

## Záznamy vložené do ASEP za UI (1. 6. – 30. 6. 2023)

### New ICS records in ASEP (1. 6. – 30. 6. 2023)

0573025 - ÚI 2024 RIV GB eng J - Journal Article

**Havlík, M. - Hlinka, Jaroslav - Klírová, M. - Adámek, P. - Horáček, J.**

Towards causal mechanisms of consciousness through focused transcranial brain stimulation. *Neuroscience of Consciousness*. Roč. 2023, č. 1 (Apr 21), č. článku niad008. E-ISSN 2057-2107

**R&D Projects:** GA MZd(CZ) NU20-04-00147

**Institutional support:** RVO:67985807

**Keywords :** brain stimulation \* causal explanation \* consciousness \* excitation \* geodesic transcranial electric neuromodulation \* inhibition \* mechanisms of consciousness \* neural correlates of consciousness \* transcranial electric stimulation

**Method of publishing:** Open access

<https://dx.doi.org/10.1093/nc/niad008>

[DOI: 10.1093/nc/niad008](https://doi.org/10.1093/nc/niad008)

Conscious experience represents one of the most elusive problems of empirical science, namely neuroscience. The main objective of empirical studies of consciousness has been to describe the minimal sets of neural events necessary for a specific neuronal state to become consciously experienced. The current state of the art still does not meet this objective but rather consists of highly speculative theories based on correlates of consciousness and an ever-growing list of knowledge gaps. The current state of the art is defined by the limitations of past stimulation techniques and the emphasis on the observational approach. However, looking at the current stimulation technologies that are becoming more accurate, it is time to consider an alternative approach to studying consciousness, which builds on the methodology of causal explanations via causal alterations. The aim of this methodology is to move beyond the correlates of consciousness and focus directly on the mechanisms of consciousness with the help of the currently focused brain stimulation techniques, such as geodesic transcranial electric neuromodulation. This approach not only overcomes the limitations of the correlational methodology but will also become another firm step in the following science of consciousness.

**Permanent Link:** <https://hdl.handle.net/11104/0343554>

0572922 - ÚI 2024 DE J - Journal Article

**Hůnová, I. - Brabec, Marek - Malý, Marek**

Ambient ozone at a rural Central European site and its vertical concentration gradient close to the ground.

*Environmental Science and Pollution Research*. Online 08 June 2023 (2023). ISSN 0944-1344. E-ISSN 1614-7499

**R&D Projects:** GA MŠk(CZ) LM2018122; GA MŠk LM2023030

**Institutional support:** RVO:67985807

**Keywords :** Ground-level ozone \* Vertical profile \* Czech Republic \* Košetice \* 2015–2021 \* GAM

**OECD category:** Statistics and probability

**Impact factor:** 5.190, year: 2021

**Method of publishing:** Limited access

<https://dx.doi.org/10.1007/s11356-023-28016-8>

[DOI: 10.1007/s11356-023-28016-8](https://doi.org/10.1007/s11356-023-28016-8)

The representativeness of ambient air quality of an in situ measurement is key in the use and correct interpretation of the measured concentration values. Though the horizontal representativeness aspect is generally not neglected in air pollution studies, a detailed, high-resolution vertical distribution of ambient air pollutant concentrations is rarely addressed. The aim of this study is twofold: (i) to explore the vertical distribution of ground-level ozone (O<sub>3</sub>) concentrations measured at four heights above the ground—namely at 2, 8, 50, and 230 m—and (ii) to examine in detail the vertical O<sub>3</sub> concentration gradient in air columns between 2 and 8, 8 and 50, and 50 and 230 m above the ground. We use the daily mean O<sub>3</sub> concentrations measured continuously at the Košetice station, representing the rural Central European background ambient air quality observed during 2015–2021. We use the semiparametric GAM (generalised additive model) approach (with complexity or roughness-penalised splines implementation) to analyse the data with sufficient flexibility. Our models for both O<sub>3</sub> concentrations and O<sub>3</sub> gradients use (additive) decomposition into annual trend and seasonality (plus an overall intercept). The seasonal and year-to-year patterns of the modelled O<sub>3</sub> concentrations look very similar at first glance. Nevertheless, a more detailed look through O<sub>3</sub> gradients shows that they differ substantially with respect to their seasonal and long-term dynamics. The vertical O<sub>3</sub> concentration gradient in 2–230 m is not uniform but changes substantially with increasing height and shows by far the highest dynamics near the ground between 2 and 8 m, differing in both the seasonal and annual aspects for all the air columns inspected. We speculate that non-linear changes of both seasonal and annual components of vertical O<sub>3</sub> gradients are due to atmospheric-terrestrial interactions and to meteorological factors, which we will explore in a future study.

**Permanent Link:** <https://hdl.handle.net/11104/0343447>

0573133 - ÚI 2024 RIV SK eng J - Journal Article

**Bezák, B. - Snopek, P. - Tóthová, L. - Jajcay, Nikola - Mojto, V. - Farský, Š. - Gmitterová, K. - Krivošík, M. - Stanková, S. - Duraníková, O. - Kollárová, M. - Petříková, K. - Böhm, A.**

Plasmatic apelin shows a promising potential as a screening biomarker for atrial fibrillation.

