KRISTINA ULICNA

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Computational Skills

Strongest programming language: ***Python***

Experience with ***supervised*** (segmentation & classification), ***weakly supervised*** (multiple-instance), ***self-supervised*** (variational autoencoders) & ***unsupervised*** (time-sequence trajectory clustering) learning & ***dimensionality reduction*** app (PCA, UMAP)

- ***Machine learning libraries:*** skimage, sklearn, torch, pytorch lightning, tensorflow 2.0, keras, innereye-deeplearning, btrack, HPACellSegmentator, CSBDeep
- ***Standard & scientific libraries:*** jupyter notebooks / conda environments, numpy, scipy, pandas, json, os, matplotlib, pyplot, h5py, tqdm, napari

Work comfortably with **GitHub** (git), **iPython** (jupyter) notebooks, **LaTeX** (overleaf) & **Sigmaplot Statistics** software

Analysis of **DNA sequencing** data :
- SnapGene software: vector construction
- CLC workbench: Sanger sequencing
- Nanopore sequencing platform interface

Laboratory Skills

Molecular biology & vector construction:
- PCR (RT-, colony-, sequential-, nested-)
- Plasmid preparation (mini- & midi-prep)
- Restriction endonuclease gene cloning
- Gateway cloning & Gibson Assembly
- Preparation & purification of mRNA
- Cell-free protein synthesis (PURExpress)

Cell engineering & tissue culture:
- Stable cell transfection via lipofection or lentiviral & retroviral transduction
- Colony selection with antibiotic titration
- Tet(Dox)-inducible gene expression
- Cell fractionation & organelle isolation
- Induction of cell differentiation (DMSO)
- Cell culture (passaging) with cell lines: *MDCK, HeLa, HL60, CHO, HEK-293, MCF-7 / 10A, MDA-MB-231, HMLER, LNCaP, HaCaT*

Cell-based assays & imaging platforms:
- IncuCyte ZOOM live-cell analysis system cell proliferation assay with colorimetric cell viability, ratiometric [Ca^{2+}] release & fluorimetric protein release assays

Gene expression detection methods:
- SDS-PAGE, Western (dot) blotting
- Immunocytochemistry (IF cell staining)
- Extra- & intracellular flow cytometry
- FACS-sorted clonal cell line expansion

Summary

*As a **PhD researcher** at UCL, I apply my **programming & laboratory skills** in a multi-disciplinary project combining cell biology, computational single-cell tracking & **deep learning**. I focus on **Python software development** for **large data analysis** to identify biological patterns influencing **cancer cell cycling** control mechanisms. I am a practical, detail-oriented wet-lab scientist with **cell engineering** background, experienced in dry-lab **machine learning research** applied to single-cell biology. I have demonstrated my **leadership skills** in individual & collective settings, which I gained through UK & US work experience in **academic biomedical research** groups & international bio-/medical & **microscopy imaging research** teams in leading **technological companies,** and through my involvement in **volunteering & community projects**.*

Education

Oct 2018 – Nov 2022 (expected) — **PhD in Biosciences, BBSRC LIDo DTP Programme, UCL | London, UK**
- Provisional Thesis Title: **"Deep Lineage with Deep Learning: Tracking Single-Cell Heterogeneity within Non-/Cancer Cell Lines"**, advised by G. Charras & A. R. Lowe
- Fully funded via London Interdisciplinary Doctoral Training Partnership (LIDo DTP)
- Yale Stem Cell Center, Yale School of Medicine exchange visitor; *postponed to '22*
- Merit-based Scholarships: *Talents of the New Europe '19, Students to the World '19*

Sep 2014 – Jul 2018 — **BSc Biomedical Science (Hons), King's College London | London, UK**
- First Class Hons **(76%)** *Biomedical Science with Extramural Year in Pharmacology*
- Awards & Scholarships: *Desmond Tutu Scholarship '14, Best Lay Article Award '15*

Research Experience

Mar 2019 – Present — **PhD Researcher, the "DeepTree" project @ UCL | London, UK**
- Co-developed a robust, supervision-free, deep learning-based tracking pipeline for deep lineage analysis of large time-lapse microscopy data in non-/cancer cell lines
- Published two computational framework manuscripts (*U-Net, CNN, btrack* multi-object tracking algorithm) with applicability to single cell cycle duration predictions
- Trained VAE representations of single-cell time-sequence image glimpse datasets
- Analysed multigenerational lineage trees (>20,000 single cells) to identify heritable proliferation characteristics which predispose cells to commit to fast divider fates
- Supervised Masters Thesis project to develop an AI-based cell segmentation tool

