Sofia Broomé

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EDUCATION   **KTH Royal Institute of Technology**, Stockholm, Sweden

- Ph.D. in Machine Learning at the Division of Robotics, Perception and Learning (RPL), September 2022, *'Learning Spatiotemporal Features in Low-Data and Fine-Grained Action Recognition with an Application to Equine Pain Behavior'*, advisor Prof. Hedvig Kjellström.

- Engineering Physics program (BSc and MSc), 2011-2017, comprising:
  - *M.Sc.*, *'Objectively Recognizing Human Activity in Body-Worn Sensor Data with More or Less Deep Neural Networks'*, RPL, advised by Prof. Josephine Sullivan, June 2017
  - *B.Sc.*, *'A Partial Differential Equation Perspective on Climate Modeling'*, Department of Mathematics, advised by Prof. Henrik Shahgholian, May 2014

SKILLS   **Programming**: Proficient in Python. Experience of Java, Matlab, C++, SQL. Extensive experience of both Pytorch and Tensorflow, gin, Pytorch Lightning and Ignite.
General tools: Git, Github, Vim, Unix, Slurm, conda, tmux, dvc.
Languages: Swedish (maternal language), English (fluent), French (fluent and professional level, lived for 3.5 years in Paris), basics of Italian.

PROFESSIONAL EXPERIENCE   **Machine Learning Research Engineer**   *Therapanacea*
November 2022 - ongoing   *Paris, France*
Research and development within healthcare applications of machine learning and computer vision, at Therapanacea, a French spin-off from University Paris-Saclay, founded in 2017 by Prof. Nikos Paragios. During 2023, I investigated disease progression and individual treatment prediction models within the context of Alzheimer's disease in the neuro AI team. Since November 23, I'm in the radiotherapy segmentation team, working to improve Therapanacea's organs-at-risk (OAR) 3D contouring, used in more than 60 radiotherapy centers spanning Europe, Middle-East, United States and Africa. I also worked with generative modeling for other radiotherapy applications in computer vision.

Teaching   *KTH*
2016 - 2022   *Stockholm*

- Project formulation and supervision of Boyu Li, for her M.Sc. thesis *Are deep video architectures (also) biased toward texture rather than shape?* (graduated June 2021).

- Supervision of Michaela Söderström, for her M.Sc. thesis *Pose-based Classification of Horse Behavior in Video* (graduated June 2021).

- Supervision of Zhenghong Li, for his M.Sc. thesis *Automated Facial Action Unit Recognition in Horses* (graduated June 2020).

- Supervision of Ci Li, now a PhD student at RPL, for her M.Sc. thesis *Automatic Horse Lameness Detection through 2D to 3D Reconstruction* (graduated Jan. 2020).

- Teaching assistant in the following courses (during my PhD studies): Artificial Intelligence (DD2380), Deep Learning in Data Science (DD2424), Machine Learning (DD2421), Image Analysis and Computer Vision (DD2423), Search Engines and Information Retrieval (DD2476)

- While still a M.Sc. student, I was selected to work as a teaching assistant in DD2380 (Artificial Intelligence) and DD2476 (Search Engines and Information Retrieval) (2016).

PhD chapter board member and   *KTH*
vice-chair of the EECS PhD council.
December 2019 - June 2021   *Stockholm*
During this period at KTH, I worked 20% with doctoral student advocacy questions
(this prolonged my PhD time with four months, paid by KTH). I was an elected
member of the board of the doctoral section, representing all doctoral students of
the university centrally. As part of my work in the board, I was also the doctoral
student representative of KTH's central Ethics committee, and occasionally partook in
recruitment and promotion interviews of KTH faculty. During 2020, I was also vice-
chair of the local doctoral student council for the school of Electrical Engineering and
Computer Science (EECS/KTH).

Machine Learning Intern   *Watty AB*
June - August 2016   *Stockholm*
Watty was a startup company aiming to reduce energy waste by applying Machine
learning on household energy data, later acquired by the German company Discovergy.
The company's ML team worked on solving the disaggregation problem: discerning
separate appliances from the total power time series. I worked in Python both test-
ing traditional ML-methods and developing experimental search algorithms to find
repeated patterns in time series, visualizing my results for the biweekly demos.

PUBLICATIONS

- **Sofia Broomé**, Karina B. Gleerup, Pia Haubro Andersen, and Hedvig Kjell-ström. *Dynamics are Important for the Recognition of Equine Pain in Video.* CVPR, 2019.

- **Sofia Broomé**, Ernest Pokropek, Boyu Li, Hedvig Kjellström. *Recur, Attend or Convolve? On Whether Temporal Modeling Matters for Cross-Domain Robustness in Action Recognition*, WACV, 2023.