*Bratislavske Lekarske Listy*. Roč. 124, č. 5 (2023), s. 368-372. ISSN 0006-9248. E-ISSN 1336-0345

**Institutional support:** RVO:67985807

**Keywords :** biomarker \* apelin \* arrhythmia \* atrial fibrillation

**Impact factor:** 1.564, year: 2021

**Method of publishing:** Open access

[https://dx.doi.org/10.4149/BLL\\_2023\\_056](https://dx.doi.org/10.4149/BLL_2023_056)

[DOI: 10.4149/BLL\\_2023\\_056](https://doi.org/10.4149/BLL_2023_056)

**OBJECTIVES:** Purpose of this study was to evaluate properties of apelin, a peptide detectable in peripheral blood, for atrial fibrillation (AF) detection in a diverse population of patients covering a broad spectrum from healthy to polymorbid patients. **BACKGROUND:** AF is the most common cardiac arrhythmia with constantly increasing incidence and prevalence. Currently available diagnostic tools do not provide sufficient detection rate. Large proportion of patients with AF remains undiagnosed and the possibility of screening at-risk groups would be significantly beneficial. **METHODS:** We designed this study as a multi-centre retrospective study. Study population included 183 patients. 64 in non-AF and 119 in AF group. **RESULTS:** Apelin plasma concentration was significantly lower in AF group compared to non-AF group ( $p < 0.001$ ). Receiver operating characteristic analysis of apelin as a predictor of AF scored area under the curve of 0.79, sensitivity = 0.941 and specificity = 0.578. Multivariate analysis using logistic regression adjusted for age, BMI, apelin, dilated LV, dilated LA, arterial hypertension, and gender showed only apelin and age to be statistically significant contributors for AF. **CONCLUSION:** Apelin might be a promising biomarker for detecting AF in our study population. These results suggest promising potential of apelin as a screening biomarker for AF (Tab. 2, Fig. 1, Ref. 46).

**Permanent Link:** <https://hdl.handle.net/11104/0343599>

0572576 - ÚI 2024 GB eng J - Journal Article

**Kůrková, Věra - Sanguineti, M.**

Approximation of Classifiers by Deep Perceptron Networks.

*Neural Networks*. Roč. 165, August 2023 (2023), s. 654-661. ISSN 0893-6080. E-ISSN 1879-2782

**R&D Projects:** GA ČR(CZ) GA22-02067S

**Institutional support:** RVO:67985807

**Keywords :** Approximation by deep networks \* Probabilistic bounds on approximation errors \*

Random classifiers \* Concentration of measure \* Method of bounded differences \* Growth functions

**OECD category:** Computer sciences, information science, bioinformatics (hardware development to be 2.2, social aspect to be 5.8)

**Impact factor:** 9.657, year: 2021

**Method of publishing:** Limited access

<https://dx.doi.org/10.1016/j.neunet.2023.06.004>

[DOI: 10.1016/j.neunet.2023.06.004](https://doi.org/10.1016/j.neunet.2023.06.004)

We employ properties of high-dimensional geometry to obtain some insights into capabilities of deep perceptron networks to classify large data sets. We derive conditions on network depths, types of activation functions, and numbers of parameters that imply that approximation errors behave almost deterministically. We illustrate general results by concrete cases of popular activation functions: Heaviside, ramp sigmoid, rectified linear, and rectified power. Our probabilistic bounds on approximation errors are derived using concentration of measure type inequalities (method of bounded differences) and concepts from statistical learning theory.

**Permanent Link:** <https://hdl.handle.net/11104/0343221>

0573030 - ÚI 2024 DE eng J - Journal Article

**Brož, J. - Brabec, Marek - Krollová, P. - Fačkovcová, L. - Michalec, J.**

HbA1c screening for the diagnosis of diabetes.

*Diabetologia*. Online 23 May 2023 (2023). ISSN 0012-186X. E-ISSN 1432-0428

**Institutional support:** RVO:67985807

**Impact factor:** 10.460, year: 2021

**Method of publishing:** Limited access

<https://dx.doi.org/10.1007/s00125-023-05924-5>

[DOI: 10.1007/s00125-023-05924-5](https://doi.org/10.1007/s00125-023-05924-5)

We read with great interest the study by Young et al [1] on the impact of population-level HbA1c screening on reducing diabetes diagnostic delay in middle-aged adults. Based on HbA1c levels among UK Biobank participants aged 40–70 years, 1% of 166,846 participants were found to have undiagnosed diabetes. The median time to clinical diagnosis for those with undiagnosed diabetes was 2.2 years.

**Permanent Link:** <https://hdl.handle.net/11104/0343556>

0572702 - ÚI 2024 RIV eng J - Journal Article

**May, M. - Sedlák, V. - Pecen, Ladislav - Příbáň, V. - Buchvald, P. - Fiedler, J. - Vaverka, M. - Lipina, R. - Reguli, S. - Malík, J. - Netuka, D. - Beneš, V.**

Role of risk factors, scoring systems, and prognostic models in predicting the functional outcome in meningioma surgery: multicentric study of 552 skull base meningiomas.

