

# Mohamed Abdelhack

POSTDOCTORAL FELLOW · KREMBIL CENTRE FOR NEUROINFORMATICS

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## Education

### Kyoto University

PHD INFORMATICS

- Advisor: Prof. Yukiyasu Kamitani

Kyoto, Japan

2015 - 2019

### Okinawa Institute of Science and Technology

MSC SCIENCE AND TECHNOLOGY

- Advisor: Dr. Ichiro Maruyama

Okinawa, Japan

2012 - 2015

### Alexandria University

BSC ELECTRICAL ENGINEERING

- Communications and Electronics Department
- Honors thesis/undergrad research advisor: Dr. Hania Farag

Alexandria, Egypt

2008 - 2012

## Professional Experience

- 2021- **Postdoctoral Research Fellow**, Krembil Centre for Neuroinformatics, Centre for Addiction and Mental Health
- 2019-2021 **Postdoctoral Research Assistant**, Department of Anesthesiology, Washington University in St. Louis
- 2018-2019 **Researcher**, Graduate School of Medicine, Kyoto University
- 2015-2018 **Research Assistant**, Graduate School of Informatics, Kyoto University
- 2015-2018 **Student Intern**, Department of Neuroinformatics, Advanced Telecommunication Research Institute
- 2011 **Summer Intern**, Laboratory of Neural Injury and Repair, Wadsworth Center

## Publications

### PUBLISHED

**Abdelhack, Mohamed.** 2022. An in vivo assay to study locomotion in *Caenorhabditis elegans*. *MethodsX*.

Ortiz, Abigail; Sanches, Marcos; **Abdelhack, Mohamed**; Schwaiger, Tyler R; Wainberg, Michael; Tripathy, Shreejoy J; Felsky, Daniel; Mulsant, Benoit H; Fiedorowicz, Jess G. 2022. Sex-specific associations between lifetime diagnosis of bipolar disorder and cardiovascular disease: a cross-sectional analysis of 257,673 participants from the UK Biobank. *Journal of Affective Disorders*.

Hueniken, Katrina; Somé, Nibene Habib; **Abdelhack, Mohamed**; Taylor, Graham; Marshall, Tara Elton; Wickens, Christine M; Hamilton, Hayley A; Wells, Samantha; Felsky, Daniel. 2021. Machine learning-based predictive modeling of anxiety and depressive symptoms during 8 months of the COVID-19 global pandemic: repeated cross-sectional survey study. *JMIR mental health*.

Fritz, Bradley A; **Abdelhack, Mohamed**; King, Christopher R; Chen, Yixin; and Avidan, Michael S. 2020. Update to 'Deep-learning model for predicting 30-day postoperative mortality (Br J Anaesth 2019; 123: 688–95). *British Journal of Anaesthesia*.

**Abdelhack, Mohamed** and Kamitani, Yukiyasu. 2018. Sharpening of hierarchical visual feature representations of blurred images. *eNeuro*.

Nedelescu, Hermina; **Abdelhack, Mohamed**; and Pritchard, Arwel T. 2018. Regional differences in Purkinje cell morphology in the cerebellar vermis of male mice. *Journal of neuroscience research*.

Nedelescu, Hermina and **Abdelhack, Mohamed**. 2013. Comparative morphology of dendritic arbors in populations of Purkinje cells in mouse sulcus and apex. *Neural Plasticity*.

### IN REVIEW

**Abdelhack, Mohamed**; Zhang, Jiaming; Tripathi, Sandhya; Fritz, Bradley A; Felsky, Daniel; Avidan, Michael S; Chen, Yixin; and King, Christopher R. A modulation layer to increase neural network robustness against data quality issues.

**Abdelhack, Mohamed**. An open-source tool for hyperspectral image augmentation in tensorflow.

## IN PREP

**Abdelhack, Mohamed\***; Murakami, Akio\*; Majima, Kei; Cheng Fan; Kamitani, Yukiyasu and Takahashi, Hidehiko. Analysis of top-down and bottom-up processes of visual recognition in schizophrenia using deep neural network models

Cheng Fan; Horikawa, Tomoyasu; Majima, Kei; **Abdelhack, Mohamed**; and Kamitani, Yukiyasu. Reconstructing visual illusory experience from human brain activity

**Abdelhack, Mohamed**; Zhukovsky, Peter; Milic, Milos; Hill, Sean and Felsky, Daniel. When less is more: Untangling the complex relationships between self-reported insomnia, accelerometry-based sleep duration, and mental health using functional MRI.

