Antonin Sulc PhD

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http://sulcantonin.github.io

Research Interests Autonomous Systems (for particle accelerators), Computer Vision (Geometry), Anomaly Detection

Technologies MLOps (e.g. Docker), High Performance Computing, Quantum Computing (Qiskit)

Languages English (C1), German (B2), Czech (native)

Education

University of Konstanz, Konstanz, Germany

PhD., Artificial Intelligence - Computer Vision, 2015 - 2020

- Grade: *Magna Cum Laude* (1.0)
- Advisors: Prof. Dr. Bastian Goldluecke
- 446 Citations (Google Scholar)
- Publications on top-tier conferences (CVPR, ICCV, BMVC)
- Contribution to projects outside scope of PhD topic (Dpt. of Collective Behavior)

Czech Technical University, Prague, Czech Republic

Bc.& MSc., Artificial Intelligence, 2008 - 2014

- **Nominated as a IT master thesis of year 2014** in Czech Republic

Teaching

Exercises tutor Image Analysis I : Image Processing Winter Sem. 2017, 2018, 2019
- University Konstanz
- Basics of image processing (denoising, pattern recognition, motion analysis)
- Leading tutorials, participating in homework preparation, homework grading, office hours, exam corrections

Exercises tutor Teacher Image Analysis II : Image Processing Summer Sem. 2017, 2018
- University Konstanz
- 3D reconstruction, camera calibration, motion and tracking
- Leading tutorials, participating in homework preparation, homework grading, office hours, exam corrections

Tutorial on Anomaly Detection 2022
- Machine Learning in Particle Accelerator Workshop @ Chicago, USA
- basics of anomaly detection, preparation of materials for lecture including code examples
- Available at: https://github.com/sulcantonin/ICFA-Beam-2022

A Potential of Use of Language Processing in Accelerator Control Systems 2023
- Particle Acceleration Controls Conference @ Cape Town, South Africa
- basics of fine-tuning LLMs with parameter efficient models, preparation of examples
- Available at: https://github.com/sulcantonin/WORKSHOP_ICALEPCS23

Students

Jens Kwasniok *Detection of Visual Anomalies on Inner Equatorial Surfaces of Superconducting Radio Frequency Cavities via an Autoencoder* 2025
- Post-production optical inspection of DESY superconducting cavities at critical welding locations
- Master Thesis 2025 Supervisor, University of Hamburg

Work

Founder April 2022 - ∞

mindling.tech
Consulting Start-up,
Development of tailor made AI solutions for various clients like tailor made multilingual search, digital twins, tracking

Researcher January 2025 - January 2027

Berkeley Lab (LBNL) - UC Berkeley
Development of intelligent algorithms for accelerator controls

Senior Data Scientist May 2021 - October 2024
Helmholtz Gemeinschaft
Real-time accelerator controls algorithms for anomaly detection
Improvement of corporate FAIR principles.

Visiting Researcher (within PhD.) March 2020 - Aug 2020
University of Haifa - Marine Imaging Lab,
A short term research stay, help in the lab, development of algorithm for image processing in challenging environments (water)
Supervisor: Dr. Tali Treibitz

Visiting Researcher (within PhD.) Oct 2018 - March 2019
National Institute of Informatics in Tokyo,
Imari Sato Lab
A short term research stay, help in the lab, development of algorithm for image processing in challenging environments (water)

Software Engineer & Data Scientist Jan 2014 - Dec 2015
Vendavo Inc., Prague, Czech Republic
Development of recommender systems
Supervisor: Dr. Ludek Kopacek, Eric Bergerson