*Neurosurgical Review*. Roč. 46, č. 1 (2023), č. článku 124. ISSN 0344-5607. E-ISSN 1437-2320

**Institutional support:** RVO:67985807

**Keywords :** Meningioma \* Skull base \* Surgery \* Outcomes \* Karnofsky Performance Status Scale \* Predictive factors

**Impact factor:** 2.800, year: 2021

**Method of publishing:** Open access

<https://dx.doi.org/10.1007/s10143-023-02004-5>

[DOI: 10.1007/s10143-023-02004-5](https://doi.org/10.1007/s10143-023-02004-5)

Despite the importance of functional outcome, only a few scoring systems exist to predict neurologic outcome in meningioma surgery. Therefore, our study aims to identify preoperative risk factors and develop the receiver operating characteristics (ROC) models estimating the risk of a new postoperative neurologic deficit and a decrease in Karnofsky performance status (KPS). A multicentric study was conducted in a cohort of 552 consecutive patients with skull base meningiomas who underwent surgical resection from 2014 to 2019. Data were gathered from clinical, surgical, and pathology records as well as radiological diagnostics. The preoperative predictive factors of functional outcome (neurologic deficit, decrease in KPS) were analyzed in univariate and multivariate stepwise selection analyses. Permanent neurologic deficits were present in 73 (13.2%) patients and a postoperative decrease in KPS in 84 (15.2%). Surgery-related mortality was 1.3%. A ROC model was developed to estimate the probability of a new neurologic deficit (area 0.74; SE 0.0284; 95% Wald confidence limits (0.69; 0.80)) based on meningioma location and diameter. Consequently, a ROC model was developed to predict the probability of a postoperative decrease in KPS (area 0.80; SE 0.0289; 95% Wald confidence limits (0.74; 0.85)) based on the patient's age, meningioma location, diameter, presence of hyperostosis, and dural tail. To ensure an evidence-based therapeutic approach, treatment should be founded on known risk factors, scoring systems, and predictive models. We propose ROC models predicting the functional outcome of skull base meningioma resection based on the age of the patient, meningioma size, and location and the presence of hyperostosis and dural tail.

**Permanent Link:** <https://hdl.handle.net/11104/0343310>

0573230 - ÚŽFG 2024 RIV NL eng J - Journal Article

**Tejkalová, H. - Jakob, L. - Kvasnová, Simona - Klaschka, Jan - Sechovcová, Hana - Mrázek, Jakub - Páleníček, T. - Olša Fliegerová, Kateřina**

The influence of antibiotic treatment on the behavior and gut microbiome of adult rats neonatally insulted with lipopolysaccharide.

*Heliyon*. Roč. 9, č. 4 (2023), č. článku e15417. ISSN 2405-8440. E-ISSN 2405-8440

**R&D Projects:** GA MZd(CZ) NV17-31852A

**Institutional support:** RVO:67985904 ; RVO:67985807

**Keywords :** rats \* lipopolysaccharide \* antibiotics \* behavior \* microbiome

**OECD category:** Microbiology; Neurosciences (including psychophysiology (UIVT-O))

**Impact factor:** 3.776, year: 2021

**Method of publishing:** Open access

<https://www.sciencedirect.com/science/article/pii/S2405844023026245?via%3Dihub#sec5>

[DOI: 10.1016/j.heliyon.2023.e15417](https://doi.org/10.1016/j.heliyon.2023.e15417)

The present study investigated whether neonatal exposure to the proinflammatory endotoxin lipopolysaccharide (LPS) followed by an antibiotic (ATB)-induced dysbiosis in early adulthood could induce neurodevelopmental disorders-like behavioral changes in adult male rats. Combining these two stressors resulted in decreased weight gain, but no significant behavioral abnormalities were observed. LPS treatment resulted in adult rats' hypoactivity and induced anxiety-like behavior in the social recognition paradigm, but these behavioral changes were not exacerbated by ATB-induced gut dysbiosis. ATB treatment seriously disrupted the gut bacterial community, but dysbiosis did not affect locomotor activity, social recognition, and acoustic reactivity in adult rats. Fecal bacterial community analyses showed no differences between the LPS challenge exposed/unexposed rats, while the effect

of ATB administration was decisive regardless of prior LPS exposure. ATB treatment resulted in significantly decreased bacterial diversity, suppression of Clostridiales and Bacteroidales, and increases in Lactobacillales, Enterobacteriales, and Burkholderiales. The persistent effect of LPS on some aspects of behavior suggests a long-term effect of early toxin exposure that was not observed in ATB-treated animals. However, an anti-inflammatory protective effect of ATB cannot be assumed because of the increased abundance of pro-inflammatory, potentially pathogenic bacteria (*Proteus*, *Suttrella*) and the elimination of the bacterial families Ruminococcaceae and Lachnospiraceae, which are generally considered beneficial for gut health.

**Permanent Link:** <https://hdl.handle.net/11104/0343699>

0572578 - ÚI 2024 GB eng J - Journal Article

**SzÁková, J. - Stiborová, H. - Mercl, F. - Solomon Hailegnaw, N. - Lhotka, M. -**

**Derevyankina, T. - Sekhar Paul, Ch. - Taisheva, A. - [Brabec, Marek](#) - Tlustoš, P. ...** Total 12 authors

Woodchips biochar versus bone char in a one-year model soil incubation experiment: the importance of soil/char pH alteration on nutrient availability in soil.

