Kshitij Dwivedi

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Research Interests

- Human visual system, computer vision, transfer learning, continual learning

Education

PhD in Computer Science, *Expected graduation year (2022)* .

2020–2022 Goethe University of Frankfurt am Main, *Germany (moved with supervisor)*.
Supervisor: Dr. Gemma Roig .

2018–2019 Singapore University of Technology & Design, *Singapore*.
Supervisor: Dr. Gemma Roig .

M.Tech in Electrical Engineering.

2009–2014 Indian Institute of Technology, *Kanpur, India*.

B.Tech in Electrical Engineering.

2009–2014 Indian Institute of Technology, *Kanpur, India*.

Research Experience

2019– present **Visiting student**, *FU*, Berlin,Germany, Supervisor: Dr. Radoslaw Martin Cichy.
Spatial and temporal emergence of visual information in human brain
- Decoding visual attributes of rendered images from fMRI and EEG data to understand visual information processing in human brain.
- Organizing team member of workshop and challenge linking computer vision and neuroscience (**Algonauts 2019**, and **Algonauts 2021**)

2018– present **PhD Student**, Supervisor: Dr. Gemma Roig.
Applying computer vision to understand human vision and vice-versa
- Finding functions of regions in human visual cortex using Deep Neural Network functions. (preprint , also presented at **CCN 2019** and **Neuromatch 2.0 2020**)
- Assessed the relationship between different visual tasks and its application to transfer learning (in **CVPR 2019**, **ECCV 2020**)

2017– 2017 **Research Engineer**, *ATR*, Kyoto,Japan, Supervisor: Dr. Yukiyasu Kamitani.
Reconstruction of perceived images from brain activity using deep learning
- Evaluated training generative models of computer vision to reconstruct images directly from fMRI activity (in **Frontiers in Computational Neuroscience**)

2014–2017 **Senior Software Engineer**, *Samsung R&D Institute India*, Bangalore.
Development of computer vision applications for Samsung smartphone cameras
- Portrait segmentation: **US Patent granted**
- Long term object tracking: Published at IEEE SPCOM 2016
- Visual saliency detection: **1st place** in **Large Scale Scene Understanding (LSUN)** saliency challenge held in **CVPR 2016**. **Patent filed**: Suggestive zoom.

2016– 2016 **Intern**, *NCBS* , Bangalore, India, Supervisor: Dr. Vatsala Thirumalai.
Studied correlation of motor neuron activity with Purkinje neuron's activity in the zebrafish by activity localization for the Calcium images of the Purkinje neuron

2013–2014 **Master's Thesis**, *IIT Kanpur*, Kanpur, India, Supervisor: Dr. Bahniman Ghosh.
Switching Current Reduction Techniques For Magnetic Tunneling Junctions Based Magnetic RAMs

2012–2012 **Intern**, *Mercedes-Benz Research & Development North America*, Palo Alto, USA.
Worked on vehicle detection part of a project which was aimed to provide driver assistance functions

Supervision

FU Berlin **Bachelor's Thesis**, *Marta Paula Balode*, *Raphael Leuner*, *Martin Pflaum*.

Master's Thesis, *Andrei Kitaitsev*, *Vanshika Bawa*.

GU Frankfurt **Bachelor's Thesis**, *Domenic Bersch*, *Quang Anh Le Hong*.

Master's Thesis, *Daniel Pietschmann*, *Yannic Vorpahl*.

Technical Skills

Programming Python, C, C++, Matlab.

Frameworks pytorch, tensorflow, caffe, torch.

Achievements

- Selected as Lead TA in Neuromatch Academy summer school, 2020
- Selected to attend Brain, Minds and Machines (BMM) summer school 2019 organized by Center of Brain, Mind and Machines
- Selected to attend International Computer Vision Summer School (ICVSS) 2019 at Sicily, Italy
- SUTD President's Graduate Fellowship (January, 2018 – July, 2019)
- First place in LSUN Saliency Challenge, CVPR 2016. Team name: Deepattent

Publications

[1] R. M. Cichy, **K. Dwivedi**, B. Lahner, A. Lascelles, P. Iamshchinina, M. Graumann, A. Andonian, N. A. R. Murty, K. Kay, G. Roig, and A. Oliva, "The algonauts project 2021 challenge: How the human brain makes sense of a world in motion," *arXiv*, 2021.