Journals

1. **A. Sulc**, A. Eichler and T. Wilksen Unsupervised Log Anomaly Detection with Few Unique Tokens *IET Journal Information Security* (in review)
2. **A. Sulc**, A. Eichler and T. Wilsken. A data-driven anomaly detection on SRF cavities at the European XFEL. *Journal of Physics: Conference Series*. Vol. 2420. No. 1. IOP Publishing, 2023.
3. **A. Sulc**, O. Johannsen, B. Goldluecke. Recovery of Geometry, Natural Illumination and BRDF from a Single Light Field Image, In *Journal of the Optical Society of America A*, 2022,
4. S. Ishihara, **A. Sulc**, and I Sato, Depth estimation using spectrally varying defocus blur, In *Journal of the Optical Society of America A*, 2021,

Peer-Reviewed Publications

1. **A. Sulc**, T. Hellert, R. Kammering, H. Houscher, J. M. St. John, Towards Agentic AI on Particle Accelerators at *ML4Physics Workshop at The Conference on Neural Information Processing Systems 2024*, New Orleans, USA
2. **A. Sulc**, R. Kammering, A. Eichler, T. Wilksen PACuna: Automated Fine-Tuning of Language Models for Particle Accelerators at *ML4Physics Workshop at The Conference on Neural Information Processing Systems 2023*, New Orleans, USA
3. **A. Sulc**, I. Sato, B. Goldluecke, T. Treibitz. Towards Monocular Shape from Refraction, In BMVC, 2021, **oral (3.3% acceptance)**
4. S. Ishihara, **A. Sulc**, I. Sato. Depth from Spectral Defocus Blur. In *Proc. International Conference in Image Processing (ICIP)*, 2019
5. M. Zhu, A. Alperovich, O. Johannsen, **A. Sulc**, B. Goldluecke. An Epipolar Volume Autoencoder with Adversarial Loss for Deep Light Field Super-Resolution. In *Proc. Conference on Computer Vision and Pattern Recognition Workshop (CVPRW)*, 2019.
6. **A. Sulc**, O. Johannsen, B. Goldluecke. Inverse Lightfield Rendering for Shape, Reflection and Natural Illumination. In *Proc. 11th International Conference on Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR)*, 2017.
7. O. Johannsen, **A. Sulc**[1], N. Marniok, B. Goldluecke. Layered scene reconstruction from multiple light field camera views. In *Proc. Asian Conference on Computer Vision (ACCV)*, 2016.
8. **A. Sulc**, A. Alperovich, N. Marniok, B. Goldluecke. Reflection Separation in Light Fields based on Sparse Coding and Specular Flow. In *Proc. Vision, Modelling and Visualization (VMV)*, 2016.

[1] Equal Contribution

9. O. Johannsen, **A. Sulc**, B. Goldluecke. Occlusion-aware depth estimation using sparse light field coding. In *Proc. German Conference on Computer Vision (GCPR)*, 2016.

10. O. Johannsen, **A. Sulc**, B. Goldluecke. What Sparse Light Field Coding Reveals About Scene Structure. In *Proc. Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016.

11. O. Johannsen, **A. Sulc**, B. Goldluecke. Variational Separation of Light Field Layers. In *Proc. Vision, Modelling and Visualization (VMV)*, 2015.

12. O. Johannsen, **A. Sulc**, B. Goldluecke. On Linear Structure from Motion for Light Field Cameras. In *Proc. International Conference on Computer Vision (ICCV)*, 2015.

Publications

1. **A. Sulc**, P. L.S. Connor, QCD in Language Models: What they really know about QCD? at *2025 European Physical Society Conference on High Energy Physics* **oral**

2. **A. Sulc**, Hellert, T., A. Reed, A. Bien, C. Bisegni, D. Ratner, A. Carpenter, C. Tennant, D. Lersch, D. McSpadden, T. Britton, A. Sulc, H. Hoschouer, and J. St. John, eLog analysis for accelerators: Status and future outlook. at *International Conference in Particle Accelerators 2025*, Taiwan, DRC

3. **A. Sulc**, P. L.S. Connor ChatQCD: Let Large Language Models Explore QCD , *42nd International Conference on High Energy Physics*

4. P. Connor, **A. Sulc** Revealing Connections in QCD with Machine Learning , *42nd International Conference on High Energy Physics*

