

BrainCreators

Research Internship 2021-2022

Fashion & Retail

Virtual Try-on (VTON)

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General Information

Contact and Interviews

Before you read on, .. we encourage interested candidates to contact us as soon as possible for an intake interview!

Please contact our head of research, Maarten Stol: maarten.stol@braincreators.com

Or visit our website: <https://www.braincreators.com/contact>

Like previous years, we have a limited number of available positions, and expect another rise in the number of candidates. Interviews will take place in September & October, and decisions to hire will be made for a timely start in November 2021.

To some degree, and given equal skills, this will be a first-come-first-serve selection process. (there is a chance of new positions opening up later in the year, so if you read this after November 2021, the door is not fully closed yet)

Introduction and overview

Welcome! You are looking at the research internships BrainCreators has on offer in 2021-2022.

BrainCreators is at the forefront of applied AI, with many years of successful research internship projects that combine cutting edge science with the challenges of applying AI in the real world. Located at Amsterdam's Prinsengracht and Science Park, we are a growing team of AI experts, software developers, MLOps & DevOps specialists and researchers.

Research internships in our applied vertical teams

The 4 business verticals that offer a research internship position this year are:

- **Road surface inspection**, combining Deep Learning Object Detection with Geo-information (and possibly 3D data).
- **Video surveillance**, based on, and extending our anonymization tooling. The focus is on understanding person and crowd behavior, anomaly detection, and video retrieval, all based on video representation Deep Learning and self-supervision.
- **Conveyor belt applications**: recognition, localization, and manipulation by robot of objects on a conveyor belt. Challenges concern high variance of object shape and visuals, and detection of out-of-distribution imagery.
- **Fashion & Retail**: this year with a focus on generative models for Virtual Try-on of clothing items.

Research internships on other activities

In addition to our business verticals, there are research topics that are more general, or concern pure research which is not immediately related to our commercial activities.

If you would like more information on topics like these, please contact our head of research, Maarten Stol: maarten.stol@braincreators.com

- **MLOps** is an essential part of every product we roll out live. Topics include data unit tests, live evaluations, deployment monitoring, handling shifting data, containerization, building KubeFlow pipelines, and scaling deployments.
- **Symbolic/Subsymbolic Hybrid Ai** In particular we are interested in compensating a lack of annotated training data with symbolically encoded background knowledge about the

application domain. If valuable explicit background knowledge is available in the form of rule-based information, then we are interested in e.g., imposing this knowledge as regularizers on our object detection models, or in other ways to exploit relational information.

- **Astronomy** A position working in tandem with our partners on the Cortex Consortium in the field of astronomy. BrainCreators is an industrial partner in this 6 year project, providing research and development with a focus on topics like neural network compression and autotuning of real-time ML pipelines. For a general impression see:
 - <https://www.uva.nl/en/shared-content/faculteiten/en/faculteit-der-natuurwetenschappen-n-wiskunde-en-informatica/news/2019/06/self-learning-machines-hunt-for-explosions-in-the-universe.html?cb>
 - <https://www.esciencecenter.nl/projects/cortex/>

What we offer, what we expect

We offer:

- Be part of a growing company with a proven track record in applied Ai
- A research internship position on one of our vertical teams
- Interaction with research interns from our other vertical teams, in a science oriented horizontal research team.
- A protected environment for your research, without distraction by commercial deadlines of the team
- Opportunities to contribute to the team by developing dual-use software: for your own research and the team's products.

- Weekly supervision on scientific progress, experimental design, and thesis text
- Weekly supervision on software development and code reviews
- Daily contact with the vertical team, and morning stand-up meetings
- Weekly participation in internal ML workshops, sharing ideas with others
- Access to compute resources (in addition to University resources)
- Opportunity to work from home, or work from our HQs at Prinsengracht or Science Park Amsterdam.
- A financial compensation of 300 euros per month

- Learn all the essential things a Master program typically does not offer, e.g.,
 - onboarding with software development skills,
 - MLOps skills,
 - optimal use of compute resources,
 - versioning of ML and datasets,
 - collaboration software,
 - and communication skills.
- Be the eyes and ears of your team, looking for promising academic developments that might be relevant to the vertical
- Opportunities to become a permanent team member, and join as ML engineer after the research internship.

We expect:

- Workload contribution of 40h per week, 6-8 months (all activities related to your MSc program are included in this 40h, other jobs and classes are not)
- Capable to work independently on your own research questions and experiments
- Active participation in team effort when needed
- Solid control of spoken and written English language

- A strong opinion on ML research and how to apply it in practice
- Solid fundamental knowledge of ML theory and practice
- Overall knowledge level of a graduating Ai MSc student
- Good PyTorch skills
- Good understanding of the required mathematics
- Good software development skills

- Active participation in internal workshops, presenting your progress, and discussing your experimental design choices with your team and other verticals in the company
- Willingness to rewrite the thesis as a publishable paper
- Co-authorship for your thesis supervisors on publications derived from the thesis.

