

Latest Publications



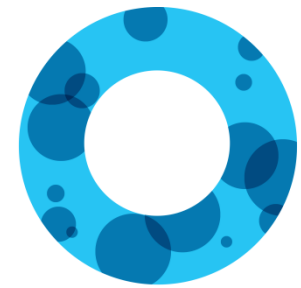
1. Abbasi, W., Yaseen, A., Hassan, F.U., Andleeb, S. and Minhas, F. (2020). **ISLAND: in-silico proteins binding affinity prediction using sequence information**. *BioData Min* **13**(1), pp. 20. [link](#)
2. Abdullahi Sidi, F., Bingham, V., Craig, S. G., McQuaid, S., James, J., Humphries, M. P. & Salto-Tellez, M. (2020) **PD-L1 Multiplex and Quantitative Image Analysis for Molecular Diagnostics**. *Cancers (Basel)*, **13** (1): [link](#)
3. Alemi Koohbanani, N., Jahanifar, M., Zamani Tajadin, N. & Rajpoot, N. (2020) **NuClick: A deep learning framework for interactive segmentation of microscopic images**. *Med Image Anal*, **65** 101771. [link](#)
4. Althobiti, M., Muftah, A. A., Aleskandarany, M. A., Joseph, C., Toss, M. S., Green, A. & Rakha, E. (2020) **The prognostic significance of BMI1 expression in invasive breast cancer is dependent on its molecular subtypes**. *Breast Cancer Res Treat*, **182** (3): 581-589. [link](#)
5. Atallah, N.M., Toss, M.S., Verrill, C. et al. **Potential quality pitfalls of digitalized whole slide image of breast pathology in routine practice**. *Mod Pathol* (2021). [link](#)
6. 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*, [link](#)
7. 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*, [link](#)
8. Bilal M, Raza SEA, Azam A, Graham S, Ilyas M, Cree IA, Snead D, Minhas F, Rajpoot NM. (2021). **Development and validation of a weakly supervised deep learning framework to predict the status of molecular pathways and key mutations in colorectal cancer from routine histology images: a retrospective study**. *Lancet Digit Health*. **3**(12):e763-e772. [link](#)
9. Browning, L., Colling, R., Rakha, E., Rajpoot, N., Rittscher, J., James, J. A., Salto-Tellez, 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*, [link](#)

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10. Browning, L., Fryer, E., Roskell, D., White, K., Colling, R., Rittscher, J. & Verrill, C. (2021) **Role of digital pathology in diagnostic histopathology in the response to COVID-19: results from a survey of experience in a UK tertiary referral hospital.** J Clin Pathol, 74 (2): 129-132. [link](#)
11. Browning L, Colling R, Verrill C. (2021). **WHO/ISUP grading of clear cell renal cell carcinoma and papillary renal cell carcinoma; validation of grading on the digital pathology platform and perspectives on reproducibility of grade.** Diagn Pathol. 21;16(1):75. [link](#)
12. Chatrian, A., Colling, R., Browning, L., Alham, N., Sirinukunwattana, K., Malacrino, S., Haghghat, M., Aberdeen, A., Monks, A., Moxley-Wyles, B., Rakha, E., Snead, D., Rittscher, J. and Verrill, C. (2021). **Artificial intelligence for advance requesting of immunohistochemistry in diagnostically uncertain prostate biopsies.** Mod Pathol pp. [link](#)
13. Chen, Y. et al (2022). **Digital Pathology: The Effect of Experience on Visual Search Behavior.** Journal of Medical Imaging. *In press.*
14. Colling, R., Colling, H., Browning, L. and Verrill, C. (2021). **Validation of grading of non-invasive urothelial carcinoma by digital pathology for routine diagnosis.** BMC Cancer 21(1), pp. 995. [link](#)
15. Colling, R., Protheroe, A., Sullivan, M., Macpherson, R., Tuthill, M., Redgwell, J., Trill, Z., et al. (2021) **Digital Pathology Transformation in a Supraregional Germ Cell Tumour Network.** Diagnostics, 11(12): 2191; [link](#)
16. Colling R, Pitman H, Oien K, Rajpoot N, Macklin P; CM-Path AI in Histopathology Working Group, et al. (2019). **Artificial intelligence in digital pathology: a roadmap to routine use in clinical practice.** J Pathol. 249(2):143-150. [link](#)
17. Coulter, C., McKay, F., Hallowell, N., Browning, L., Colling, R., Macklin, P., Sorell, T., Aslam, M., Bryson, G., Treanor, D. and Verrill, C. (2021). **Understanding the ethical and legal considerations of Digital Pathology.** J Pathol Clin Res [link](#)
18. Eitzinger, S., Asif, A., Watters, K. E., Iavarone, A. T., Knott, G. J., Doudna, J. A. & Minhas, F. U. A. A. (2020) **Machine learning predicts new anti-CRISPR proteins.** Nucleic Acids Res, 48 (9): 4698-4708. [link](#)

