ICR The Institute of Cancer Research

**Licensing and collaboration opportunity**

# Image/AI-driven cancer biomarker to measure immune environment

**The Institute of Cancer Research, London, is seeking a partner to continue the commercial development of AI-TIL: an image-based biomarker that quantifies tumour-infiltrating lymphocyte (TIL) from histopathological samples using proprietary AI technologies. It has already shown particular promise as a predictor of response to immunotherapy in triple negative breast cancer.**

## Key Features

- Reproducible new prognostic biomarker with potential in multiple tumour types and particular promise in triple negative breast cancer (TNBC).
- Pioneering use of AI in digital pathology.
- Fully automated measurement from digitised slide samples is quicker, more accurate and more cost effective than traditional estimation.

## Intellectual property

The Institute of Cancer Research (ICR) owns the intellectual property and holds US (US20170365053 B1) and European (EP3224624 B1) patents covering the method of automated immune scoring by utilizing the spatial immune-microenvironment from routine histology and its use as a prognostic biomarker in cancer.

## Commercial Opportunity

The team at the ICR is working towards CE-marking AI-TIL and is now seeking commercial partners to further develop and scale the method to be incorporated in large clinical trials and everyday diagnostic histopathology practice. The team is also seeking partners to commercialize AI-TIL for use in R&D and pharmaceutical drug development.

## Summary

Currently the main prognostic factors in early-stage TNBC represent anatomic tumour burden; the host microenvironment is not usually considered in prognostic assessment.

The TIL method, based on clinical routine diagnostic histology samples, has been shown to be a reproducible biomarker that could be fairly straightforward to implement in standard clinical pathology globally. TILs are immune cells that protect the patient against their cancer.

An algorithm has been developed to enable the AI-driven measurement of TIL score from digitised images of routine pathology samples.

A project is underway in collaboration with The Royal Marsden NHS Foundation Trust, the ICR's hospital partner. If successful, it will deliver:

- A sample processing framework for digitalisation and AI deployment
- A standardization protocol for AI input, tailoring and testing the AI algorithm developed in the Yuan Lab for the analysis of TNBC samples in the training set
- Validation of the AI algorithm.

The team at the ICR is currently also working to validate AI-TIL in patient samples with Professor Roberto Salgado, of GZA-ZNA Antwerp and co-chair of the International Immuno-Oncology Biomarker Working Group.

## More about the programme

Digital pathology is an emerging field. It uses sophisticated computing tools and AI to diagnose disease and guide treatments faster and more easily. It offers particular promise for developing novel ways to understand cancer.

The Computational Pathology and Integrative Genomics Team at the ICR, led by Professor Yinyin Yuan, has already created a method to automate TIL scoring in several cancer types, by scanning routine pathological slides into digital images and using an AI algorithm to analyse the images automatically at single-cell level. They are currently adapting and trialling this algorithm for use as a novel biomarker.

Triple Negative Breast Cancers (TNBC) are among the most aggressive forms of breast cancer but there are too few targeted treatments or biomarkers for patient stratification, or to guide immunotherapeutic development. Manual estimation of tumour-infiltrating lymphocyte (TIL) score, as proposed by the International Immuno-Oncology Biomarker Working Group on Breast Cancer, has emerged as a promising prognostic and predictive biomarker in TNBC.

If successful, the application of AI-TIL as a biomarker will guide therapeutic decision making, for example recommending chemotherapy de-escalation for the subgroup of node negative TNBC patients with high TIL levels (which represent relatively good prognosis).

**Key publications**

AbdulJabbar K et al., *Geospatial immune variability illuminates differential evolution of lung adenocarcinoma*. Nat Med. 2020 Jul;1062-1054:(7)26. doi: 10.1038/s-0900-020-41591x

Yuan Y. *Modelling the spatial heterogeneity and molecular correlates of lymphocytic infiltration in triple-negative breast cancer.* J R Soc Interface. 2015;12(103):20141153. doi:10.1098/rsif.2014.1153

Evaluation of immune-checkpoint-based therapy could potentially be extended to other high-TIL TNBC subgroups and the overall method could be extended to other tumour types.

## Lead scientists

**Professor Yinyin Yuan** (***below*** *left*) leads the Computational Pathology and Integrative Genomics team. Her team uses techniques from a broad range of scientific fields to formulate unique approaches for linking genetic mutations, pathological observations and patient treatment to improve cancer research.

**Dr Khalid AbdulJabbar** (*below right*) is a post-doc in the team currently working on this project.

## The Business and Innovation Office

The ICR's interactions with industry partners are led by our Business and Innovation Office, which oversees a portfolio of partnership and licensing opportunities across a range of oncology research.

Contact the Business and Innovation Office for more information on our licensing and partnering opportunities.

To read more about our commercialisation work and sign up for our industry email newsletter at [icr.ac.uk/partnerships.](icr.ac.uk/partnerships)

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