*Journal of Chemical Technology and Biotechnology*. Online 2 May 2023 (2023). ISSN 0268-2575. E-ISSN 1097-4660

**Institutional support:** RVO:67985807

**Keywords :** biochar \* bone char \* incubation experiment \* soil–biochar interaction \* nutrient mobility

**OECD category:** Statistics and probability

**Impact factor:** 3.709, year: 2021

**Method of publishing:** Open access

<https://dx.doi.org/10.1002/jctb.7421>

[DOI: 10.1002/jctb.7421](https://doi.org/10.1002/jctb.7421)

**BACKGROUND:** Biochars have become one of the most intensively and extensively investigated soil amendment materials in terms of their production, application and fate in the soil because of benefits such as increased soil quality and fertility. Biochar from woodchips and bone char from meat bone waste from a poultry slaughterhouse were prepared at 300 and 500 °C and then thoroughly mixed with two soils (Cambisol and Luvisol) that differed in their physicochemical parameters in ratios of 2% and 5% (w/w). **RESULTS:** The impact of bone and biochar amendments on nutrient availability was assessed during a one-year model laboratory experiment. The feedstock origin and pyrolysis temperature affected the prepared materials' physical properties and nutrient (Ca, Cu, K, Mg, Mn, P, S, Zn) availability. With increasing temperature, the structure of woodchip biochar changed from macroporous to microporous, and bone char changed from non-porous to mesoporous. However, when mixed with soil, the biochar-derived change in soil pH was revealed to be the most crucial parameter affecting soil nutrient mobility. Of all the tested elements, only Cu, Fe and Zn were unaffected by biochar addition. Furthermore, temporal changes in element mobility during incubation were also elucidated. **CONCLUSION:** The changes over time in element mobility indicated that soil properties were more important than bone and biochar characteristics.

**Permanent Link:** <https://hdl.handle.net/11104/0343222>

0572921 - ÚI 2024 RIV CA eng J - Journal Article

**VlasÁková, M. - Mužík, J. - Holubová, A. - Fiala, D. - Arsand, E. - Urbanová, J. - Janíčková ŹďÁrská, D. - [Brabec, Marek](#) - Brož, J.**

A Telemedicine System Intervention for Patients With Type 1 Diabetes: Pilot Feasibility Crossover Intervention Study.

*JMIR Formative Research*. Roč. 7 (2023), č. článku e35064. ISSN 2561-326X

**Institutional support:** RVO:67985807

**Keywords :** diabetes mellitus \* diabetes \* telemedicine \* telemedicine system \* mobile health \* mHealth \* telemonitoring \* quality of life \* telehealth \* compensation \* evaluation \* intervention \* feasibility

**OECD category:** Statistics and probability

**Method of publishing:** Open access

<https://dx.doi.org/10.2196/35064>

[DOI: 10.2196/35064](https://doi.org/10.2196/35064)

**BACKGROUND:** Today's diabetes-oriented telemedicine systems can gather and analyze many parameters like blood glucose levels, carbohydrate intake, insulin doses, and physical activity levels (steps). Information collected can be presented to patients in a variety of graphical outputs. Despite the availability of several technical means, a large percentage of patients do not reach the goals established in their diabetes treatment. **OBJECTIVE:** The objective of the study was to evaluate the benefits of the Diani telemedicine system for the treatment of patients with type 1 diabetes mellitus. **METHODS:** Data were collected during a 24-week feasibility study. Patients responded to the World Health Organization Quality of Life – BREF (WHOQOL-BREF) questionnaire and a system evaluation questionnaire. The level of glycated hemoglobin (HbA1c) and the patient's body weight were measured, and the patient's use of the telemedicine system and their daily physical activity level were monitored. All data were sent from the patient's device to the Diani server using a real-time diabetes diary app. Wilcoxon and Friedman tests and the linear mixed effects method were used for data analysis. **RESULTS:** This study involved 10 patients (men: n=5; women: n=5), with a mean age of 47.7 (SD 19.3) years, a mean duration of diabetes of 10.5 (SD 8.6) years, and a mean HbA1c value of 59.5 (SD 6.7) mmol/mol. The median number of days the patients used the system was 84. After the intervention, the mean HbA1c decreased by 4.35 mmol/mol ( $P=.01$ ). The patients spent 18.6 (SD 6.8) minutes on average using the app daily. After the intervention, the number of patients who measured their blood glucose level at least 3 times a day increased by 30%. The graphical visualization of the monitored parameters, automatic transmission of measured data from the glucometer, compatibility, and interconnection of individual devices when entering data were positively evaluated by patients. **CONCLUSIONS:** The Diani system was found to be beneficial for patients with type 1 diabetes mellitus in terms of managing their disease. Patients perceived it positively; it strengthened their knowledge of diabetes and their understanding of the influences of the measured values on the management of their disease. Its use had a positive effect on the HbA1c level.

**Permanent Link:** <https://hdl.handle.net/11104/0343446>

0573246 - ÚI 2024 RIV US eng J - Journal Article

**Fabián, Zdeněk**

Score correlation.

*Research in Statistics*. Roč. 1, č. 1 (2023), č. článku 2216686. E-ISSN 2768-4520

**Institutional support:** RVO:67985807

**Keywords :** correlation \* skewed distributions \* heavy-tailed distributions \* scalar-valued scores

**OECD category:** Statistics and probability

**Method of publishing:** Open access

<https://dx.doi.org/10.1080/27684520.2023.2216686>

[DOI: 10.1080/27684520.2023.2216686](https://doi.org/10.1080/27684520.2023.2216686)

Based on the new concept of the scalar-valued score function of continuous distributions we introduce the score correlation coefficient "tailored" to the assumed probabilistic model. By means of simulation experiments we show that it can reveal association of skewed heavy-tailed distributions with high kurtosis.