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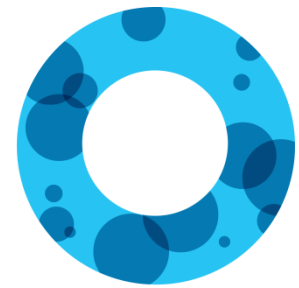
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19. Elsharawy, K. A., Althobiti, M., Mohammed, O. J., Aljohani, A. I., Toss, M. S., Green, A. R. & Rakha, E. A. (2021) **Nucleolar protein 10 (NOP10) predicts poor prognosis in invasive breast cancer**. Breast Cancer Res Treat, 185 (3): 615-627. [link](#)
20. Ghosh, A., Sirinukunwattana, K., Khalid Alham, N., Browning, L., Colling, R., Protheroe, A., Protheroe, E., Jones, S., Aberdeen, A., Rittscher, J. and Verrill, C. (2021). **The Potential of Artificial Intelligence to Detect Lymphovascular Invasion in Testicular Cancer**. Cancers (Basel) **13**(6), pp. [link](#)
21. Graham, S., Epstein, D. & Rajpoot, N. (2020) **Dense Steerable Filter CNNs for Exploiting Rotational Symmetry in Histology Images**. IEEE Trans Med Imaging, 39 (12): 4124-4136. [link](#)
22. Humphries, M.P., Maxwell, P. and Salto-Tellez, M. (2021). **QuPath: The global impact of an open source digital pathology system**. Comput Struct Biotechnol J **19**pp. 852-859. [link](#)
23. Haghghat, M., Browning, L., Sirinukunwattana, K., Malacrino, S., Khalid Alham, N., Colling, R., Cui, Y., Rakha, E., Hamdy, F.C., Verrill, C., Rittscher, J. (2021). **PathProfiler: Automated Quality Assessment of Retrospective Histopathology Whole-Slide Image Cohorts by Artificial Intelligence – A Case Study for Prostate Cancer Research**. medRxiv 2021.09.24.21263762; [link](#)
24. Ibrahim, A., Lashen, A.G., Katayama, A. et al. (2021). **Defining the area of mitoses counting in invasive breast cancer using whole slide image**. Mod Pathol. DOI: 10.1038/s41379-021-00981-w [link](#)
25. Javed, S., Mahmood, A., Fraz, M. M., Koohbanani, N. A., Benes, K., Tsang, Y. W., Hewitt, K., Epstein, D., Snead, D. & Rajpoot, N. (2020) **Cellular community detection for tissue phenotyping in colorectal cancer histology images**. Med Image Anal, 63 101696. [link](#)
26. Javed, S., Mahmood, A., Werghi, N., Benes, K. and Rajpoot, N. (2020b). **Multiplex Cellular Communities in Multi-Gigapixel Colorectal Cancer Histology Images for Tissue Phenotyping**. IEEE Trans Image Process pp. [link](#)
27. Joseph, C., Alsaleem, M. A., Toss, M. S., Kariri, Y. A., Althobiti, M., Alsaeed, S., Aljohani, A. I., Narasimha, P. L., Mongan, N. P., Green, A. R. & Rakha, E. A. (2020) **The**



