

# ROBERT-JAN BRUINTJES

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I am a PhD candidate in Computer Vision, working with dr. Jan C. van Gemert at Delft University of Technology, the Netherlands. I work on integrating prior knowledge into Computer Vision, to benefit data efficiency and robustness of vision models. My methods of choice concern reparameterizations of neural network operators, for example, neural implicit convolutional kernel representations (see my FlexConv work), group equivariant convolutions and self-attention.

Before my PhD candidacy, my experience as lead of a five-person R&D team taught me to perform fast, results-driven research while yielding production-grade experimentation environments. Through the Artificial Intelligence MSc program I learned to work with state of the art machine learning and Deep Learning models. Even during this program this has resulted in a short paper published in the field of Information Retrieval, as well as several successful projects over the course of the AI master program.

I am energetic, open and direct. I consider myself to be open-minded and actively strive for collaboration. I am an active contributor to my research group in Delft.

## SELECTED PUBLICATIONS

OCTOBER 2021

### **FLEXCONV: CONTINUOUS KERNEL CONVOLUTIONS WITH DIFFERENTIABLE KERNEL SIZES / ICLR 2022 (POSTER)**

**David W. Romero\***, **Robert-Jan Bruintjes\***, **Jakub M. Tomczak**, **Erik J. Bekkers**, **Mark Hoogendoorn**, **Jan C. van Gemert** (\*equal contribution)

Abstract: When designing Convolutional Neural Networks (CNNs), one must select the size of the convolutional kernels before training. Recent works show CNNs benefit from different kernel sizes at different layers, but exploring all possible combinations is unfeasible in practice. A more efficient approach is to learn the kernel size during training. However, existing works that learn the kernel size have a limited bandwidth. These approaches scale kernels by dilation, and thus the detail they can describe is limited. In this work, we propose FlexConv, a novel convolutional operation with which high bandwidth convolutional kernels of learnable kernel size can be learned at a fixed parameter cost. FlexNets model long-term dependencies without the use of pooling, achieve state-of-the-art performance on several sequential datasets, outperform recent works with learned kernel sizes, and are competitive with much deeper ResNets on image benchmark datasets. Additionally, FlexNets can be deployed at higher resolutions than those seen during training. To avoid aliasing, we propose a novel kernel parameterization with which the frequency of the kernels can be analytically controlled. Our novel kernel parameterization shows higher descriptive power and faster convergence speed than existing parameterizations. This leads to important improvements in classification accuracy.

JULY 2017

### **CAUSAL DISCOVERY WITH LONG SHORT-TERM MEMORY / MASTER THESIS**

**Robert-Jan Brintjes, supervision by Efstratios Gavves, Joris Mooij (University of Amsterdam)**

This thesis research investigated the possibility of implementing a test for causal relations in time series data using neural network architectures. We applied the LSTM model architecture to learn a model that predicts interacting time series from which we can deduce the existence of Granger-causality, a form of causality.

## AWARDS & HONORS

SEPTEMBER 2021

**OUTSTANDING REVIEWER / ICCV 2021**

## GRANTS

OCTOBER 2021

**NWO / COMPUTING TIME ON NATIONAL COMPUTER FACILITIES (SMALL)**

Title: **Visual Inductive Priors for Data-Efficient Deep Learning**

Press release: <https://www.nwo.nl/en/news/nwo-grants-eight-applications-computing-time-national-computer-facilities-1>

## EXPERIENCE

SEPTEMBER 2019 – PRESENT

**PHD CANDIDATE / DELFT UNIVERSITY OF TECHNOLOGY**

Supervisor: dr. Jan C. van Gemert

I work on integrating prior knowledge into Computer Vision, to benefit data efficiency and robustness of vision models. My methods of choice concern reparameterizations of neural network operators, for example, neural implicit convolutional kernel representations (see my FlexConv work), group equivariant convolutions and self-attention.

I am co-organizer of the VIPriors workshop series (<https://vipriors.github.io>), so far organizing editions at ECCV 2020 and ICCV 2021. As organizer I have been responsible for the challenge track (2020) and paper track (2021) of the workshop, as well as being the host of both editions' live sessions.