**Abdelhack, Mohamed\***; Tripathi, Sandhya\*; Avidan, Michael S; Chen, Yixin; and King, Christopher R. Post-operative complications association with social vulnerability measurements.

**Abdelhack, Mohamed**; Gonzalez-Torres, Christina; Ortiz, Abigail; Goldstein, Benjamin; and Felsky, Daniel. Population-level integrative modelling of factors associated with elevated cardiovascular disease risk in women with bipolar disorder.

**Abdelhack, Mohamed**; Allam, Mona; and Elsherif, Omar. Modelling sharpening in the human visual cortex using deblurring methods.

Salah, Alaa; Mostafa, Abdalrhman; Abedi, Reem; El Masri, Ghinwa; Hammad, Ghada; Eltaras, Menna; Fadl, Amira; Khaira, Enas; Elsubaie, Rawan; **Abdelhack, Mohamed**. Arabs in Neuroscience: a case for localization in diversity educational programs.

Spychala, Nadine; Hernandez-Garcia, Alex; Schumann, Frank; Jablonka, Jan; **Abdelhack, Mohamed**; James, Katie; Atay, Melvin Selim; Kording, Konrad. All boats rise together: going against wrong incentives in academia for better life and better science - a survey-based opinion paper.

## Awards, Fellowships, Honors, & Grants

2022	<b>Top Reviewer Award</b> , Conference on Neural Information Processing Systems	
2022	<b>womenmind™2022 Postdoctoral Fellowship Competition</b> , Centre of Addiction and Mental Health	CAS 65,000
2022	<b>IBRO Diversity Grant - For Arabs in Neuroscience Initiative</b> , International Brain Research Organization	€2,200
2022	<b>Highlighted Reviewer of ICLR 2022</b> , International Conference on Learning Representations	
2019	<b>Fourth Place in Image Recognition Hackathon</b> , AI Hack Tunisia	Internship Offer
2018	<b>Monbukagakusho Scholarship</b> , Japanese Ministry of Education, Culture, Sports, Science and Technology	¥1.1 M
2017	<b>Monbukagakusho Scholarship</b> , Japanese Ministry of Education, Culture, Sports, Science and Technology	¥2.3 M
2017	<b>Summer School Cost Waiver</b> , Computational and Cognitive Neuroscience Summer School	\$US 1500
2016	<b>Tuition Exemption Award</b> , Kyoto University	¥535,800
2015	<b>Tuition Exemption Award</b> , Kyoto University	¥267,900
2015	<b>Admission Fee Waiver Award</b> , Kyoto University	¥282,000
2010	<b>Cairo International Biomedical Engineering Conference Registration Fee Grant</b> , Misr El Kheir Foundation	£EG 100

## Presentations

\* *presenting author*; + *mentored student*

## INVITED TALKS

- Dec 2022. *The future of Neuro-AI through the lens of early career researchers*. Invited panel: Montreal AI & Neuroscience Conference 2022, Montreal, Canada.
- Jul 2022. *What can human and computer vision reveal to us about brain health?*. Invited talk: Simply Neurocon Conference 2022, Online.
- May 2022. *Computational neuroscience and applications in medicine*. Invited webinar: IEEE Engineering in Medicine and Biology Society American University of Sharjah Student Branch, Online.
- Apr 2022. *Computational neuroscience (Arabic)*. Invited webinar: Egypt Scholars.
- Oct 2021. *Computational neuroscience (Arabic)*. Invited webinar: Birzeit University, Online.
- Dec 2020. *Top-down modulation in human visual cortex*. Invited webinar: Society of Neuroscientists of Africa.