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The Research Internship Position: Virtual Try-on (VTON) for Fashion and Retail

Summary

Join our Ai fashion team as a research intern. Work on R&D for visual Ai methods based on e.g., GANs and/or Self-Supervision to create a Virtual Try-On solution. The end product will be used for our work in retail and the fashion industry. Describe your scientific results in a publishable paper.

Product

<https://wairforretail.com/>

Together with our fellow Wair Retail Geeks, BrainCreators develops Ai based applications for fashion retail. Cutting edge technology is used for out-of-the-box solutions that reduce inefficiencies in the value chain and make for a better shopping experience. This combines the financial potential of the fashion industry with the technical challenges of today's Ai.

In parallel with development of other fashion retail products, BrainCreators wants to spend 1 year of R&D effort on the challenge of virtual try-on, and aim to deliver a working solution at the end of the research internship.

Technology

Image virtual try-on aims to fit a garment image (target clothes) to a person image [1]. The goal is to help consumers decide which garment to buy, based on a personalized visual impression created by the application.

This has been an active field of research in visual Ai since at least 2012 [5]. Approaches range from exploiting human parsing algorithms to full end-to-end trainable pipelines.

The best approach often depends on the (type of) available data and constraints of the deployment environment. Self-supervision seems to play an important role in modern approaches. See [2] for an example video. Other examples from recent work are [6] and [7].

The research intern will have to help select and/or implement any methods to be used during the project. Starting points may include this curated list of VTON research [4], or one of the many available survey papers, e.g., [5]. *Papers with Code* [3] also has a decent overview of available methods.

Research Questions

At BrainCreators, research interns have considerable freedom to define their own research questions. We do, however, provide scope and direction, and maintain the possibility to veto ideas that are too far removed from our commercial interests. That said, part of the internship should have a strong scientific orientation, and aim to result in a publishable paper. Another part of the internship is the development of software modules to be integrated into our product stack.

For this project we want to create an application where customers can upload a picture of themselves and virtually try on a product from a client's catalogue. For this, we propose the more general scientific task of exploring how we can perform this mapping visually. This can be done in the form of visual generative modeling (e.g. GANs) or with 3D modeling techniques and avatars. We want to know which of the recent advances in the field have the most potential for our line of products, and want to work towards a working prototype during the internship.

Examples of research questions include, but are not limited to:

- How far can we build on the teacher-tutor-student knowledge distillation methods from [1] to improve sota results on academic benchmarks, and create value using data available from our partner, Wair?
- How far can we improve image resolution, going toward 1024x768 like [7], and reproduce sota results on real world data from our partner, Wair?
- What are innovative ways to collect and use real world data from our retail locations, for use in our VTON methods?

- The research intern candidate is encouraged to bring their own ideas to the table (even during the selection rounds!) and help shape the goals for the project.

Engineering & MLOPs

The research intern will be partly responsible for integration of developed technologies into our product stacks, to facilitate deployment and scaling of the solutions with MLOPs.

While this requires a substantial amount of skills that are often different from typical Ai research, we hope to provide the research intern the opportunity to learn as much as possible, and implement the solution together with our team.

Sources

[1] Parser-Free Virtual Try-on via Distilling Appearance Flows <https://arxiv.org/abs/2103.04559>

[2] Self-Supervised Collision Handling via Generative 3D Garment Models for Virtual Try-On (CVPR 2021) <https://www.youtube.com/watch?v=9AnBNco6i2U>

[3] Papers with Code: Virtual Try-on <https://paperswithcode.com/task/virtual-try-on/codeless>

[4] A Curated List of Awesome Virtual Try-on (VTON) Research <https://github.com/minar09/awesome-virtual-try-on>

[5] Comprehensive Survey on Virtually Try-on Outfits https://www.techrxiv.org/articles/preprint/Image-Based_Virtual_Try-on_System_A_Survey_of_Deep_Learning-Based_Methods/13904099

[6] Disentangled Cycle Consistency for Highly-Realistic Virtual Try-On <https://arxiv.org/abs/2103.09479>

[7] VITON-HD: High-Resolution Virtual Try-On via Misalignment-Aware Normalization https://openaccess.thecvf.com/content/CVPR2021/papers/Choi_VITON-HD_High-Resolution_Virtual_Try-On_via_Misalignment-Aware_Normalization_CVPR_2021_paper.pdf

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