**Permanent Link:** <https://hdl.handle.net/11104/0343716>

0572706 - ÚI 2024 CZ cze J - Journal Article

[Klaschka, Jan](#)

K osmdesátinám Zdeňka Fabiána.

[On the 80th Birthday of Zdeněk Fabián.]

*Informační bulletin České statistické společnosti*. Roč. 34, č. 1 (2023), s. 3-5. ISSN 1210-8022

**Institutional support:** RVO:67985807

**Method of publishing:** Open access

Redakce IB mě požádala o několik slov u příležitosti životního jubilea Zdeňka Fabiána. Rád vyhovím, jen jaksi po svém.

**Permanent Link:** <https://hdl.handle.net/11104/0343314>

0572707 - ÚI 2024 CZ cze J - Journal Article

[Fabián, Zdeněk](#)

Dvě poznámky k Honzově písničce.

[Two Notes on Honza's Song.]

*Informační bulletin České statistické společnosti*. Roč. 34, č. 1 (2023), s. 6-17. ISSN 1210-8022

**Institutional support:** RVO:67985807

**Method of publishing:** Open access

V článku popisují cestu k nové metodě inference založené na zjištění, že ke každé spojité náhodné veličině lze přiřadit náhodnou veličinu s významem relativního vlivu pozorování na konstrukci typické hodnoty rozdělení. Odtud plyne nový popis standardních rozdělení, snadno zobecnitelný pro parametrická rozdělení a použitelný pro řešení statistických úloh.

In the paper the way to a new paradigm in probabilistic and statistical reasoning is described. The new paradigm is based on the finding that a scalar-valued score random variable expressing relative influence of items generated from the distribution of  $X$  with respect to its typical value can be assigned to any continuous univariate random variable  $X$ . The approach leads to a new description of standard distributions. The methodology is generalized for parametric families and used for solutions of some estimation problems.

**Permanent Link:** <https://hdl.handle.net/11104/0343315>

0573359 - ÚI 2024 CH eng C - Conference Paper (international conference)

[Šíma, Jiří](#) - [Cabessa, Jérémie](#)

Energy Complexity of Fully-Connected Layers (to appear).

*Proceedings of the IWANN 2023 Seventeenth International Work-Conference on Artificial Neural Networks (INPRINT)*, (2023)

**R&D Projects:** GA ČR(CZ) GA22-02067S

**Institutional support:** RVO:67985807

**Keywords :** Convolutional neural networks \* Energy complexity \* Dataflow

The energy efficiency of processing convolutional neural networks (CNNs) is crucial for their deployment on low-power mobile devices. In our previous work, a simplified theoretical hardware-independent model of energy complexity for CNNs has been introduced. This model has been experimentally shown to asymptotically fit the power consumption estimates of CNN hardware implementations on different platforms. Here, we pursue the study of this model from a theoretically perspective in the context of fully-connected layers. We present two dataflows and compute their associated energy costs to obtain upper bounds on the optimal energy. Using the weak duality theorem, we further prove a matching lower bound when the buffer memory is divided into two fixed parts for inputs and outputs. The optimal energy complexity for fully-connected layers in the case of partitioned buffer ensues. These results are intended to be generalized to the case of convolutional layers.

**Permanent Link:** <https://hdl.handle.net/11104/0343823>

0573373 - ÚI 2024 eng C - Conference Paper (international conference)

[Šíma, Jiří](#) - [Vidnerová, Petra](#) - [Mrázek, V.](#)

Energy Complexity Model for Convolutional Neural Networks (to appear).

*Proceedings of the ICANN 2023 Thirty-Second International Conference on Artificial Neural Networks (INPRINT). 2023*

**R&D Projects:** GA ČR(CZ) GA22-02067S

**Institutional support:** RVO:67985807

**Keywords :** Convolutional neural networks \* Energy complexity \* Dataflow

The energy efficiency of hardware implementations of convolutional neural networks (CNNs) is critical to their widespread deployment in low-power mobile devices. Recently, a plethora of methods have been proposed providing energy-optimal mappings of CNNs onto diverse hardware accelerators. Their estimated power consumption is related to specific implementation details and hardware parameters, which does not allow for machine-independent exploration of CNN energy measures. In this paper, we introduce a simplified theoretical energy complexity model for CNNs, based on only two-level memory hierarchy that captures asymptotically all important sources of power consumption of different CNN hardware implementations. We calculate energy complexity in this model for two common dataflows which, according to statistical tests, fits asymptotically very well the power consumption estimated by the Time/Accelergy program for AlexNet-like network on the Simba and Eyeriss hardware platforms. The model opens the possibility of proving principal limits on the energy efficiency of CNN hardware accelerators.

**Permanent Link:** <https://hdl.handle.net/11104/0343835>

0573183 - ÚI 2024 FR eng A - Abstract

[Paluš, Milan](#)

Big whirles and small whirles talk to each other: detecting cross-scale information flow.

*Brest Workshop on Environmental Physics and Signal Processing: Program.* Brest, 2023. s. 3-3.