## CONTRIBUTED PRESENTATIONS

- Abdelhack, Mohamed\***; Zhukovsky, Peter; Milic, Milos; Hill, Sean; Felsky, Daniel. 2023. Shared Neural Representations between Sleep and Depression and Their Effect on Visual Perception. Poster presentation: Society of Biological Psychiatry Annual Meeting (Upcoming).
- Bakkar, Nour Mounira\*; Mostafa, Abdalrhman\*; **Abdelhack, Mohamed**; El-Yazbi, Ahmed F. 2023. A convolutional neural network model classifies beat-to-beat arterial pressure time-series: sex stratification and cardiovascular risk prediction. ASPET 2023 Annual Meeting (Upcoming).
- Dolling-Boreham, Roberta M\*; Mohan, Akshay; **Abdelhack, Mohamed**; Elton-Marshall, Tara; Hamilton, Hayley A; Boak, A; Felsky, Daniel. 2023. Identifying psychosocial and ecological determinants of enthusiasm in youth using machine learning. Poster presentation: International Conference on Health Policy Statistics.
- Hoxha, Isabelle; Mudrik, Noga; Urai, Anne; Kienigiel, Dante; Forest, Jeremy; **Abdelhack, Mohamed**; Peters, Megan A K; Zhang, Ru-Yuan; Lu, Xinquan; Halper, Nick; Butler, John S.\* 2022. Virtual escape room for kids: opening online conferences to a wider audience. Poster presentation: SCI:COM
- Abdelhack, Mohamed\***; Zhukovsky, Peter; Milic, Milos; Felsky, Daniel. 2022. Effect of sleep on neural coding in early visual cortex revealed in a large population study. Poster presentation: Society for Neuroscience Annual Meeting.
- Salah, Alaa\*; Mostafa, Abdalrhman\*; Abedi, Reem\*; El Masri, Ghinwa\*\*; Hammad, Ghada\*; Eltaras, Menna\*; Fadl, Amira\*; Khaira, Enas\*; **Abdelhack, Mohamed**. 2022. Computational neuroscience in the arabic region. Flash talk: Neuromatch Conference 5.0.
- Abdelhack, Mohamed\***; Zhukovsky, Peter; Milic, Milos; Felsky, Daniel. 2022. Effect of sleep on neural coding in early visual cortex revealed in a large population study. Poster presentation: Krembil Centre for Neuroinformatics Open House.
- Elsherif, Omar\*\*, **Abdelhack, Mohamed**. 2021. Modeling image sharpening in human visual cortex using computer vision models. Flash talk: Neuromatch Conference 4.0.
- Abdelhack, Mohamed\***. 2021. Big data in the wild: modulation of artificial intelligence model weights in real time. Flash talk: Krembil Centre for Neuroinformatics Open House.
- Abdelhack, Mohamed\***. 2021. Modulation layer for combating missing data. Oral talk: Anesthesiology Research Data Blitz, Washington University in St. Louis, St. Louis, MO.
- Abdelhack, Mohamed\*** and Kamitani, Yukiyasu. 2020. Visual misrecognition reveals contradiction between lower and higher visual cortex activations. Flash talk: Neuromatch Conference 3.0.
- Abdelhack, Mohamed\***; King, Christopher R; Tripathi, Sandhya; Fritz, Bradley; Chen, Yixin; Avidan, Michael. 2020. Post-operative mortality prediction with and without the use of intraoperative features. Poster presentation: AMIA 2020 Symposium.
- Abdelhack, Mohamed\*** and Kamitani, Yukiyasu. 2019. Top-down modulation in human visual cortex revealed by brain decoding with deep neural network representation. Poster presentation: CiNet Conference, Osaka, Japan.
- Murakami, Akio\*; **Abdelhack, Mohamed\***; Majima, Kei; Cheng Fan; Kamitani, Yukiyasu and Takahashi, Hidehiko. 2019. Representational structure of the higher visual cortex in schizophrenia. Poster presentation: Mechanism of Brain and Mind Winter Workshop, Hokkaido, Japan.

Murakami, Akio\*; **Abdelhack, Mohamed\***; Majima, Kei; Cheng Fan; Kamitani, Yukiya and Takahashi, Hidehiko. 2018. Analysis of top-down and bottom-up processes of visual recognition in schizophrenia using deep neural network models. Poster presentation: International Consortium on Hallucination Research, Kyoto, Japan.

**Abdelhack, Mohamed\*** and Kamitani, Yukiya. 2017. Top-down neural processing that supplements missing image features revealed by brain decoding with deep neural network representation. Poster presentation: Vision Science Society Annual Meeting, St. Pete Beach, FL.

Nedelescu, Hermina\*; **Abdelhack, Mohamed**; and Pritchard, Arwel T. 2016. Purkinje cell heterogeneity in the anterior and posterior cerebellar lobule. Dynamic poster presentation: Society for Neuroscience Annual Meeting, San Diego, CA.

**Abdelhack, Mohamed\*** and Maruyama, Ichiro. 2015. Locomolyzer: a comprehensive tool for animal locomotion analysis. Poster presentation: Congress of the European Society of Biomechanics, Prague, Czechia.

