Krisztián Koós

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EDUCATION

University of Szeged — PhD *2014 - 2020*
Microscopy image analysis at the Hungarian Academy of Sciences, BRC

University of Szeged — MSc *2012 - 2014*
Computer Scientist, Institute of Informatics

SCIENTIFIC PUBLICATIONS

Grexa, I., Diosdi, A., Harmati, M., Kriston, A., Moshkov, N., Buzas, K., Pietiäinen, V., **Koos, K.** & Horvath, P. SpheroidPicker for automated 3D cell culture manipulation using deep learning. Sci. Rep. 11, 14813 (2021).

Diosdi, A., Hirling, D., Kovacs, M., Toth, T., Harmati, M., **Koos, K.**, Buzas, K., Piccinini, F. & Horvath, P. Cell lines and clearing approaches: a single-cell level 3D light-sheet fluorescence microscopy dataset of multicellular spheroids. Data Brief 36, 107090 (2021).

Koos, K., Oláh, G., Balassa, T., Mihut, N., Rózsa, M., Ozsvár, A., Tasnadi, E., Barzó, P., Faragó, N., Puskás, L., Molnár, G., Molnár, J., Tamás, G. & Horvath, P. Automatic deep learning-driven label-free image-guided patch clamp system. Nat. Commun. 12, 936 (2021).

Bukva, M., Dobra, G., Gomez-Perez, J., **Koos, K.**, Harmati, M., Gyukity-Sebestyen, E., Biro, T., Jenei, A., Kormondi, S., Horvath, P., Konya, Z., Klekner, A. & Buzas, K. Raman Spectral Signatures of Serum-Derived Extracellular Vesicle-Enriched Isolates May Support the Diagnosis of CNS Tumors. Cancers 13, 1407 (2021).

Molnár, B., Sere, P., Bordé, S., **Koós, K.**, Zsigri, N., Horváth, P. & Lőrincz, M. L. Cell Type-Specific Arousal-Dependent Modulation of Thalamic Activity in the Lateral Geniculate Nucleus. Cereb Cortex Commun 2, tgab020 (2021).

Diosdi, A., Hirling, D., Kovacs, M., Toth, T., Harmati, M., **Koos, K.**, Buzas, K., Piccinini, F. & Horvath, P. A quantitative metric for the comparative evaluation of optical clearing protocols for 3D multicellular spheroids. Comput. Struct. Biotechnol. J. 19, 1233–1243 (2021).

Hollandi, R., Szkalisity, A., Toth, T., Tasnadi, E., Molnar, C., Mathe, B., Grexa, I., Molnar, J., Balind, A., Gorbe, M., Kovacs, M., Migh, E., Goodman, A., Balassa, T., **Koos, K.**, Wang, W., Caicedo, J. C., Bara, N., Kovacs, F., Paavolainen, L., Danka, T., Kriston, A., Carpenter, A. E., Smith, K. & Horvath, P. nucleAIzer: A Parameter-free Deep Learning Framework for Nucleus Segmentation Using Image Style Transfer. Cell Syst 10, 453–458.e6 (2020).

Hirling, D., **Koos, K.**, Molnár, J. & Horvath, P. Pipette Hunter 3D: Fluorescent Micropipette Detection. Trends in Biomathematics: Modeling Cells, Flows, Epidemics, and the Environment 111–125 (2020). doi:10.1007/978-3-030-46306-9_8

Smith, K., Piccinini, F., Balassa, T., **Koos, K.**, Danka, T., Azizpour, H. & Horvath, P. Phenotypic Image Analysis Software Tools for Exploring and Understanding Big Image Data from Cell-Based Assays. Cell Syst 6, 636–653 (2018).

Koos, K., Molnár, J. & Horvath, P. Pipette Hunter: Patch-Clamp Pipette Detection. Image Analysis 172–183 (2017). doi:10.1007/978-3-319-59126-1_15

Koos, K., Peksel, B. & Kelemen, L. Phase Measurement Using DIC Microscopy. Acta Cybernetica 23, 629–643 (2017).

Koos, K., Molnár, J., Kelemen, L., Tamás, G. & Horvath, P. DIC image reconstruction using an energy minimization framework to visualize optical path length distribution. Scientific Reports 6, (2016).

Koos, K., Molnar, J. & Horvath, P. DIC Microscopy Image Reconstruction Using a Novel Variational Framework. in 2015 International Conference on Digital Image Computing: Techniques and Applications (DICTA) 1–7 (2015).

Wandrey, F., Montellese, C., **Koos, K.**, Badertscher, L., Bammert, L., Cook, A. G., Zemp, I., Horvath, P. & Kutay, U. The NF45/NF90 Heterodimer Contributes to the Biogenesis of 60S Ribosomal Subunits and Influences Nucleolar Morphology. Molecular and Cellular Biology 35, 3491–3503 (2015).

Scholar profile
Total citations: 232
h-index: 7
Cumulative impact factors: 67.452

RESEARCH & WORK EXPERIENCES

Lorand Eotvos Research Network, Biological Research Centre — **Szeged, HU**
Research Associate | Biological Image Analysis and Machine Learning Group — *2020-present*

Hungarian Academy of Sciences, Biological Research Centre — **Szeged, HU**
PhD student | Biological Image Analysis and Machine Learning Group — *2014-2020*

FrontEndART Ltd. — **Szeged, HU**
Java developer — *2010-2013*

LANGUAGES

English - fluent
French - basic
Hungarian - native language

TEACHING

Linear and Integer programming
Nonlinear and Global Optimization
Microscopy Image Analysis

AWARDS

Stephen W. Kuffler 2022 - Publication Award
Qualitas Biologica 2021 - Award of Biological Research Centre's foundation, 2nd prize
SZTE Innovation Prize 2021 - Most innovative dissertation
Jozsef Sofi Innovation Award 2017 - Special prize for automating a patch-clamp microscope
Dresden Summer School on Systems Biology 2015 - 1st prize project on modeling biological processes
Campus Hungary 2015 - Awarded scholarship to develop a tool for nucleoli detection at ETH Zurich
Eotvos Lorand 2013 - Graduate Researcher Scholarship
Students Scientific Conference 2013 - 3rd place for paper on tomographic reconstruction algorithms
CEEPUS 2012 - Summer School on Image Processing, 2nd prize project
Honors student 2012 - University of Szeged, Department of Computer Science

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RESEARCH INTERESTS

Biological imaging is one of the fields where image analysis algorithms and tools have pushed the frontiers of scientific computing. Advanced digital microscopes can easily generate thousands of high-resolution images of cells daily and there is a strong demand to process these images in high quality yet fast. I have had the opportunity to join Peter Horvath's laboratory at the Biological Research Centre of Szeged in Hungary and work in this field during my PhD studies. Our group has developed several cutting-edge methods for microscopy image analysis which we apply to biological studies. My main project was the automation of a microscope that is used to measure the electrophysiological properties of living neurons in human brain tissue slices. The patch clamping method when performed manually is an error-prone process and requires expertise. I believe the system that we have developed has revolutionized brain research and sped it up by an order of magnitude. The automated system has already multiplied the number of measured cells. By extending to multiple pipettes, we will be able to analyze neural connections between phenotypes. My research focus is the development of deep learning methods for microscopy, system automation, and high-performance computing in cloud environments using graphical processing units (GPUs). I am actively participating in various projects where our goals are either to detect, segment, phenotype cells or 3D cell aggregates or to register images of different modalities. In the future, I will work on developing a cloud-based platform to host our models and make them broadly available.