



TIA Centre
TISSUE IMAGE ANALYTICS

Newsletter - Autumn 2024

Welcome to the Termly Newsletter of the TIA Centre at the University of Warwick. This newsletter provides updates on the Centre's recent activities and offers insights into our work over the past few months. Additionally, it includes details of upcoming events and initiatives for the months ahead.

Over the past year, members of the TIA Centre have been actively engaged in numerous research initiatives, contributing to the development of several notable publications. We would like to take this opportunity to highlight a selection of the research papers that have been published:

[Mitosis detection, fast and slow: Robust and efficient detection of mitotic figures](#) **M Jahanifar et al, Medical Image Analysis**

Counting cell divisions (mitotic figures) helps assess cancer severity but can be slow and inconsistent due to visual variations. AI tools exist but often struggle with image changes. To address this, we developed a two-step system for more accurate detection. The first step uses EUNet to quickly scan images at lower quality, and the second step employs EfficientNet-B7 for detailed confirmation. Our system adapts to varying image quality and achieved top results on three public datasets, winning two challenges (MIDOG21 and MIDOG22). We also tested it on a large breast cancer dataset, identifying over 620,000 potential cell divisions.

[Cancer drug sensitivity prediction from routine histology images](#) **M Dawood et al, NPJ Precision Oncology**

Models predicting cancer patients' responses to drugs can help doctors personalise treatments, but clinical trials are time-consuming and costly. In this study, we show for the first time that deep learning can analyse stained breast cancer tissue images to predict drug responses. Using cancer cell line data, we trained the AI to link tissue patterns to drug sensitivities. Our results demonstrate that routine tissue images can predict patient reactions to both existing and experimental drugs, and the model can identify tissue patterns related to drug effectiveness.

[Cross-linking breast tumor transcriptomic states and tissue histology](#) **M Dawood et al, Cell Reports Medicine**

We developed a method to predict key gene activity in cancer patients using standard tissue images, helping guide treatment decisions. Since many genes work together, we

grouped similar genes and used AI to analyse these patterns. This simplifies understanding a patient's gene activity, linking tissue appearance to gene behaviour and revealing new insights from routine tests.

CoNIC Challenge: Pushing the frontiers of nuclear detection, segmentation, classification and counting S Graham et al, Medical image analysis

Detecting and analysing cell nuclei is crucial for understanding how tissue structure impacts patient outcomes. To improve this, we launched the CoNIC challenge, using the largest dataset of its kind to develop better cell identification methods with real-time leaderboard tracking. Top models analysed 1,658 colon tissue images, detecting around 700 million nuclei per model. These findings helped assess disease severity and predict survival, showing significant improvements over previous methods. We also identified key immune cells in the tumour environment and made the models and results publicly available for further research.

Ouroboros: cross-linking protein expression perturbations and cancer histology imaging with generative-predictive modeling S Deshpande et al, Bioinformatics

Imagine using routine tissue images to predict protein levels and create virtual tissue images from protein data. This could help doctors make quicker, more accurate treatment decisions for diseases like cancer while reducing costs and improving understanding. In this study, we examined the relationship between protein levels and tissue structures in glioblastoma (a type of brain cancer). We developed an AI method, Ouroboros, that predicts protein levels from tissue images and generates realistic tissue images from protein data, showing significant improvements over current methods and enhancing our understanding of disease.

TIA spinout Histofy completes its first private investment round

Lumiares, a health technology investment firm based in Belgium, has announced it is investing in Histofy, a new company from the University of Warwick. Histofy is developing artificial intelligence (AI) tools to improve how doctors diagnose diseases, especially complex ones like cancer, and to speed up the discovery of new treatments for pharmaceutical companies. Histofy's CEO, Professor Nasir Rajpoot, is a well-known expert in AI-based research for disease diagnosis. He said he's excited to work with Lumiares, a company with deep experience in healthcare, cancer treatment, and medical technology. He believes this partnership will help Histofy grow and continue to innovate in its field. Several experienced doctors, including pathologist Dr. Romaric Croes, are also backing the investment. Dr. Croes explained that Histofy's technology could make it easier and cheaper for pathologists (who study diseases) to use AI in their work. It can even predict how patients will respond to specific treatments without needing expensive additional tests. For more information on Histofy please access this [link](#)

Other News items

Upcoming TIA Centre Seminar Series: An Opportunity to Engage with Leading Researchers in Computational Pathology

– read about the highlights from our 23/24 seminar series and find out about the 24/25 speakers

[**Workshop on Future Interface of Computing and Pathology**](#) – read about this TIA Centre event and our plans for future events to discuss this topic

[**Reflections on Medical Imaging with Deep Learning 2024 Conference**](#) – hear about Kesi Xu’s experience at the MIDL 2024 conference, held in Paris, July 3rd to 5th

[**Reflections on the European Congress on Digital Pathology 2024 by Neda Zamanitajeddin**](#) –TIA Centre member’s involvement in the Conference

[**Dr Zhao Chen reflects on her visit to TIA Centre**](#) – Dr Chen’s experience at the TIA Centre

Our latest large scale project is the [**COBix Multi-site validation study of the Colon and Rectal Endoscopic Biopsy \(COBix\) reporting tool**](#) – take a look here to find out more about the study and who our partners are.

Want to know who is involved in the **TIA Centre** – please take a look at our [**Team page**](#) on the website

For more information on the TIA Centre or if you have any queries please do not hesitate to contact us at :-

[**https://warwick.ac.uk/fac/cross_fac/tia/**](https://warwick.ac.uk/fac/cross_fac/tia/)

More news stories can be found [**here**](#).

The next TIA Centre Newsletter will be available in the Spring of 2025. If you would like to be removed from this mailing list then please reply to this email asking to be unsubscribed.

Many thanks for your interest and support.