**Abdelhack, Mohamed\***. 2014. Adaptation in locomotion behavior of *Caenorhabditis elegans*. Poster presentation: Okinawa Computational Neuroscience Course, Okinawa, Japan.

**Abdelhack, Mohamed\*** and Nedelescu, Hermina. 2013. Investigating the effect of anatomical location on Purkinje cell morphology. Poster presentation: Society for Neuroscience Annual Meeting, San Diego, CA.

## Teaching Experience

Nov 2022	<b>IBRO-ARC School on Impact of Lifestyle Modification on Neurodegenerative Disorders from Preventive and Therapeutic Perspectives</b> , Instructor	Mansoura, Egypt
Aug 2022	<b>IBRO-Simons Computational Neuroscience Imbizo</b> , Teaching Assistant	Cape Town, South Africa
Jun 2022	<b>Introduction to Computational Neuroscience</b> , Lecturer and Course Lead	Online
Jul 2020	<b>Neuromatch Academy</b> , Lead Teaching Assistant	Online
Jul 2009 & Jun 2012	<b>IEEE Alexandria Student Branch</b> , C Programming Instructor	Alexandria, Egypt

## Mentoring

2022-	<b>Cathlyn Chen</b> , Research Student, Krembil Centre for Neuroinformatics	Toronto, ON
2021-	<b>Roberta M Dolling-Boreham</b> , Research Student, Krembil Centre for Neuroinformatics	Toronto, ON
2021-2022	<b>Abdallah Mostafa</b> , Mentee, Arabs in Neuroscience	Online
2021	<b>Omar ElSharif</b> , Mentee, Arabs in Neuroscience	Online
2020-2021	<b>Jiaming Zhang</b> , Intern, Department of Computer Science, Washington University in St. Louis	Online
2020-2021	<b>Jerome Gammie</b> , Intern, Department of Computer Science, Washington University in St. Louis	St. Louis MO
2017-2019	<b>Shirin Vafae</b> , Intern, Graduate School of Informatics, Kyoto University	Kyoto, Japan
2018-2019	<b>Fan Cheng</b> , Intern, Graduate School of Informatics, Kyoto University	Kyoto, Japan
2018-2019	<b>Ken Shirakawa</b> , Undergraduate thesis student, Graduate School of Informatics, Kyoto University	Kyoto, Japan
2018-2019	<b>Emi Satake</b> , Master student, Graduate School of Informatics, Kyoto University	Kyoto, Japan
2018-2019	<b>Akira Murakami</b> , Master student, Graduate School of Informatics, Kyoto University	Kyoto, Japan

## Outreach & Professional Development

### SERVICE AND OUTREACH

2022	<b>Neuromatch Conference 5.0</b> , Organizer	Online
2020-	<b>Arabs in Neuroscience</b> , Founder	Online
2021-	<b>The Africa I Know</b> , Mentorship Team Member	Online
2021	<b>Neuromatch Conference 4.0</b> , Organizer	Online
2021	<b>Neuromatch Academy</b> , Chief Communication Officer & Outreach Coordinator	Online
2021	<b>Neuromatch Academy Computational Neuroscience Summer School</b> , Project Mentor	Online
2019-2021	<b>Washington University Postdoc Society</b> , Policy Committee Member	St. Louis MO
2013	<b>An Introduction to Interdisciplinary Science Workshop</b> , Instructor & organizer	Okinawa, Japan
2011	<b>Brain-Computer Interfacing Challenge</b> , Judging Panel Member	Albany, NY

## DEVELOPMENT

**Cultivating Community in Academia**, online interview at the show "PhD - The Philosophical Drama."

**Careers in Neuroscience Panel Discussion**, invited by Alexandria Neuroscience Committee.

**Computational and Cognitive Neuroscience Summer School 2017**, New York University Shanghai, China.

**OIST Computational Neuroscience Course 2014**, Okinawa, Japan.

## PEER REVIEW

### Journals

PLOS One

British Journal of Anaesthesia

Journal of Biomedical Informatics

### Conferences

The Conference on Neural Information Processing Systems (NeurIPS)

International Conference on Learning Representations (ICLR)

The International Joint Conference on Artificial Intelligence (IJCAI)

IEEE Big Data

## PROFESSIONAL MEMBERSHIPS

Society for Neuroscience

Temerty Centre for AI Research and Education in Medicine