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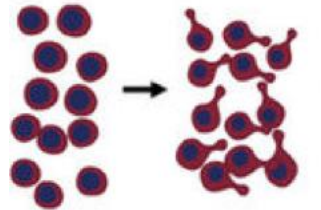
SciLifeLab

Predicting adverse effects of compounds based on high content imaging of cells

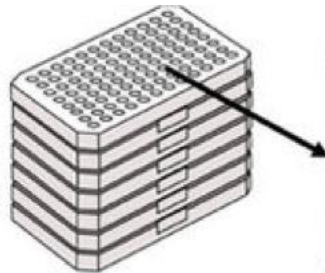
Prof. Ola Spjuth, Department of Pharmaceutical Biosciences, Uppsala University, Sweden

Research group
website:
www.pharmb.io

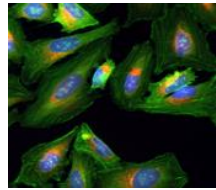
Cell Painting



Chemical
perturbation of cells



Experiments in
multiwell plates
6 dyes



Microscopy
imaging, 5 ch

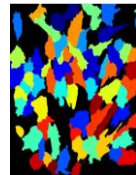
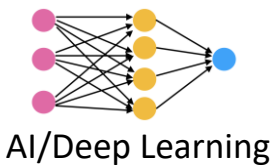


Image analysis



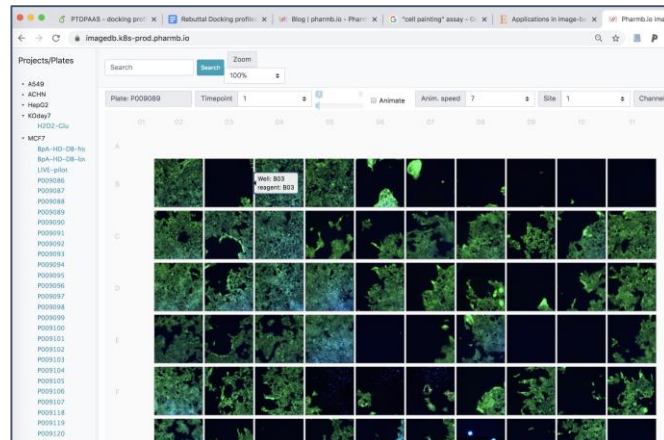
Profile



AI/Deep Learning

[Bray et al. Nat Protoc 2016](https://doi.org/10.1038/nprot.2016.116)

