

KRISTINA ULICNA

PhD Candidate (penultimate year)
@ University College London, UK

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Computational Skills

Strongest programming language: **Python**

- **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 – **PhD in Biosciences, BBSRC LIDo DTP Programme, UCL | London, UK**
Nov 2022 (expected)
- 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 – **BSc Biomedical Science (Hons), King's College London | London, UK**
Jul 2018
- 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 – **PhD Researcher, the "DeepTree" project @ UCL | London, UK**
Present
- 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
 - Analysed multigenerational lineage trees (>20,000 single cells) to identify heritable [proliferation characteristics](#) which predispose cell to acquire cancer-like properties
- Apr 2021 – **Research Intern @ Microsoft Research Cambridge | Cambridge, UK**
Sep 2021
- Developed an AI-assisted end-to-end pipeline for multiple instance learning on weakly labelled confocal [microscopy image dataset](#) to classify subcellular protein localisation in single cells using Azure computing & [InnerEye open source toolkits](#)
 - Collaborated with [Human Protein Atlas](#) & Emma Lundberg's Lab on model design
- Sep 2016 – **Industrial Trainee @ Crescendo Biologics Ltd. | Cambridge, UK**
Aug 2017
- 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 – **Cancer Research UK Intern @ Cambridge University | Cambridge, UK**
Sep 2016
- 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 – **Visiting Scholar, Whitehead Institute @ MIT | Cambridge, USA**
Aug 2015
- 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 – **Google Certified Trainer for AI Tech & Tools | Bratislava, Slovakia**
Dec 2021
- 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 – **Graduate Teaching Assistant @ UCL BIOC0016 module | London, UK**
Present
- 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 Awards**

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
- Counselling college choices with gifted high-schoolers & edited personal statements

Specialist Trainings & Summer Schools

- 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'
- Nov 2012 **Festival of Science & Technology** | Bratislava, Slovakia
- Recognised as 'Best Scientific Project at Festival of Science & Technology 2012'

Invited Talks

- 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 Data Science (WIDS) Worldwide Conference @ Stanford University*
Speaker | *Virtual Seminars in Biomedical Science @ Imperial College London*
- 2020 Poster | *London Stem Cell Network Annual Symposium @ 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* (submitted); bioRxiv [2020.09.10.276980](https://doi.org/10.276980) DOI: 10.1101/2020.09.10.276980 | GitHub: <https://github.com/KristinaUlicna/DeepTree>

Ulicna, K., Ho, L.T.L., Soelistyo, C.J., Day, N.J. & Lowe, A.R. (2021). Convolutional neural networks for classifying chromatin morphology in live cell imaging. *Methods in Molecular Biology*, Springer Nature (pending) | GitHub: <https://github.com/lowe-lab-ucl/cnn-annotator>