[EPSP2023 : Brest Workshop on Environmental Physics and Signal Processing 2023. 19.06.2023-21.06.2023]

**Institutional support:** RVO:67985807

[https://eps2023.sciencesconf.org/data/pages/Program\\_EPSP2023.pdf](https://eps2023.sciencesconf.org/data/pages/Program_EPSP2023.pdf)

Big whirles have little whirles that feed on their velocity,  
and little whirles have lesser whirles and so on to viscosity.

These famous words written in 1922 by Lewis Fry Richardson have become inspiration for intensively developing scientific field studying scales of climate variability and their interactions. In spite of ever growing interest in this research area, there is still need for developing efficient methodologies to diagnose the scale-to-scale energy or other physical quantities fluxes to characterize such flows quantitatively, e.g., in their strength, direction, etc. In this contribution we would like to introduce the methodology able to identify causal relations and information transfer between dynamical processes on different time scales and even quantify the effect of such causal influences. Moreover, in macroscopic systems the information transfer is tied to the transfer of mass and energy. The detection of cross-scale causal interactions starts with a wavelet (or other scale-wise) decomposition of a multi-scale signal into quasi-oscillatory modes of a limited bandwidth, described using their instantaneous phases and amplitudes. Then their statistical associations are tested in order to search interactions across time scales. An information-theoretic formulation of the generalized, nonlinear Granger causality uncovers causal influence and information transfer from large-scale modes of climate variability, characterized by time scales from years to almost a decade, to regional temperature variability on short time scales. In particular, a climate oscillation with the period around 7-8 years has been identified as a factor influencing variability of surface air temperature (SAT) on



shorter time scales. Its influence on the amplitude of the SAT annual cycle was estimated in the range 0.7-1.4oC, while its strongest effect was observed in the interannual variability of the winter SAT anomaly means where it reaches 4-5oC in central European station and reanalysis data. In the dynamics of El Nio-Southern Oscillation, three principal time scales - the annual cycle (AC), the quasi-biennial (QB) mode(s) and the low-frequency (LF) variability - and their causal network have been identified. Recent results show how the phases of ENSO QB and LF oscillations influence amplitudes of precipitation variability in east Asia in the annual and QB scales.

**Permanent Link:** <https://hdl.handle.net/11104/0343641>

0573178 - ÚI 2024 CZ eng A - Abstract

**Matonoha, Ctirad - Papáček, Štěpán**

Bohl-Marek Formulation of the Nonlinear System of ODEs for a Class of Mathematical Models With Conservation Laws.

*ODAM 2023 Book of Abstracts*. Olomouc: Department of Mathematical Analysis and Applications of Mathematics, Faculty of Science, Palacký University Olomouc, 2023. s. 51-52.

[ODAM 2023: Olomoucian Days of Applied Mathematics. 12.06.2023-14.06.2023, Olomouc]

**Institutional support:** RVO:67985807 ; RVO:67985556

[https://odam.upol.cz/soubory/ODAM\\_2023\\_Book\\_of\\_abstracts.pdf](https://odam.upol.cz/soubory/ODAM_2023_Book_of_abstracts.pdf)

Our study presents an application of one special technique, further called the Bohl- Marek formulation, related to the mathematical modeling of biochemical networks with mass conservation properties. Nonlinear cooperative systems possessing certain conservation laws, arising frequently in biology and chemistry, were studied by Erich Bohl and Ivo Marek in different papers [1], [2]. The conservation law guarantees a lot of mathematical properties, e.g. the existence and uniqueness results, the positivity of the solutions (for positive inputs), periodicity and controllability, or proposing a stability theorem. These properties are consequence of the fact that the underlying nonlinear dynamical systems describing a class of biochemical networks are built up of linear evolutions with negative M-matrices whose entries depend on the dynamical variables of the other subsystems involved. Thus, the nonlinearity of the whole system is created via this dependence, i.e., the matrix of the complete system is blockwise diagonal. On a case study, namely the Michaelis-Menten enzyme-catalyzed reaction with a substrate transport chain [3], we show how to transform the system of nonlinear ODEs into a set of smaller, quasi-linear subsystems of ODEs with negative M- matrices. For the two model formulations, the classical nonlinear formulation and the quasi-linear Bohl-Marek formulation, we determine and compare the results and show the computational advantages of the latter formulation.

**Permanent Link:** <https://hdl.handle.net/11104/0343637>

0572674 - ÚI 2024 US eng A - Abstract

**Květoňová, V. - Geletič, Jan - Brabec, Marek - Šimáček, P. - Lehnert, M.**

Cell phone based application for exploring thermal perception in urban areas: case of Prague-Holešovice district.

*23rd International Congress of Biometeorology - Abstract Book - Posters..* Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 12-12.

[International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]

**R&D Projects:** GA TA ČR(CZ) TO01000219

**Institutional support:** RVO:67985807

**OECD category:** Meteorology and atmospheric sciences

[https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023\\_Abstracts\\_Posters2.pdf](https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023_Abstracts_Posters2.pdf)

Manifestation of climate change together with increasing urbanization call for more efficient solutions in urban planning. Most of the studies regarding thermal comfort research are based mainly on thermal conditions. Nevertheless, according to the human-oriented paradigm it becomes apparent that thermal comfort is largely affected by mental component which is usually neglected. In this contribution, we introduce a simple cell phone (based) application, which provides reporting of actual thermal sensation vote of a control group of respondents and presents first results for Prague-Holešovice district (Czech Republic) which can be further analyzed statistically in context of several other recorded and simulated environmental as well as mental factors. First results revealed arterial roads and exposed concrete areas as mental hotspots. Results also suggest that particular areas including a peninsula with a river port, a waterfront or one of the parks were perceived differently than we could expect. Eventual findings of this study ought to be taken into account, together with the thermal exposure, in planning effective heat stress reduction measures in urban areas.

