SUSHRUT THORAT

Contact Information

email: sushrut.thorat94@gmail.com website: sushrutthorat.com
github: novelmartis Other info: Short-CV

Mission

Understanding and building resource-constrained agents that can learn and function in the wild

Research Areas

Lifelong learning, decision-making & reasoning, recurrent computations, explainable AI

Academic Trajectory

Postdoc in Machine Learning *2022 - present*
Institute of Cognitive Science, Osnabrück University, Germany
Advisor: Tim Kietzmann

Ph.D. in Cognitive Neuroscience *2017 - 2021*
Donders Centre for Cognition, Radboud University, The Netherlands
Thesis: Smart Search - Investigations into human visual search in structured environments
Advisors: Marius Peelen and Marcel van Gerven

M.Sc. (cum laude) in Cognitive Neuroscience *2015 - 2017*
Center for Mind/Brain Sciences (CIMeC), University of Trento, Italy
Thesis: Using Convolutional Neural Networks to measure the contribution of visual features to the representation of object animacy in the brain
Advisor: Marius Peelen

B.Tech. in Engineering Physics *2011 - 2015*
Department of Physics, Indian Institute of Technology - Bombay (IIT-B), India
Thesis: Quadcopter Flight Control using Modular Spiking Neural Networks
Advisor: Bipin Rajendran

Key Publications

Thorat S*, Aldegheri G*, Kietzmann TC (2021). Category-orthogonal object features guide information processing in recurrent neural networks trained for object categorization. *Shared Visual Representations in Human & Machine Intelligence Workshop @ NeurIPS*. *equal contribution.

Thorat S, Proklova D, Peelen MV (2019). The nature of the animacy organization in human ventral temporal cortex. *eLife* 8: e47142.

Anthes D*, Thorat S*, Konig P, Kietzmann TC (2024). Keep Moving: identifying task-relevant subspaces to maximise plasticity for newly learned tasks. *Conference on Lifelong Learning Agents (CoLLAs)*. *equal contribution.

Thorat S, Quek GL, Peelen MV (2022). Statistical learning of distractor co-occurrences facilitates visual search. *Journal of Vision* 22(10), 2-2.

Piefke L, Doerig A, Kietzmann T, Thorat S (2024). Computational characterization of the role of an attention schema in controlling visuospatial attention. *Annual Meeting of the Cognitive Science Society* (Vol. 46).

∼ A full list of publications can be accessed on Google Scholar; short descriptions on my website.

Achievements/ Awards

- Voted **best poster/short-pitch**, among **15 posters**, in the 'Perception, Action, and Control' theme at the annual Donders Poster Session (2020).
- Recipient of the **Merit Award** (2017), awarded to students who achieve remarkable results at the end of their degree, by the University of Trento, Italy.
- Recipient of the **Abstract Award**, awarded to **5 of the 57** accepted abstracts at the Rovereto Workshop on Concepts, Actions and Objects (2017).

- Ranked **721 among 450,000** students in the Joint Entrance Examination **(JEE, 2011)** conducted towards admission to the Indian Institute of Technology (IIT).
- Recipient of the **KVPY scholarship** (2009), awarded to **215 students across India** with talent and aptitude for research, by the Dept. of Science & Technology, Govt. of India.
- Recipient of the **NTSE scholarship** (2007), awarded to **1000 students across India** with high intellect and academic talent, by the National Centre for Educational Research and Technology, Govt. of India.

Technical Experience

Programming languages: Python, MATLAB, Javascript

Machine learning frameworks: TensorFlow, PyTorch, MatConvNet

Experimentation frameworks: PsychToolbox, jsPsych, Pavlovia

Imaging techniques: fMRI, EEG, EyeLink

Conference Talks

Category-orthogonal object features guide information processing in recurrent neural networks trained for object categorization
(Talk) *European Conference on Vision Perception (ECVP)*, Nijmegen, 2022
(Flash talk) *Neuromatch conference 4.0*, Online, 2021

Body silhouettes as features in visual search: evidence from spatially-global attention modulation in visual cortex
(Talk) *Neuromatch conference 3.0*, Online, 2020

The functional role of cue-driven feature-based feedback in object recognition
(Talk) *Perception Day*, Nijmegen, 2018

Using convolutional neural networks to measure the contribution of visual features to the representation of object animacy in the brain
(Talk) *Rovereto Workshop on Concepts, Actions and Objects (CAOs)*, Rovereto, 2017

Reviewing work

Nature Human Behavior, Neural Networks, PLOS Computational Biology, Nature Communications, Science Advances, NeurIPS, Memory & Cognition, eLife, iScience, CCN

Supervision Experience

Supervision of 11 undergraduate, 3 masters, and 3 PhD students. Notable theses are listed.

- (Bachelors) Lotta Piefke: *Investigating the practicality and emergence of the Attention Schema Theory* — *Osnabrück University, 2023*
- (Masters) Jochem Koopmans: *How our predictions do not deceive us: an investigation of the illusory perception of upside-down letters* — *Radboud University, 2022*
- (Bachelors) Sjoerd Meijer & Ilze Thoonen: *Primed modulation of low-level object features using real-world objects and scenes* — *Radboud University, 2018*

Teaching Experience

- **Lecturer**: *Reading group on integrative systems approaches in computational cognitive neuroscience* (design, supervision, & evaluation; Masters) — *Osnabrück University, 2024*
- **Lecturer**: *Topics in cognitive neuroscience* (design, teaching, & evaluation; Masters) — *Osnabrück University, 23-24*
- **Lecturer**: *Machine learning for cognitive computational neuroscience* (teaching, & evaluation; Masters) — *Osnabrück University, 2023*
- **Lecturer**: *Reading group at the intersection of neuroscience & machine learning* (design, supervision, & evaluation; Masters) — *Osnabrück University, 2023*
- Mentor: *Neuromatch Academy (Deep Learning course)* — *Online, 2022*
- Teaching Assistant: *Advanced Academic & Professional Skills* (evaluation; Masters) — *Radboud University, 2020*
- Teaching Assistant: *Neural Networks* (supervision & evaluation; Bachelors) — *Radboud University, 2019*

– Guest Lecturer: *Academic Skills 2* — *Radboud University, 18-19*
(teaching & evaluation; Bachelors)
– Teaching Assistant: *Brain for AI* — *Radboud University, 2018*
(supervision & evaluation; Bachelors)

Workshops Attended

Analytical Connectionism (AC) — *September, 2023*
London, United Kingdom
Project: Visual feature manifolds in a convolutional RNN.

IBRO-SIMONS Computational Neuroscience Imbizo (ISi-CNI) — *January, 2017*
Cape Town, South Africa
Project: Assessing the role of feature attention in object detection with CNNs.

Computational Approaches to Memory and Plasticity (CAMP) — *June, 2015*
Bangalore, India
Project: The role of the billions of granule cells in the cerebellum.

Invited Talks

Behaving RNNs: Bridging the gap between naturalistic evidence and decision-making
(Lab retreat talk) Cichy lab, FU, Berlin, 2024

Useful scene representations
(Lab meeting talk) Kaiser lab, JLU, Giessen, 2023

Category-orthogonal object features guide information processing in recurrent neural networks trained for object categorization
(Guest talk) MSc course on *Advanced Neural and Cognitive Modelling*, UvA, Amsterdam, 2022

Representations: Useful, useless or harmful?
(Seminar talk) Foundations of Cognition Series, Donders Institute, Nijmegen, 2019

Other Work Experience

General Secretary
Undergraduate division - Department of Physics, IIT Bombay — *2014-15*

Content Developer
Avanti Fellows, Delhi — *Summer 2013*