Apr 2021 – Sep 2021 — **Research Intern @ Microsoft Research Cambridge | Cambridge, UK**
- Developed an AI-based end-to-end pipeline to classify subcellular protein localisation in single cells from Human Protein Atlas' dataset of weakly labelled confocal microscopy images using Azure computing & InnerEye Deep Learning OS toolkit
- Trained a competitively-performing model (MIL / SimCLR & BYOL architectures) upon evaluation with Kaggle competition authors (Prof. Emma Lundberg's Lab)
- Summarised project to Health Intelligence Lab leadership at End-of-Internship talk

Sep 2016 – Aug 2017 — **Industrial Trainee @ Crescendo Biologics Ltd. | Cambridge, UK**
- Engineered novel, universal tool cell line for early drug discovery, i.e. phage display selection & functional screening of antibody fragment oncology therapeutics
- Presented project outcomes to senior scientists & company management board

Jun 2016 – Sep 2016 — **Cancer Research UK Intern @ Cambridge University | Cambridge, UK**
- S. Bohndiek Lab: Characterised anti-angiogenic drug effects via breast cancer cell-based growth, viability assays to evaluate oxygen role in cancer progression

Jun 2015 – Aug 2015 — **Visiting Scholar, Whitehead Institute @ MIT | Cambridge, USA**
- R. Weinberg's Lab: Investigated determinants of cancer cell invasion, metastasis & tumour stroma immunomodulation upon epithelial-to-mesenchymal transition

Teaching Experience

May 2021 — **"Smart Microscopy" Workshop @ ZEISS | Gothenburg, Sweden**
- Trained 30+ intermediate-level attendees at "Train Your Own Model" hands-on workshop session to use (bio)image analysis tools (*napari, jupyter notebooks*) to annotate cell imaging data to train deep learning model to classify cell cycle state

Jan 2021 – Dec 2021 — **Google Certified Trainer for AI Tech & Tools | Bratislava, Slovakia**
- Empowering non-tech professionals by leveraging their expertise & leadership in AI tech field via AI-basics talks & workshops with Google Slovakia outreach team

Mar 2020 – Present — **Graduate Teaching Assistant @ UCL BIOC0016 module | London, UK**
- Co-designed an iPython-based practical session for 70+ undergraduate students for introductory concepts in bioimage analysis, bioinformatics & machine learning to hand-label image mini-dataset & train simplified classifier of cell mitotic state

Jun 2020 — **"Introduction to Deep Learning" @ UCL Cancer Domain | London, UK**
- Delivered beginner-friendly masterclass series for 100+ interdisciplinary scientists with real-life examples of deep learning-based bioimage analysis from PhD project
- Demonstrated deep learning benefits, contrasted deep learning to computer vision methods, emphasised fundamentals of 'learning' component & current challenges

Language Skills

Slovak — native proficiency

Czech — bilingual proficiency

English — full professional proficiency

IELTS & iBT TOEFL language test certificates

German — limited working proficiency

High-school certificate; German evening classes

Awards & Scholarships

- 2021 **30 under 30** @ *Forbes Slovakia*
- 2019 **European Union** Council Delegate
- 2017 **United Nations** Assembly Delegate
- 2017 **GSK Healthcare** STEM Awardee

Hobbies & Interests

- Ballroom dancing; standard & Latin style (UK national partner competitions level)
- Bachata & salsa social dancing (int/adv)
- Long-distance running (half-marathons)
- Playing tennis (competitively at school)

General

- Member of the University of London DanceSport Society (active competitor)
- Member of London Stem Cell Network
- Member of British Pharmacol Society
- EU / Slovak driving licence | *B type*
- First aid training course certificate

Academic Referees

Prof Guillaume Charras

– PhD project advisor; Professor in Cell & Tissue Biophysics @ London Centre for Nanotechnology & Dept. of Cell & Developmental Biology @ UCL

- *Web:* https://charraslab.com/
- *Email:* g.charras@ucl.ac.uk

Dr Alan R. Lowe

– PhD project advisor; AI for Science Fellow @ The Alan Turing Institute & Associate Professor of Biophysics at Inst. of Struct. & Molec. Biology @ UCL

- *Web:* http://lowe.cs.ucl.ac.uk/
- *Email:* a.lowe@ucl.ac.uk

Prof Geraint Thomas

– LIDo PhD Programme Deputy Director; Professor of Biochemistry at Dept. of Cell & Developmental Biology @ UCL