**Permanent Link:** <https://hdl.handle.net/11104/0343282>

0572669 - ÚI 2024 US eng A - Abstract

**Belda, M. - Geletič, Jan - Kopp, J. - Brabec, Marek - Jurek, M. - Květoňová, V. - Pánek, J.**  
Could mental maps help to improve thermal comfort and reduce heat stress in urban areas? A case study of three Central European cities.

*23rd International Congress of Biometeorology - Abstract Book – Monday, May 15.* Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 21-21.

[International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]

**R&D Projects:** GA TA ČR(CZ) TO01000219

**Institutional support:** RVO:67985807

**OECD category:** Meteorology and atmospheric sciences

[https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023\\_Abstracts\\_MonMay15.pdf](https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023_Abstracts_MonMay15.pdf)

With increasing urbanization and climate change, citizens are more frequently exposed to heat stress. In the current pragmatists' discourse, efforts to adapt cities to deteriorating climate conditions should reflect not only the objective (physical) effect of the proposed measures, but also citizens' preferences, which influence the perception schemata and mental image of a place. This study employs the approach of mental mapping to identify mental hotspots and coldspots in three Central European cities. Personal behavioral adaptation measures and citizens' preferences for measures ameliorating thermal comfort in thermally uncomfortable areas are further analyzed. Mental maps can be used to improve thermal comfort and reduce heat stress by helping people navigate through the city in ways that minimize their exposure to excess heat. Mental mapping can also facilitate improvement of thermal comfort and reduction of heat stress by helping people locate and access resources that provide relief from the heat, such as public fountains, parks, or air-conditioned buildings. Mental maps allow us to identify and prioritize areas of the city that are most in need of interventions to improve thermal comfort and reduce heat stress. Results of our case study show that the most preferred measures are trees and parks and a combination of greenery with blue elements. Other measures, such as temporary greenery, green roofs and facades, exterior shading elements, water spraying and misting, and street sprinkling, are substantially less frequently proposed. However, there are spatial differences between the preferred measures, which we will analyze statistically. It turns out that it will be important to reflect these relationships in effective heat stress mitigation strategies and urban planning.

**Permanent Link:** <https://hdl.handle.net/11104/0343280>

0572673 - ÚI 2024 RIV US eng A - Abstract

**Belda, M. - Resler, Jaroslav - Geletič, Jan - Krč, Pavel - Maronga, B. - Sühning, M. - Kurppa, M. - Kanani-Sühning, F. - Fuka, V. - Eben, Kryštof - Benešová, N.**

Simple and complex measures for improvement of urban thermal comfort: an LES modeling study. *23rd International Congress of Biometeorology - Abstract Book – Monday, May 15*. Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 12-12.

[International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]

**R&D Projects:** GA TA ČR(CZ) TO01000219

**Institutional support:** RVO:67985807

**Keywords :** sensitivity \* biometeorology \* large-eddy simulation \* mitigation \* PALM

**OECD category:** Meteorology and atmospheric sciences

[https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023\\_Abstracts\\_MonMay15.pdf](https://biomet23.asu.edu/wp-content/uploads/sites/25/2023/05/ICB2023_Abstracts_MonMay15.pdf)

ZÁKLADNÍ ÚDAJE: 23rd International Congress of Biometeorology - Abstract Book – Monday, May 15. Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 20-20.

[International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]. ABSTRAKT:

Thermal comfort of city dwellers is at the forefront of the urban studies especially in connection with climate change. Urban planners are considering various measures to improve thermal comfort in the cities, ranging from very simple (like painting surfaces bright to reflect more solar radiation) to very complex (changing the entire urban configurations with more green and blue infrastructure). In this study a complex micro-scale modeling system PALM featuring an advanced urban model was used to analyze micro-climate sensitivity with respect to potential UHI mitigation measures in a densely built-up typical residential area in Prague, Czech Republic. The use of an integrated modeling system allowed the analysis of the effects both on physical variables and biometeorological indicators or indices (MRT, PET or UTCI).. Two types of scenario simulations were designed. First, a set of simple scenarios was performed, changing individual surface and material parameters such as albedo or emissivity. These showed the highest sensitivity to changes of surface parameters used in radiation balance equations. Second, a set of scenarios was designed to assess the limits of effects of commonly considered complex UHI mitigation measures such as adding tree alleys or introducing water channels in the streets. In this case, urban greenery is confirmed to be the most effective measure, especially when considering both physical indicators and biometeorological indices. Comparing the two sets showed that the simple measures are not as effective and in some cases can lead to adverse effects, e.g. painting surfaces white lead to a decrease of air temperature but at the same time worse thermal comfort at the pedestrian level due to more radiation being reflected back to the street canyon.

**Permanent Link:** <https://hdl.handle.net/11104/0343281>

0572667 - ÚI 2024 RIV US eng A - Abstract

**Geletič, Jan - Lehnert, M. - Krč, Pavel - Resler, Jaroslav - Krüger, E.**

Sky view factor and its effects on thermal comfort in realistic urban environment.