Open Source Lab Automation

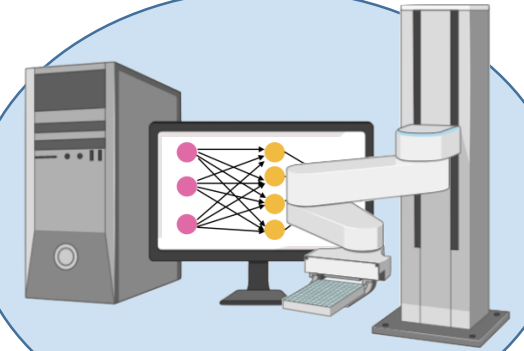


<https://github.com/pharmbio/aros>

Goal: Autonomous Phenomics

Intelligent
design of
experiments

AI and Robotics

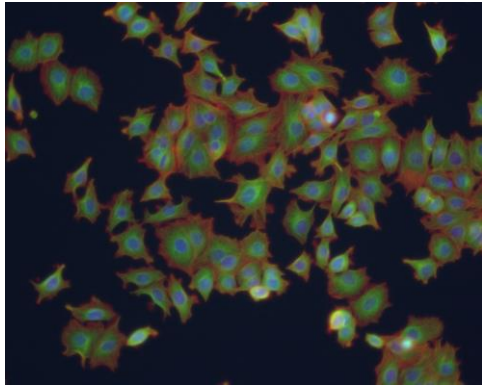


Morphological profiling experiments

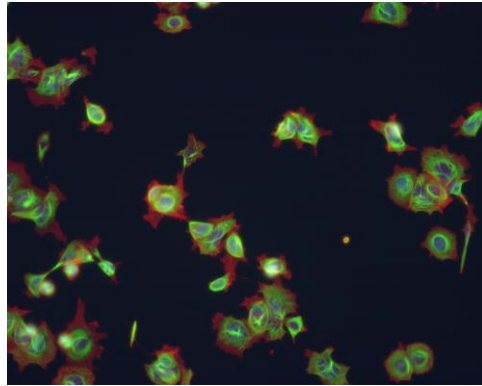


Example applications

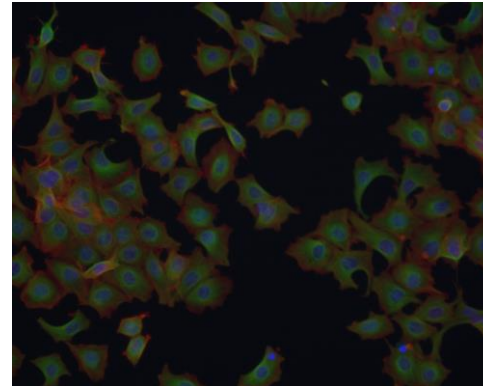
Cell painting combined with AI modeling for predicting MoA (Kensert et al. 2019)¹



