KATERINA MALAKHOVA — *Researcher in Deep Learning and Vision Science*

○ +1(646) 881-6180 ○ New York, US. St. Petersburg, Russia ○ katerina.malahova@gmail.com ○ kmalakhova.com

RESEARCH INTERESTS

With great passion and dedication, I study neuroscience and AI to explore how information about the outer world is represented in neural systems. The main focus of my research is the process of object and face recognition occurring in higher-level areas of the visual cortex. I utilize deep learning to analyze neural data and, simultaneously, use it as a platform to test hypotheses through the modeling of new bio-inspired architectures.

RELATED EXPERIENCE

JUL 2014 - PRESENT

Researcher

Pavlov Institute of Physiology, St. Petersburg, Russia

Lead projects on data analysis and deep learning, including:

- Visualization of information encoded by neurons using GANs:
  - Developed an approach for visualization of latent representations encoded by neurons using generative networks.
  - Implemented short-loop integration of neural recording with the generative approach.
- Segmentation of pathologies on OCT retinal scans:
  - Implemented a compact convolutional neural network for segmentation of Pigment epithelial detachment regions using loosely-labeled data.
- Estimation of gaze direction from webcam data:
  - Created a model to predict gaze location from webcam video. Improved the performance by including temporal information.
- Text perception:
  - Developed a tool for text analysis (natural language processing - syntactic structure analysis, segmentation of regions containing text on images) and utilized it in experiments on text perception.

DEC 2015 - APR 2017

Part-time researcher, Ph.D. exchange student

Laboratory of Integrative Neural Systems (Manabu Tanifuji), Brain Science Institute, RIKEN, Tokyo, Japan

- Studied the effect of priming information during face detection task: created a dataset of faces and objects, developed experimental software, conducted a preliminary study.
- Researched the functional similarities in information processing in the visual cortex and deep layers of Convolutional neural networks.

FEB 2013 - MAY 2015

Co-Founder, Project manager

BetaMind, St. Petersburg, Russia

- Co-founder and project manager of a B2B-company that consulted on machine learning.
- Responsibilities included: project and team management, data analysis, text mining.

APR 2012 - OCT 2014

Founder, CEO

Concept Media, St. Petersburg, Russia

- Founded a digital agency to consult clients on marketing and social media monitoring.
- Managed a team of designers and worked with engineers on a system for sentiment analysis of texts in Russian.

Education

JUL 2014 - PRESENT

Pavlov Institute of Physiology, St. Petersburg, Russia
Ph.D. student, Laboratory of Physiology of Vision. Supervisor Shelepin Yuri

Ph.D. thesis topic: "Information processing in higher-order areas of the visual cortex." The research focuses on understanding how high-level concepts are represented in the brain and how these representations shape the perception.

SEPT 2012 - JUL 2014

St. Petersburg State University, St. Petersburg, Russia
M.S. in Cognitive Sciences, School of Liberal Arts, Supervisor Khudobakhshov Vitaly

Completed master's thesis on natural language generation. Using statistical and grammar-based approaches implemented a procedural model of text generation to represent the artificially-produced information in human-readable form.

SEPT 2004 - JUL 2009

St. Petersburg State University, St. Petersburg, Russia
Specialist in Management (Level 7 in ISCED classification, the equivalent of M.S.), School of Economics

Relevant skills

- Programming languages: Python, R. Libraries for Deep Learning: Caffe, TensorFlow, Keras
- Data analysis, statistics, machine learning, and deep neural networks
- Specialization in Vision Science: neural and cognitive mechanisms of visual perception
- Experiment design and execution
- Leadership and experience in managing teams with diverse backgrounds
- Strong communication skills
- Fluency in English

Awards and Community Outreach

Academic awards

Best talk at the conference: "Integrative neurobiology of brain functions," St. Petersburg, Russia, 2017
3rd place at poster session: "AINL: artificial intelligence and natural language," St. Petersburg, Russia, 2013
Merit academic scholarship for university students, St. Petersburg, Russia, 2012-2014

Hackathons

Special nomination winner at "SocialHack" hackathon, St. Petersburg, Russia, 2017
3rd place at "Data mining for social networks" hackathon, St. Petersburg, Russia, 2014
1st place at "Informational retrieval hackathon," Kazan, Russia, 2013

Community outreach

Organize events and give public lectures about vision, neuroscience and machine learning. Founded "Science and Technology" and "Machine Learning Gym" communities in Tokyo (with a total audience > 1400 people), where invited scientists and engineers gave talks, and where we held free hackathon-classes helping participants to acquire practical skills in machine learning and data analysis.

Publications

Malakhova, K. (2018). "Visualization of information encoded by neurons in the higher-level areas of the visual system." *Journal of Optical Technology.* Vol. 85, No. 8.

Malakhova E. Yu., Shelepin E. Yu., and Malashin R. O. "Temporal data processing from webcam eye tracking using artificial neural networks." *Journal of Optical Technology.* Vol. 85, No. 3.

Malakhova K. "Representation of categories in filters of deep neural networks." *In Proceedings:* The IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2018.