[2] **K. Dwivedi**, M. F. Bonner, R. M. Cichy, and G. Roig, "Unveiling functions of the visual cortex using task-specific deep neural networks," *bioRxiv (In revision)*, 2020.

[3] **K. Dwivedi**, J. Huang, R. M. Cichy, and G. Roig, "Duality diagram similarity: a generic framework for initialization selection in task transfer learning," in *European Conference on Computer Vision (ECCV)*, 2020.

[4] **K. Dwivedi**, R. M. Cichy*, and G. Roig*, "Unravelling representations in scene-selective brain regions using scene parsing deep neural networks," *Journal of Cognitive Neuroscience*, 2020 (* jointly directed work).

[5] **K. Dwivedi** and G. Roig, "Representation similarity analysis for efficient task taxonomy and transfer learning," in *Computer Vision and Pattern Recognition (CVPR)*, 2019.

[6] **K. Dwivedi**, M. F. Bonner, and G. Roig, "Explaining scene-selective visual areas using task-specific deep neural network representations," *Conference on Cognitive Computational Neuroscience (CCN)*, 2019.

[7] R. M. Cichy, G. Roig, A. Andonian, **K. Dwivedi**, B. Lahner, A. Lascelles, Y. Mohsenzadeh, K. Ramakrishnan, and A. Oliva, "The Algonauts Project: A Platform for Communication between the Sciences of Biological and Artificial Intelligence," *Conference on Cognitive Computational Neuroscience (CCN)*, 2019.

[8] G. Shen*, **K. Dwivedi***, K. Majima, T. Horikawa, and Y. Kamitani, "End-to-end deep image reconstruction from human brain activity," *Frontiers in Computational Neuroscience*, 2019 (* equal contribution).

[9] J. Huang, **K. Dwivedi**, and G. Roig, "Deep anchored convolutional neural networks," *in Computer Vision and Pattern Recognition Workshops (CVPRW) on Compact and Efficient Feature Representation and Learning (CEFRL), 2019.*

[10] **K. Dwivedi** and G. Roig, "Task-specific vision models explain task-specific areas of visual cortex," *bioRxiv*, p. 402735, 2018.

[11] **K. Dwivedi** and G. Roig, "Navigational affordance cortical responses explained by scene parsing model," *European Conference on Computer Vision Workshop (ECCVW) on Brain Driven Computer Vision (BDCV)*, 2018.

[12] **K. Dwivedi**, N. Singh, S. Shanmugham, and M. Kumar, "Deepattent: Saliency prediction with deep multiscale residual network," *in Proceedings of International Conference on Computer Vision and Image Processing (CVIP), 2018*
*(**1st place** in LSUN Saliency Challenge, CVPR 2016).*

[13] K.-H. Lee, P. P. Prabhudesai, S. R. Shanmugam, N. Jin-Hee, **K. Dwivedi**, S. Deshmukh, S. R. Malreddy, and H. Jong-Min, "Electronic device for processing image and method for controlling the same," Nov. 17 2016. US Patent App. 15/154,615.

[14] **K. Dwivedi**, P. Prabhudesai, and S. R. Shanmugam, "A hybrid method for long term moving object tracker," in *Signal Processing and Communications (SPCOM), 2016 International Conference on*, pp. 1–5, IEEE, 2016.

[15] B. Ghosh and **K. Dwivedi**, "Micromagnetic analysis of a double-barrier synthetic antiferromagnetic mtj stack," *Applied Nanoscience*, vol. 5, no. 7, pp. 771–775, 2015.

[16] B. Ghosh and **K. Dwivedi**, "Micromagnetic analysis of heusler alloy-based perpendicular double barrier synthetic antiferromagnetic free layer mtjs," *Journal of Theoretical and Applied Physics*, vol. 9, no. 3, pp. 207–212, 2015.

Conference abstracts

- **K. Dwivedi**, M.F. Bonner, R.M. Cichy, G. Roig, "Unveiling functions of visual cortex using task-specific deep neural networks", Neuromatch 2.0, 2020.
- **K. Dwivedi**, M.F. Bonner, G. Roig, "Explaining Scene-selective Visual Area Using Task-specific and Category-specific DNN Units ", Vision Science Society, 2019.
- **K. Dwivedi**, G. Roig, "Importance of object selection in Relational Reasoning tasks", NeurIPS Workshop on Relational Representation Learning, 2018.
- **K. Dwivedi**, G. Roig, "Evaluation of plug and play modules for multi-domain learning ", ECCV workshop on Interactive and Adaptive Learning, 2018.