- ITIM-Containing Receptor: Leukocyte-Associated Immunoglobulin-Like Receptor-1 (LAIR-1) Modulates Immune Response and Confers Poor Prognosis in Invasive Breast Carcinoma.** *Cancers (Basel)*, 13 (1): [link](#)
28. Kariri, Y. A., Aleskandarany, M. A., Joseph, C., Kurozumi, S., Mohammed, O. J., Toss, M. S., Green, A. R. & Rakha, E. A. (2020) **Molecular Complexity of Lymphovascular Invasion: The Role of Cell Migration in Breast Cancer as a Prototype.** *Pathobiology*, 87 (4): 218-231. [link](#)
29. Mahmood, H., Shaban, M., Indave, B. I., Santos-Silva, A. R., Rajpoot, N. & Khurram, S. A. (2020) **Use of artificial intelligence in diagnosis of head and neck precancerous and cancerous lesions: A systematic review.** *Oral Oncol*, 110 104885. [link](#)
30. Mahmood, H., Shaban, M., Rajpoot, N. and Khurram, S.A. (2021). **Artificial Intelligence-based methods in head and neck cancer diagnosis: an overview.** *Br J Cancer* **124**(12), pp. 1934-1940. [link](#)
31. Miligy, I. M., Toss, M. S., Shiino, S., Oni, G., Syed, B. M., Khout, H., Tan, Q. T., Green, A. R., Macmillan, R. D., Robertson, J. F. R. & Rakha, E. A. (2020) **The clinical significance of oestrogen receptor expression in breast ductal carcinoma in situ.** *Br J Cancer*, 123 (10): 1513-1520. [link](#)
32. Rakha, E. A., Alsaleem, M., ElSharawy, K. A., Toss, M. S., Raafat, S., Mihai, R., Minhas, F. A., Green, A. R., Rajpoot, N. M., Dalton, L. W. & Mongan, N. P. (2020) **Visual histological assessment of morphological features reflects the underlying molecular profile in invasive breast cancer: a morphomolecular study.** *Histopathology*, 77 (4): 631-645. [link](#)
33. Rakha, E.A., Toss, M., Shiino, S., Gamble, P., Jaroensri, R., Mermel, C.H. and Chen, P.C. (2021). **Current and future applications of artificial intelligence in pathology: a clinical perspective.** *J Clin Pathol* **74**(7), pp. 409-414. [link](#)
34. Shaban, M., Awan, R., Fraz, M. M., Azam, A., Tsang, Y. W., Snead, D. & Rajpoot, N. M. (2020) **Context-Aware Convolutional Neural Network for Grading of Colorectal Cancer Histology Images.** *IEEE Trans Med Imaging*, 39 (7): 2395-2405. [link](#)
35. Sirinukunwattana, K., Domingo, E., Richman, S., Redmond, K., Blake, A., Verrill, C., et al (2021). **Image-based consensus molecular subtype (imCMS) classification of colorectal cancer using deep learning.** *Gut* **70**(3), pp. 544-554. [link](#)

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36. Sorell, T., Rajpoot, N. & Verrill, C. (2021) **Ethical issues in computational pathology.** J Med Ethics, [link](#)
37. Viratham Pulsawatdi, A., Craig, S. G., Bingham, V., McCombe, K., Humphries, M. P., Senevirathne, S., Richman, S. D., Quirke, P., Campo, L., Domingo, E., Maughan, T. S., James, J. A. & Salto-Tellez, M. (2020) **A robust multiplex immunofluorescence and digital pathology workflow for the characterisation of the tumour immune microenvironment.** Mol Oncol, 14 (10): 2384-2402. [link](#)
38. Wahab N, Miligy IM, Dodd K, Sahota H, Toss M, Lu W, et al. (2022). **Semantic annotation for computational pathology: multidisciplinary experience and best practice recommendations.** J Pathol Clin Res.8(2):116-128. [link](#)
39. Williams, B. J., Brettle, D., Aslam, M., Barrett, P., Bryson, G., Cross, S., Snead, D., Verrill, C., Clarke, E., Wright, A. & Treanor, D. (2020) **Guidance for Remote Reporting of Digital Pathology Slides During Periods of Exceptional Service Pressure: An Emergency Response from the UK Royal College of Pathologists.** J Pathol Inform, 11 12. [link](#)