- **Sofia Broomé**, Marcelo Feighelstein, Anna Zamansky, Gabriel Carreira Lencioni, Pia Haubro Andersen, Francisca Pessanha, Marwa Mahmoud, Hedvig Kjellström, Albert Ali Salah. *Going Deeper than Tracking: a Survey of Computer-Vision Based Recognition of Animal Pain and Affective States*, IJCV, 2022.

- Joonatan Mänttäri*, **Sofia Broomé***, John Folkesson and Hedvig Kjellström. *Interpreting Video Features: A Comparison of 3D Convolutional Networks and Convolutional LSTM Networks*, ACCV, 2020. (*Joint first authors)

- **Sofia Broomé**, Katrina Ask, Maheen Rashid, Pia Haubro Andersen, and Hedvig Kjellström. *Sharing Pain: Using Domain Transfer Between Pain Types for Recognition of Sparse Pain Expressions in Horses*, PLOS ONE, 2022.

- Maheen Rashid, **Sofia Broomé**, Katrina Ask, Elin Hernlund, Pia Haubro Andersen, Hedvig Kjellström and Yong Jae Lee. *Equine Pain Behavior Classification via Self-Supervised Disentangled Pose Representation.* WACV, 2022.

- Ci Li, Nima Ghorbani, **Sofia Broomé**, Maheen Rashid, Michael J. Black, Elin Hernlund, Hedvig Kjellström, and Silvia Zuffi. *hSMAL: Detailed horse shape and pose reconstruction for motion pattern recognition.* CV4Animals (CVPR Workshop), 2021.

- F.M. Serra Bragança, **Sofia Broomé**, Marie Rhodin et al. *Improving gait classification in horses by using inertial measurement unit (IMU) generated data and machine learning.* Nature Scientific Reports, 10, 17785 (2020).

- Felix Liljefors*, Moein Sorkhei*, **Sofia Broomé***, *[Re] Unsupervised Scalable Representation Learning for Multivariate Time Series*, ReScience C 6, 2, # 6, NeurIPS 2019 Reproducibility Challenge, 2020. (*Joint first authors)

PREPRINTS

- Zhenghong Li, **Sofia Broomé**, Pia Haubro Andersen, and Hedvig Kjellström. *Automated Detection of Equine Facial Action Units*, arXiv:2102.08983, 2021.

OTHER

- Presented the abstract *Evaluation of machine learning models that predict Alzheimer's disease progression in observational studies and randomized clinical trials*, a joint project between Therapanacea and Biogen, at CTAD in Boston, October 2023.

- June 2021, gave a 2 hour lecture at a PhD-level course in *Digital tools and objective methods for motion research in animals* at the Swedish University of Agriculture (SLU) in Uppsala on basics of machine learning and computer vision, as well as my applied research in deep learning.

- Selected among 150 accepted participants, from 631 applicants, and participated in the International Computer Vision Summer School (ICVSS) 2022, July 10-16th.

- Pilot user in summer 2021 before the launching of the premier AI/ML computing cluster in Sweden, Berzelius (`https://www.nsc.liu.se/systems/berzelius/`).

- Invited speaker for the 1st International Workshop on Research Methods in Animal Emotion Analysis (RM4AEA), July 2021.

- Reviewer for RSS 2020, ECCV 2020, CVPR 2021, ICCV 2021, WACV 2022, ICLR 2022, CVPR 2022, CV4Animals 2022@CVPR, NeurIPS 2022, WACV 2023, ICLR 2023, ICLR 2024 and ICML 2024.

- I was an invited guest on Swedish national radio (Musikhjälpen), explaining what are neural networks and discussing AI in general (December 2020).

- Participant of the Future Digileaders 2020 workshop, for selected early career female researchers (November 2020).

- Published The question of single unit semantics in deep networks on Towards Data Science (Medium), Oct 26 2020.

- Participated in a panel discussion on the computer vision challenges in autonomous systems at Digitalize in Stockholm 2020, bringing a general computer vision and deep learning perspective (November 2020).

- Participated in the Reproducibility Challenge @ NeurIPS 2019. Our report was selected for ReScience-C journal publication, November 2019.

- Participated in the Computer Vision Summer School in Freudenstadt, Germany (CVSS19), July 2019.

- 2015-2018, I regularly (every third week) arranged and participated in an interdisciplinary study circle about the brain and consciousness, together with engineering, medicine and psychology students.

- Organized an Arduino robot workshop (with Prof. Patric Jensfelt and more) in May 2016 and 2017 at the Tekla festival enhancing young girls' interest in technology.

- Volunteer for Kodcentrum, an organization teaching coding (via Scratch) to school children, in May 2016.

- Volunteer at the SXSW Music Festival in Austin, TX, USA in March 2015.

- Since 2014, I have occasionally worked as a DJ (around once per month between 2014-2020).