5. **A. Sulc**, A. Eichler, T. Wilksen, Automated Anomaly Detection on European XFEL Klystrons at *International Conference in Particle Accelerators 2024*, Nashville, USA

6. **A. Sulc**, A. Eichler, G. Hartmann, T. Wilksen, J. St. John, F. Mayet, J. Maldonado, D. Ratner, J. Kaiser, V. Kain, T. Hellert, H. Hoschouer, Towards Unlocking Insights from Logbooks Using AI at *International Conference in Particle Accelerators 2024*, Nashville, USA

7. **A. Sulc**, A. Eichler, T. Wilksen, Log Anomaly Detection on EuXFEL Nodes at *The 19th Biennial International Conference on Accelerator and Large Experimental Physics Control Systems*, Cape Town, South Africa, **oral**

8. **A. Sulc**, A. Eichler, T. Wilksen Textual Analysis of ICALEPCS and IPAC Conference Proceedings: Revealing Research Trends, Topics, and Collaborations for Future Insights and Advanced Search at *The 19th Biennial International Conference on Accelerator and Large Experimental Physics Control Systems*, Cape Town, South Africa,**oral**

9. **A. Sulc**, O. R. Kammering, T. Wilksen. A Data-Driven Beam Trajectory Monitoring at the European XFEL at *International Conference in Particle Accelerators 2022*, Bangkok, Thailand

Talks and Tutorials

1. Addressing Challenges in Accelerator Operations with Artificial Intelligence *JeffersonLab Seminars*

2. Language Processing for Matter and Technology, *10th Annual MT Meeting*

3. Exploring the Strong Coupling Through Natural Language Processing at *1st Large Language Models in Physics Symposium (LIPS)*

4. Illuminating the Dark: Discovering in Dark Matter Research through Natural Language Processing at *1st Large Language Models in Physics Symposium (LIPS)*

5. Unlocking Insights from Logbooks using AI at DESY and BESSY at *9th Low Emittance Rings Workshop 2024*

6. Towards Unlocking Insights from Logbooks using AI at DESY and BESSY at *4th ICFA Beam Dynamics Mini-Workshop on Machine Learning for Particle Accelerators*

7. A Potential of Use of Language Processing in Accelerator Control Systems at *International Conference on Accelerator and Large Experimental Physics Control Systems 2023 in Cape Town, South Africa*

8. Machine Learning for Accelerator(s) R&D at *Any Light Particle Search Workshop at DESY in Hamburg, Germany*
9. Tutorial on Anomaly Detection at *ICFA Beam Dynamics Workshop in Chicago, IL, USA*
10. Current Development of Automated Accelerator Controls at *DESY 8th Matter and Technologies Annual Meeting in Hamburg, Germany*
11. Machine Learning for Anomaly Detection at *MLE-Summer School at TUHH in Hamburg, Germany*
12. Data-Driven Diagnosis at European XFEL at *CDCS Opening Symposium in Hamburg, GErmany*
13. Light Field Analysis for non-Lambertian Scenes at *PixelClub - Technion in Haifa, Israel*
14. Multiobject Tracking Repetitive Patterns with Autoencoder at *Machine learning in the behavioral sciences Workshop at ASAB Summer School 2019 in Konstanz, Germany*
15. Lightfield Analysis for non-Lambertian Scenes at *The 11th Intelligent Machine Perception Seminar in Prague, Czech Republic*
16. Light-fields: Beyond the Lambertian at *The 38th Pattern Recognition and Computer Vision Colloquium in Prague, Czech Republic*
17. State-of-The-Art Computational Design and Fabrication

OTHER

- Scientific Chair of 5th ICFA Beam Dynamics Mini-Workshop on Machine Learning for Particle Accelerators.
- Program Chair of Foundations of Agentic Systems Theory (FAST) @ NeuralIPS 2025.
- Reviewer of CVPR, NeuralIPS