*23rd International Congress of Biometeorology - Abstract Book – Monday, May 15*. Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 20-20.

[International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]

**R&D Projects:** GA TA ČR(CZ) TO01000219

**Institutional support:** RVO:67985807

**Keywords :** sky view factor \* biometeorology \* large-eddy simulation \* PALM

**OECD category:** Meteorology and atmospheric sciences

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ZÁKLADNÍ ÚDAJE: 23rd International Congress of Biometeorology - Abstract Book – Monday, May 15. Tempe: Arizona State University / International Congress of Biometeorology, 2023. s. 20-20. [International Congress of Biometeorology /23./ 14.05.2023-17.05.2023, Tempe]. ABSTRAKT: The Sky View Factor (SVF) is a commonly used indicator of urban geometry. The availability of pedestrian-level SVF measurements has been fairly limited due to the high costs of field survey. Modern modelling approaches are based on precise GIS databases combining advantages of precise SVF calculation in fine-scale resolution and simulation of thermal comfort variables. In this contribution, we would like to present SVFs modelled in the PALM modelling system using Radiative Transfer Model (RTM) version 3.0 and their effect on thermal comfort in pedestrian level. The SVF in PALM is calculated explicitly by ray tracing. The algorithm takes into account all the resolved 3-D obstacles such as terrain and buildings (fully opaque) and plant canopy (semi-transparent depending on the resolved leaf area density), and its performance benefits greatly from the fact that most scenes contain only a limited amount of overhanging structures (i.e. the rest is a so-called 2.5-D geometry). The view from each calculated grid cell is discretized by a configurable fixed number of azimuth and elevation angles for which the rays are traced. We will demonstrate different effects of SVF including transparency of plant canopy on thermal comfort during heat-wave episode in Prague-Dejvice. Moreover, we will discuss principles how to maximize mitigation effects of urban greenery in a complex urban environment using the large-eddy simulation model PALM.

**Permanent Link:** <https://hdl.handle.net/11104/0343275>

0573179 - ÚI 2024 CZ eng A - Abstract

**[Papáček, Štěpán](#) - [Matonoha, Ctirad](#) - [Sanchez, A.](#)**

On the D-QSSA Method With Optimal Constant Delays Applied to a Class of Mathematical Models. *ODAM 2023 Book of Abstracts*. Olomouc: Department of Mathematical Analysis and Applications of Mathematics, Faculty of Science, Palacký University Olomouc, 2023. s. 58-58.

[ODAM 2023: Olomoucian Days of Applied Mathematics. 12.06.2023-14.06.2023, Olomouc]

**Institutional support:** RVO:67985807 ; RVO:67985556

[https://odam.upol.cz/soubory/ODAM\\_2023\\_Book\\_of\\_abstracts.pdf](https://odam.upol.cz/soubory/ODAM_2023_Book_of_abstracts.pdf)

The existence of the fast/slow phenomena in (bio)chemical reaction systems represents difficulties for numerical simulation. However, it provides opportunities to reduce the system order. A well-known example of a classical model reduction method is the so-called quasi-steady-state approximation (QSSA) method, usually applied to a system of ODEs describing chemical reaction networks where one or more reactions are so fast that a quasi-steady-state for some species concentration is reached almost instantaneously. In this contribution, we develop and test a novel model reduction method, the delayed quasi-steady-state approximation (D-QSSA) method, which was first proposed by Vejchodský [1], [2] and further developed by Matonoha and Papáček [3]. While Vejchodský et al. developed their method for the generally time-dependent delays, we newly analyzed theoretical and numerical issues related to the existence and setting of constant delays in some sense optimal. As a numerical case study, we took the paradigmatic example of the Michaelis-Menten kinetics with a simple transport process. The results of the comparison of the full non-reduced system behavior with nine respective variants of reduced models are discussed.

**Permanent Link:** <https://hdl.handle.net/11104/0343638>

0573188 - ÚI 2024 SK eng A - Abstract

**[Paluš, Milan](#) - [Kathpalia, Aditi](#) - [Brunovský, M.](#)**

EEG Connectivity in Treatment of Major Depressive Disorder: Tackling the Conductivity Effects. *Program of the Measurement 2023 Conference*. Smolenice, 2023.

[MEASUREMENT 2023: International Conference on Measurement /14./ 29.05.2023-31.05.2023, Smolenice]

**Institutional support:** RVO:67985807

[https://www.measurement.sk/M2023/doc/Scientific\\_programe.pdf](https://www.measurement.sk/M2023/doc/Scientific_programe.pdf)

**Permanent Link:** <https://hdl.handle.net/11104/0343648>

0572683 - ÚI 2024 cze A - Abstract

**[Řezníček, Hynek](#) - [Geletič, Jan](#) - [Resler, Jaroslav](#) - [Krč, Pavel](#) - [Bureš, Martin](#)**

Specifika městského prostředí v různých měřících; tepelný komfort a související proměnné.

[Konzultační setkání o využití měření mikroklimatických parametrů pro vyhodnocení adaptačních opatření v Praze. Praha, 31.05.2023-31.05.2023]

**Method of presentation:** Přednáška

**Grant - others:** AV ČR(CZ) StrategieAV21/23

**Program:** StrategieAV

**Institutional support:** RVO:67985807

**OECD category:** Meteorology and atmospheric sciences

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