

# PathLAKE

Computational Pathology Excellence



David  
Snead

“ PathLAKE has come a long way since we launched in January 2019. During COVID and lockdown, the PathLAKE teams have adapted to working differently. I am very proud of how everyone has worked together creatively to continue to make good progress on our projects and programme deliverables. Learn more about what we have been doing in this Spring edition of our newsletter. ”

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# Project Progress Overview

"At PathLAKE, we are developing the next-generation of AI algorithms for Computational Pathology to assist with early diagnosis and personalised treatment of different types of cancer. The research and development of AI technologies will be complemented by the establishment of a massive data lake consisting of richly annotated pathology images with linked metadata."

## Data Lake and Analytics Engine: The University of Warwick

The University of Warwick team have put together a preliminary front-end for the data lake portal for viewing and annotating images for the UHCW and Nottingham exemplar projects. The team is also continuing the work of the coordination of data transferred to Warwick from all NHS sites as the data flows from the different NHS site data ponds to the data lake. This means that all the data collected and annotated from the NHS sites can be sent to the central data lake for further annotation and sharing.

## Breast Cancer: University of Nottingham

The Breast Pathology Research Group at University of Nottingham is utilising its vast archive of breast cancer tissue to create an algorithm that will classify the indeterminate risk group of breast cancer patients into precise treatment groups depending on whether they will or will not benefit from chemotherapy treatment.

The algorithm is being developed together with the Warwick team and expanded using different variables in breast cancer, for example by introducing tumour grade, shape and pattern of the malignant cells, the rate of tumour cell division and growth and the relation between the adjacent and surrounding cells to the cancer cells.

The whole project uses tissue and data from 2400 cases to develop the algorithm. So far, half of these have been collected, which includes a total of 3452 images. Initial development, testing and training of the algorithm is showing very promising results.

## Colorectal Cancer: Queen's University, Belfast (QUB)

The Precision Medicine Centre at QUB is developing three AI algorithms that quantify specific immune cells shown to be important biomarkers for colorectal cancer prognosis. The aim is to create a reliable analytical tool to predict and stratify patients who may benefit from certain therapies, particularly immune therapies. To date, we have generated over 290,000 annotations of immune cells in digitised colorectal cancer images. We continue to develop our algorithms through training and testing using a standardised set of AI performance metrics. The addition of samples from PathLAKE partners will allow further development of the algorithms by introducing more variation, to improve the accuracy and reliability of the results, and to help prepare the algorithms for clinical use.

## Colon Cancer: University Hospital Coventry and Warwickshire

The UHCW project is developing an AI algorithm together with the Warwick team to change how tissue biopsies are reported in the lab. Focusing on colon biopsies, the algorithm will identify normal and abnormal samples quickly. This will speed up diagnosis for patients and allow pathologists' to focus on the cases that need their expertise. To develop the AI, we first need thousands of biopsy images to be annotated (marked up) by pathologists and machine learning. Good progress is being made - so far we have done 700 thousand annotations and the first version of the algorithm is showing promise.

## Prostate Cancer: University of Oxford

The Oxford team are developing AI algorithms for prostate cancer. One is a workflow algorithm which pre orders extra stains that may be needed (immunohistochemistry) when a prostate biopsy case is difficult. This tool aims to provide pathologists with everything they need to sign a case out in one reporting session. Currently up to half of prostate biopsies need immunohistochemistry and it slows down the reporting process as a pathologist needs to review the case to make the request.

### [See here.](#)

The other algorithm focuses on using AI to improve the recognition of which prostate cancers will behave in an aggressive fashion, leading to better selection of patients for radical treatment and new insights into cancer biology and prognosis.

# Events



**17 Oct – 16 Nov 2020**

**Beat the Pathologists** was an online competition aimed at school children. It introduced them to pathology, and in particular the processes involved in developing algorithms and artificial intelligence (AI) solutions for digital pathology applications, on a games-based platform.

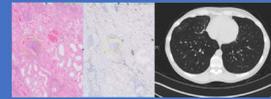
Entrants were encouraged to complete different levels in the competition, with each level getting progressively harder, from 'mild' to 'supercharger'. Four types of tumour had to be identified.

