science 5, 111.
4. B Køster, JSøndergaard, JB Nielsen, M Allen, M Bjerregaard, A Olsen, JBentzen (2015) Feasibility of smartphone diaries and personal dosimeters to quantitatively study exposure to ultraviolet radiation in a small national sample. Photoderm.Photoimmun.Photomed. (In Press): 1.

Multiplex Inference from Co-occurrences

Stefan Pickl (*), Maximilian Moll – Universität der Bundeswehr München

In recent years a very popular approach is modelling complex networks as multiplex networks. These are multi-layered networks with replica of each node in every layer. One of the key practical problems with complex networks is learning their structure. One approach for single layer networks is based on co-occurrences, i.e. the knowledge which nodes occur on paths through the network but not in which order. In this paper we extend the methodology to be applicable to multiplex networks. First results will be presented and embedded in the context of citation and transport networks.

References:

M. Nistor, M. Zsifkovits, S. Meyer-Nieberg, S. Pickl; Passenger Pattern Recognition in Railway Stations using Quantitative Network Analysis, 2016
M.Nistor, M. Dehmer, S. Pickl; Network Exploratory Analysis on Subway Transportation Systems against Complex Threats Including a Human Factors Perspective, 2015
D. Lozovanu, S. Pickl; Determining the optimal strategies for discrete control problems on stochastic networks with discounted costs, 2015