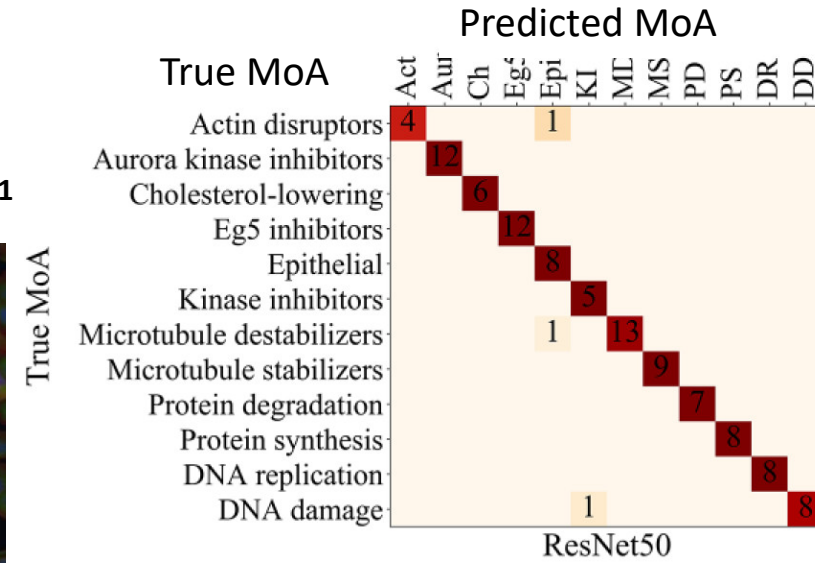
Protein degradation



Microtubule stabilizer

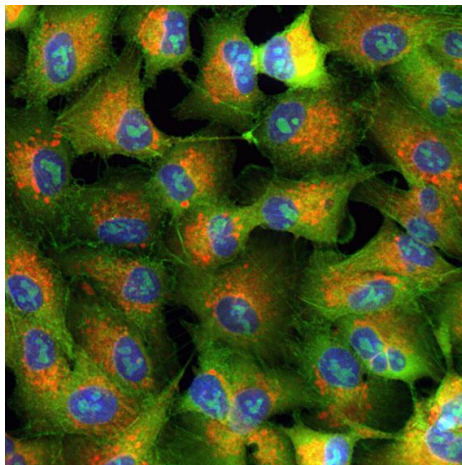


DNA replication

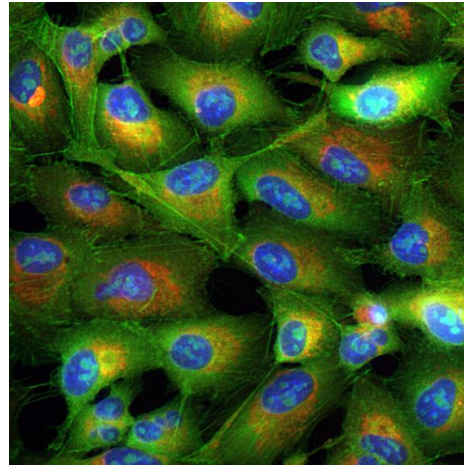


¹ Kensert A, Harrison PJ, Spjuth O. SLAS DISCOVERY: Advancing Life Sciences R&D. 24, 4 (2019)

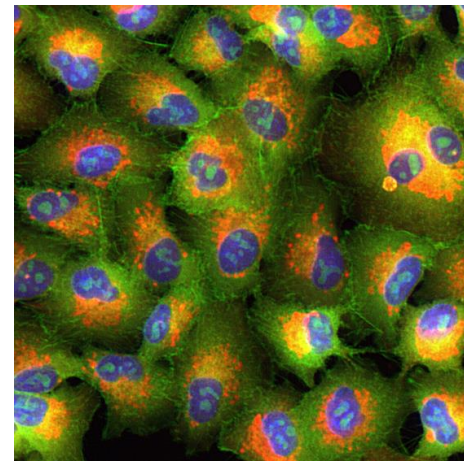
Cell painting profiling of combinations of toxicants (Aggarwal et al., unpublished data)



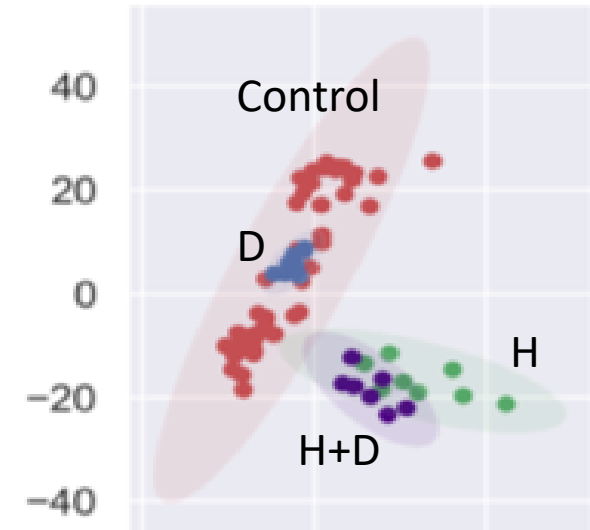
Hexabromocyclododecane (H)



Dibutyltin dilaurate (D)