165 children took part, across all school years from primary to sixth form. Congratulations to Florence who won the Primary competition, Amelia who won the Secondary and Sanjanaben who took first place in the Sixth Form category. The top three in each category won Amazon vouchers.

[Read more here](#)

**Competition Prizewinners Announced - PathLAKE : PathLAKE**

## AI Centres of Excellence Ethics in Imaging Webinar



*Part of the work on interoperability across the centres*

Seminar 1:  
Thursday 14<sup>th</sup> Jan 2021 1-2pm  
Where are we now, experience to date?

**18th March 2021**

### Ethics Workshop: Clare Verill

The Ethics Workshop is part of a series of informal online seminars to exchange ideas, create debate and look for common themes, challenges and solutions across the PathLAKE centres.

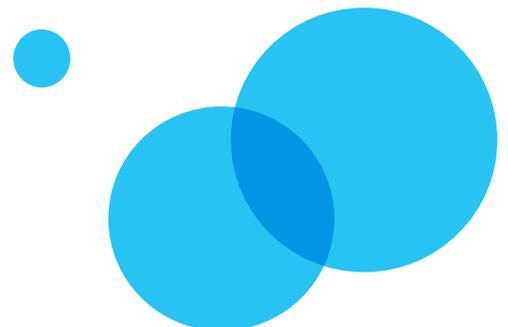
The main theme focussed around the question:

#### **What is the 'Value' of Health data?**

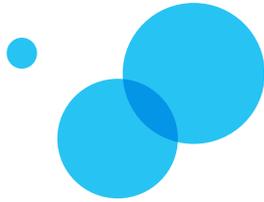
The day included talks such as:

- The need for a new social contract for data driven research/healthcare.
- NCIMI research on health data valuation – 'value levers'.
- Role of public trust and confidence in sharing patient data with commercial companies.

**[Make sure to check our central PathLAKE Website for any similar upcoming events!](#)**



# Upcoming Events



May 27

## Nottingham Breast Pathology Online Masterclass: Addressing Challenges in Diagnostic Breast Pathology

With a faculty of leading experts from across the world, the masterclass is an ideal opportunity for reporting breast pathologists to gain hands-on experience and update the knowledge and skills necessary to deal with routine and referral breast pathology service.

7 CPD points.

[Find out more and register here](#)

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July 16

## Nottingham Breast Pathology Online Masterclass Addressing Challenges in Diagnostic Breast Pathology

Join us online for the second event in the 2021 series of Breast Pathology masterclasses. Hear from experts from across the world to update your knowledge and skills in breast pathology.

Attend either event, or for maximum benefit and registration discounts, book a place on each.

7 CPD points.

[Find out more and register here](#)

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May 18 & 20

## Computational Pathology Masterclass:

Register for this exciting computational masterclass focussed around the theme, "AI for Pathologists".

[Please register here.](#)

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Sept 9-11

## Save the date - PathLAKE Annual Meeting

The annual meeting will run alongside Cirdan's Pathology Horizons event. More details will be announced soon.

# Publications

Here are a few of our most recent PathLAKE Publications  
Please follow the link here to visit a more comprehensive list!

1. Browning, L., Colling, R., Rakha, E., Rajpoot, N., Rittscher, J., James, J. A., SaltoTellez, M., Snead, D. R. J. & Verrill, C. (2020) **Digital pathology and artificial intelligence will be key to supporting clinical and academic cellular pathology through COVID-19 and future crises: the PathLAKE consortium perspective.** J Clin Pathol. [Details](#)

2. Awan, R., Benes, K., Azam, A., Song, T. H., Shaban, M., Verrill, C., Tsang, Y. W., Snead, D., Minhas, F. & Rajpoot, N. (2021) **Deep learning based digital cell profiles for risk stratification of urine cytology images.** Cytometry A. [Details](#)

3. Azam, A. S., Miligy, I. M., Kimani, P. K., Maqbool, H., Hewitt, K., Rajpoot, N. M. & Snead, D. R. J. (2020) **Diagnostic concordance and discordance in digital pathology: a systematic review and meta-analysis.** J Clin Pathol. [Details](#)