APRIL 2018 – AUGUST 2019

**LEAD DEEP LEARNING ENGINEER / SIGHTCORP**

Sightcorp is an AI spin-off from the University of Amsterdam specializing in face analysis software. At Sightcorp I apply state-of-the-art Deep Learning for Computer Vision while constrained by business priorities and maintaining a solid code base for repeatable experimentation. I lead my colleagues and myself to achieve competitive results for face detection systems by exploiting overlapping expertise and coming up with innovative solutions by collaborating in brainstorming.

AUGUST 2017 – APRIL 2018

**DEEP LEARNING ENGINEER / SIGHTCORP**

Before becoming team lead in April 2018 my responsibilities included researching leads to improve the face detection using Convolutional Neural Networks through applying state-of-the-art Computer Vision research. Leading up to becoming team lead I was additionally involved in hiring new team members and streamlining the team's communication.

JULY 2016 – AUGUST 2017

## **RESEARCH ASSISTANT / VRIJE UNIVERSITEIT AMSTERDAM**

Based on previous VU research, this project aims to expand the capabilities of quality indicator estimation systems from hospital patient data. In particular the focus of this research is to incorporate natural language descriptions into the estimation of quality indicators. This means working with hospitals to get an understanding of medical jargon.

**MARCH 2015 – MARCH 2016**

## **RESEARCH ASSISTANT / UNIVERSITEIT VAN AMSTERDAM**

Researching and implementing a large-scale version of COSTA, a zero-shot image classification framework proposed by dr. Thomas Mensink at UvA. The new implementation has a Python-powered web interface and handles big sources of data in an efficient way.

**SEPTEMBER 2013 – JANUARY 2020**

## **FOUNDER / IKWILGEWOONEENWEBSITE.NL**

Designing, building and maintaining websites for businesses and people. Clients include several student associations and small businesses.

**SEPTEMBER 2013 – SEPTEMBER 2014**

## **ASSESSOR / STUDENT SOCIETY VGSU**

During my bachelor studies, I was elected to the executive board for one year. My responsibilities included organizing various activities for the society of around a hundred students, such as lectures and other academic activities.

## **EDUCATION**

**JULY 2017**

## **MSC ARTIFICIAL INTELLIGENCE / UNIVERSITEIT VAN AMSTERDAM**

Completed the tracks Machine Learning and Natural Language Processing.  
Thesis: see *Selected Publications*.

**SEPTEMBER 2014**

## **BSC COMPUTER SCIENCE / UNIVERSITEIT UTRECHT**

Completed the minor Technical Artificial Intelligence.

**JULY 2010**

## **VWO NATUUR & TECHNIEK / GREIJDANUS COLLEGE ZWOLLE**

## **OTHER PUBLICATIONS**

### **VIPriors 1: Visual Inductive Priors for Data-Efficient Deep Learning Challenges.**

Robert-Jan Brintjes, Attila Lengyel, Marcos Baptista Rios, Osman Semih Kayhan, Jan van Gemert.  
*arXiv preprint arXiv:2103.03768.*

### **Domain Adaptation for Rare Classes Augmented with Synthetic Samples.**

Tuhin Das, Robert-Jan Brintjes, Attila Lengyel, Jan van Gemert, Sara Beery.  
*arXiv preprint arXiv:2110.12216*

### **Probabilistic Multileave For Online Retrieval Evaluation.**

Anne Schuth, Robert-Jan Brintjes, Fritjof Buüttner, Joost van Doorn, Carla Groenland, Harrie Oosterhuis, Cong-Nguyen Tran, Bas Veeling, Jos van der Velde, Roger Wechsler, David Woudenbergh, Maarten de Rijke.

## SKILLS

- Machine learning, Deep Learning
- Computer Vision, Natural Language Processing
- Fluent in Python, PyTorch, Git, LaTeX
- Proficient in TensorFlow, Flask, C#, Java, SQL, HTML, CSS, JavaScript, Ruby on Rails.

## REFERENCES

- Dr. Thomas Mensink  
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Amsterdam  
[mensink@google.com](mailto:mensink@google.com)
- Dr. Jan van Gemert  
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