H + D

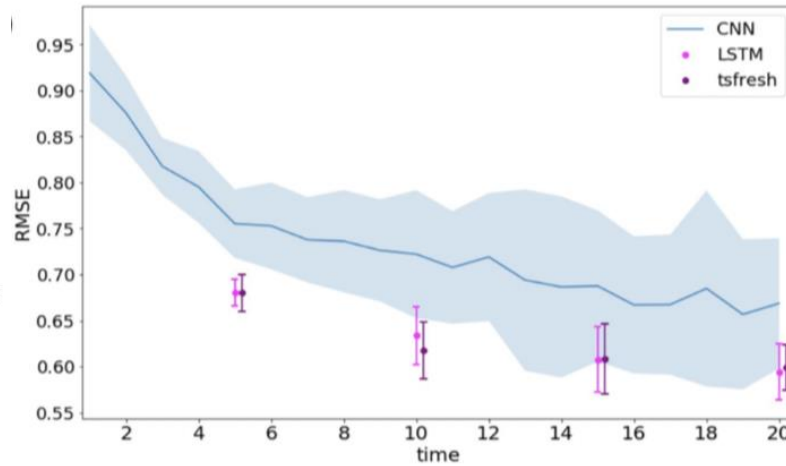
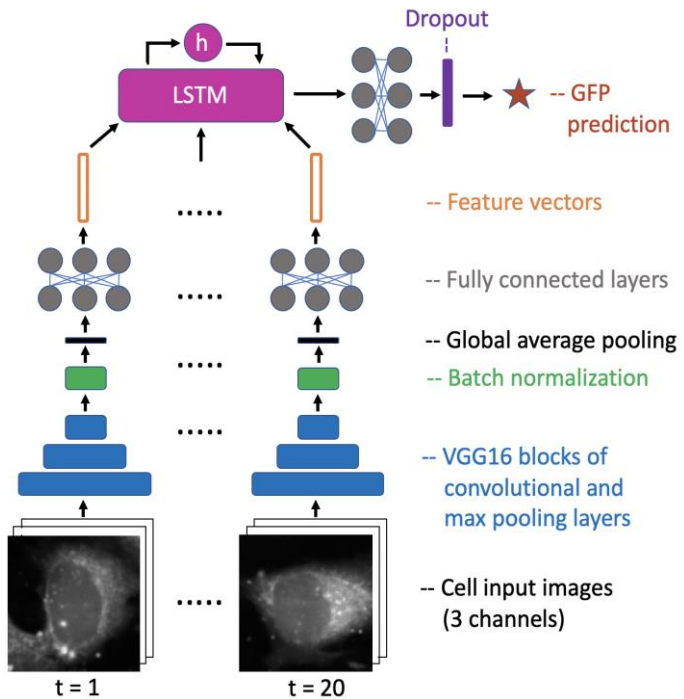


PCA score plot



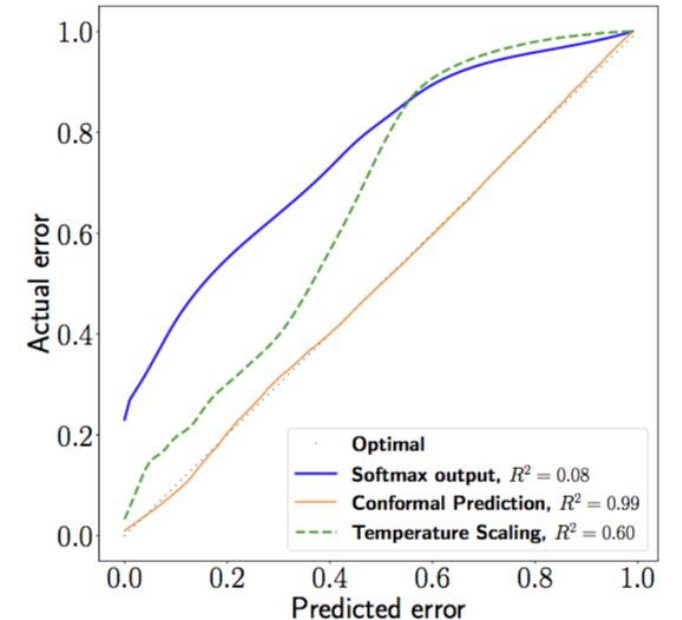
AI methods development

Deep learning models for time-lapse microscopy image data



Harrison P, Wieslander H, Sabirsh A, Karlsson J, Malmsjö V, Hellander A, Wählby C, Spjuth O.
bioRxiv. 2020.04.06.027672 (2020).
 DOI: [10.1101/2020.04.06.027672](https://doi.org/10.1101/2020.04.06.027672)

Conformal Prediction for valid estimates of confidence in predictions



Wieslander H., Harrison P, Skogberg G, Jackson S, Fridén M, Karlsson J, Spjuth O, and Wählby C. "Deep learning with conformal prediction for hierarchical analysis of large-scale whole-slide tissue images." *IEEE Journal of Biomedical and Health Informatics*. Early access (2020).
 DOI: [10.1109/JBHI.2020.2996300](https://doi.org/10.1109/JBHI.2020.2996300)