4. **Nucleolar protein 10 (NOP10) predicts poor prognosis in invasive breast cancer** [Details](#)

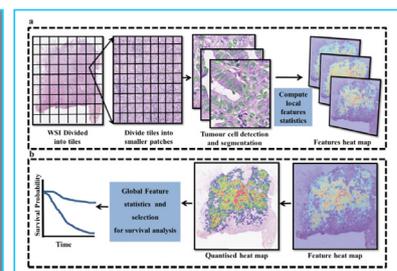
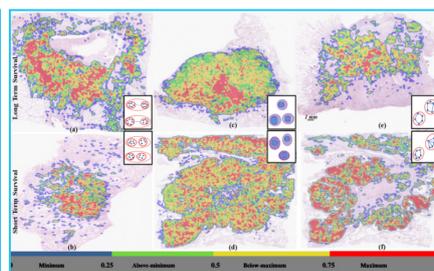
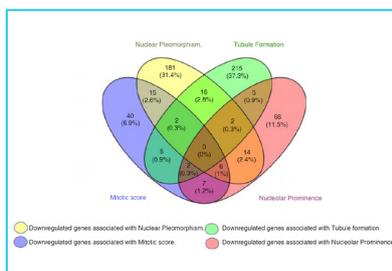
**Abstract: Purpose:** Nucleolar protein 10 (NOP10) is required for ribosome biogenesis and telomere maintenance and plays a key role in carcinogenesis. This study aims to evaluate the clinical and prognostic significance of NOP10 in breast cancer (BC).

5. **Visual histological assessment of morphological features reflects the underlying molecular profile in invasive breast cancer: a morpho molecular study** [Histopathology](#) [Details](#)

**Abstract: Aims:** Tumour genotype and phenotype are related and can predict outcome. In this study, we hypothesised that the visual assessment of breast cancer (BC) morphological features can provide valuable insight into underlying molecular profiles.

6. **"Tumour Nuclear Morphometrics Predict Survival in Lung Adenocarcinoma"** [Details](#)

**Abstract:** Providing a quantitative assessment of tumour nuclei would improve decision objectivity and overcome inter and intra-observer variation. In this study, we show that the summary statistics for the whole slide image of nuclear pleomorphism can provide such quantification. We characterise the heterogeneity of lung adenocarcinoma (LUAD) using morphometric features of tumour nuclei. The Cox proportional hazard regression model is employed on a dataset of 78 patients to find the top discriminative features such that there is a strong correlation with patient survival. We find that global nuclear morphometric features, characterised by heatmap statistics, have a significant correlation with overall survival in LUAD ( $p < 0.0003$ ).



# Reflection & final comments

## Reflection:

This extract from Professor Dame Ottoline Leyser's (CEO of UKRI) recent blog, resonated with the PathLAKE team as we've been working together but differently over the last year:

### Overcoming the Einstein myth and embracing a culture of togetherness

We see the strong misconceptions people may have towards research & innovation both outside and inside the academic sphere. Many view researchers as 'Einstein like geniuses' whose thoughts and way of life are far away from others.

Although we are experiencing the Covid-19 pandemic spread throughout our communities we can also see the momentous combined effort which is inspiring so many people across the world. That joint effort, sharing of ideas and focus on improving the dilemma is having profound impacts each and every day. Researchers and innovators are on the front line, providing life saving ideas and equipment to save millions. This does not support the general myth of researchers but instead enlightens the huge amount of work that is being performed by thousands of researchers collaborating across the world. It is worth taking a minute to consider this - the value and impact of collaborating together, the tremendous work which has been done by researchers and innovators across this past year and what impact we each could have if we work together. Take the time to nurture and treasure the value of working together.

### [Details](#)

## What's coming up in the next edition?

Have you ever thought of getting involved in research? We shine a spotlight on our patient and public representatives to find out how their involvement shapes the project and what it means to them.

We will also feature our Digital Tutor platform and the recent launch of our accredited modules.

We look forward to posting the next edition.

Please keep up to date and in touch by checking our central PathLAKE [website](#)



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