- *Web:* https://www.lido-dtp.ac.uk/
- *Email:* g.thomas@ucl.ac.uk

Leadership & Teamwork Experience

Sep 2019 - Present — **Student Ambassador, LIDo PhD Programme @ UCL** | London, UK
- Outlined programme structure & shared own experience with new student cohorts
- Guided individual students through responsibilities with changing rotation projects

2015 – 2017 — **Jury Member, LEAF Award @ LEAF** | Bratislava, Slovakia
- Shortlisted self-driven, talented students with community involvement in jury team

2016 – 2018 — **University Mentor, Talent Guide @ LEAF** | Bratislava, Slovakia
- Counselled college choices with gifted high-schoolers & edited personal statements

Specialist Trainings & Summer Schools

Apr - May 2022 — **Institut Curie & Sorbonne Université** | Paris, France
- 'International course of Cell Biology & Cancer' with the 'Science & Life' workshop

Nov - Dec 2020 — **Jumping Rivers Ltd.** | London, UK
- Two intermediate courses: *'Machine Learning with Python'*, *'Python & Tensorflow'*

Aug - Sep 2019 — **University of Hong Kong** | Hong Kong, China
- Practical course *'Advanced Imaging: Deep Learning in Live Imaging & Cell Biology'*

Jun - Jul 2019 — **University of Genova** | Genova, Italy
- *'Machine Learning Crash Course' covering theoretical foundations & core concepts*

Sep - Oct 2016 — **University of Cambridge** | Cambridge, UK
- Two beginners courses: *'Solving Biological Problems'*, *'Statistical Analysis' using R*

Jun - Jul 2012 — **Johns Hopkins University** | Baltimore, USA
- Interactive class *'The History of Disease'* by Centre for Talented Youth (CTY JHU)

Science Popularisation Activities

Sep 2015 — **Universal Expo Milano 2015** | Milan, Italy
- Presented ongoing research as national team member to expert & lay audience

May 2014 — **Intel International Science & Engineering Fair** | Los Angeles, USA
- Shortlisted finalist at world's largest pre-college science competition *(poster talk)*

Jul 2013 — **International Congress of Young Investigators** | Zaragoza, Spain
- Invited as *'Absolute Winner at the Festival of Science & Technology'* & recipient of *'The Special Award by the Dean of the Faculty of Natural Sciences'*

Invited Talks

2022 Speaker | AI for Image Analysis @ Analytica 2022 Conference Fair | Munich, Germany

2021 Speaker | Machine Learning Methods Advances @ Recursion CytoData Society Meeting
Speaker | AI Microscopy Symposium @ The Allen Institute for Brain Science & AIVIA
Panelist | "See the Hidden": Future of AI in Microscopy Workshop @ Leica Microsystems
Panelist | "Women in AI for Global Health" Session @ Mozilla Festival Tech Conference

2020 Speaker | UCL BioImage Analysis Interest Group @ Laboratory of Molecular Cell Biology
Speaker | Imperial College Brain Sciences Seminar @ UK Dementia Research Institute
Speaker | Python Software Foundation Pro Network Meetup @ #PyLadies Dublin

Contributed Talks

2021 Poster | Women in Machine Learning (WiML) Workshop @ NeurIPS Conference
Poster | Crick BioImage Analysis Symposium (CBIAS) @ The Francis Crick Institute
Poster | Women in Data Science (WiDS) Worldwide Conference @ Stanford University
Speaker | Virtual Seminars in Biomedical Science @ Imperial College London

2020 Poster | London Stem Cell Network Annual Symposium @ The Francis Crick Institute
Poster | Society of Biomolecular Imaging & Informatics High Content Conference
Speaker |. UCL Institute of Structural & Molecular Biology Postgraduate Symposium

2019 Speaker | UCL Institute of Structural & Molecular Biology Friday Wrap @ Birkbeck
Speaker | Quantitative Systems Biology Workshop @ King's College London
Poster |. UCL Graduate Student Symposium @ Francis Crick Institute

Publications

Ulicna, K., Vallardi, G., Charras, G. & Lowe, A.R. (**2021**). *Automated deep lineage tree analysis using a Bayesian single cell tracking approach.* Frontiers in Computer Science, Computer Vision: Methods & Tools for Bioimage Analysis | Frontiers | BioRxiv | GitHub repository

Ulicna, K., Ho, L.T.L., Soelistyo, C.J., Day, N.J. & Lowe, A.R. (**2022**). *Convolutional neural networks for classifying chromatin morphology in live cell imaging.* Methods in Molecular Biology, Springer Nature Protocols (accepted; in press) | GitHub repository