

# SUSHRUT THORAT

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## CONTACT INFORMATION

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GITHUB: [novelmartis](https://github.com/novelmartis)    OTHER INFO: [G-Scholar](#), [Short-CV](#)

## GOAL

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

## RESEARCH AREAS

Recurrent computations, lifelong learning, explainable AI, neural representations of scenes

## ACADEMIC TRAJECTORY

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

**Ph.D. in Cognitive Neuroscience** *November, 2022*  
*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** *July, 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** *August, 2015*  
*Department of Physics, Indian Institute of Technology - Bombay (IIT-B), India*  
[Thesis](#): Quadcopter Flight Control using Modular Spiking Neural Networks  
Advisor: Bipin Rajendran

## PRE-PUB PAPERS

Gayet S, Battistoni E, [Thorat S](#), Peelen MV (2023). Searching near and far: the attentional template incorporates viewing distance. *PsyArXiv* (under review).

Yeh LC, [Thorat S](#), Peelen MV (2023). Spatiotemporal associations between neural representational similarity and visual task performance. *bioRxiv* (under review).

## PEER-REVIEWED PUBLICATIONS

[Thorat S](#), Doerig A, Kietzmann TC (2023). Characterising representation dynamics in recurrent neural networks for object recognition. *Conference on Cognitive Computational Neuroscience (CCN)*.

Anthes D, [Thorat S](#), König P, Kietzmann TC (2023). Diagnosing catastrophe: Large parts of accuracy loss in continual learning can be accounted for by readout misalignment. *Conference on Cognitive Computational Neuroscience (CCN)*.

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

[Thorat S](#), Peelen MV (2022). Body shape as a visual feature: evidence from spatially-global attentional modulation in human visual cortex. *NeuroImage*: 119207.

[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.

Thorat S\*, Aldegheri G\*, van Gerven MAJ, Peelen MV (2019). Modulation of early visual processing alleviates capacity limits in solving multiple tasks. *Conference on Cognitive Computational Neuroscience (CCN)*: 226-229. \*equal contribution.

Thorat S, van Gerven MAJ, Peelen MV (2018). The functional role of cue-driven feature-based feedback in object recognition. *Conference on Cognitive Computational Neuroscience (CCN)*.

Thorat S, Choudhari V (2016). Implementing a Reverse Dictionary, based on word definitions, using a Node-Graph Architecture. *Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers*: 2797-2806.

Thorat S, Rajendran B (2015). Arithmetic computing via rate coding in neural circuits with spike-triggered adaptive synapses. *International Joint Conference on Neural Networks (IJCNN)*.

#### 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 PROFICIENCY

**Programming languages:** Python, MATLAB, Javascript

**Machine learning frameworks:** TensorFlow, PyTorch, MatConvNet

**Experimentation frameworks:** PsychToolbox, jsPsych, Pavlovla

**Neuro-imaging:** fMRI (data acquisition and analysis), EEG (data analysis)

#### CONFERENCE TALKS/POSTERS

Characterising representation dynamics in recurrent neural networks for object recognition  
([Poster](#)) *Conference on Cognitive Computational Neuroscience (CCN)*, Oxford, 2023

Category-orthogonal object features guide information processing in recurrent neural networks trained for object categorization

(Talk) *European Conference on Vision Perception (ECVP)*, Nijmegen, 2022

(Poster) *SVRHM @ NeurIPS*, Online, 2021

([Flash talk](#)) *neuromatch 4.0*, Online, 2021

(Poster) *Champalimaud Research Symposium*, Online, 2021

Statistical learning of distractor regularities facilitates visual search

([Poster](#)) *European Conference on Vision Perception (ECVP)*, Online, 2021

Body silhouettes as features in visual search: evidence from spatially-global attention modulation in visual cortex

(Poster) *Donders Poster Session*, Nijmegen, 2020

([Talk](#)) *Neuromatch conference 3.0*, Online, 2020

The nature of the animacy organization in human ventral temporal cortex

([Poster](#)) *Conference on Cognitive Computational Neuroscience (CCN)*, Berlin, 2019

Modulation of early visual processing alleviates capacity limits in solving multiple tasks

([Poster](#)) *Conference on Cognitive Computational Neuroscience (CCN)*, Berlin, 2019

The functional role of cue-driven feature-based feedback in object recognition  
 (Talk) *Perception Day*, Nijmegen, 2018  
 (Poster) *Donders Discussions*, Nijmegen, 2018  
 (Poster) *Conference on Cognitive Computational Neuroscience (CCN)*, Philadelphia, 2018

Using convolutional neural networks to measure the contribution of visual features to the representation of object animacy in the brain  
 (Poster) *Donders Discussions*, Nijmegen, 2017  
 (Talk & Poster) *Rovereto Workshop on Concepts, Actions and Objects (CAOs)*, Rovereto, 2017  
 (Tweets) *Brain Twitter Conference (brainTC)*, 2017

Arithmetic computing via rate coding in neural circuits with spike-triggered adaptive synapses  
 (Poster) *International Joint Conference on Neural Networks (IJCNN)*, Killarney, 2015

**REVIEWING WORK** Nature Communications, Science Advances, NeurIPS workshops, Memory & Cognition, eLife, CCN

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

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

**SUPERVISION** Supervised 11 undergraduate and 2 masters students during their thesis projects.  
**EXPERIENCE** Notable theses are listed:

- (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**
- **Lecturer:** *Topics in cognitive neuroscience* *Osnabrück University, 2023*  
 (design, teaching, & evaluation; Masters)
  - **Lecturer:** *Reading group at the intersection of neuroscience & machine learning* *Osnabrück University, 2023*  
 (design, supervision, & evaluation; Masters)
  - Teaching Assistant: *Advanced Academic & Professional Skills* *Radboud University, 2020*  
 (evaluation; Masters)
  - Guest Lecturer: *Academic Skills 2* *Radboud University, 2019*  
 (teaching & evaluation; Bachelors)
  - Teaching Assistant: *Neural Networks* *Radboud University, 2019*  
 (supervision & evaluation; Bachelors)
  - Guest Lecturer: *Academic Skills 2* *Radboud University, 2018*  
 (teaching & evaluation; Bachelors)
  - Teaching Assistant: *Brain for AI* *Radboud University, 2018*  
 (supervision & evaluation; Bachelors)

**OTHER WORK** **General Secretary**  
**EXPERIENCE** Undergraduate division - Department of Physics, IIT Bombay *2014-15*

**Content Developer**  
 Avanti Fellows, Delhi *Summer 2013*