

brAIIn (Biological Rendering through Artificial Intelligence and Neural network)

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Executive Summary

brAIIn enables pathologists to make rapid, precise, accessible, and cost-effective diagnostic decisions by transforming pathology from a “qualitative art” into a “quantitative science” via the novel approach of using AI to automate the process of histomorphological slide annotation.

Team

brAIIn is led by Dr. [Phedias Diamandis](#), a neuropathologist at the University Health Network (UHN) and an affiliate scientist at Princess Margaret Cancer Centre.

Market

According to the World Health Organization, cancer diagnoses worldwide are predicted to rise 70% in the next 20 years, from 14 to 22 million. Combined with the fact that most cancer treatment decisions are based on pathological analysis, rapid and accurate annotation and decision support tools will be needed to handle this increase. Moreover, nearly 60% of new cancer cases occur in the developing world, and this figure is expected to increase to over 70% within the next 15 years. With a scarcity of skilled pathologists in low- and medium-income regions—such as sub-Saharan Africa, where there is less than one pathologist per 500,000 people—pathology tools must also be cost-effective and globally accessible.

Clinical Need

Morphologic classification of disease remains a valuable, skilled and cost-effective diagnostic tool as well as an important means of triaging tissue samples for in-depth molecular testing. However, it is prone to well-recognized inter-observer variability and can result in errors in pathology diagnoses. Studies have estimated a 6.8% discrepancy rate between pathologists, of which 21% are major diagnostic errors. This equates to a significant error rate of 0.5%-1.7% (i.e., 10,000 errors/million). brAIIn uses deep learning to overcome this challenge: it allows computers to excel at histomorphologic analysis, thus providing the potential for improving diagnostic accuracy, diagnostic turnaround, resource management (through objective triaging of molecular tests), and patient care.

Product

brAIIn stands for “biological rendering through Artificial Intelligence and neural network” and is a decision support tool for pathologists. It is fully automated and uses a convolutional neural network (CNN) to annotate and classify pathology slides. Using a growing dataset of over 500,000 images spanning 100’s of neuro-oncology cases at the Princess Margaret Cancer Centre—one of the world’s top 5 cancer centres—to train the platform, the prototype brAIIn model showed high concordance to pathologist and immunohistochemistry-based annotations. It also demonstrated an area under the receiver operator characteristic (AUC) of >0.95 for multiple classification tasks, including lesion localization, and differentiation among different brain tumor types. It is fully automated, compatible with standard pathology workflows, and provides prompt whole-slide annotation and lesion classification in less than 3 minutes per slide.

Competitive Environment

Current AI-aided pathology diagnostic tools have largely focused on relatively narrow classification tasks and on pre-defined tissue specimens. brAIIn’s convolutional neural network technology, however, has the capability to provide complete pathology assessments on any tissue specimen, including classification with multi-class statistics and differential diagnoses. While existing AI-aided pathology diagnostic tools use publicly available data for their training platform, brAIIn offers unmatched robustness by using both publicly available and in-house clinical data from the Princess Margaret for its training platform. Its value as a decision support tool is already undergoing testing on neuro-oncology cases at the Princess Margaret.

Intellectual Property

US provisional application has been filed for brAIIn platform.

Company Profile:

Industry: Pathology AI Diagnostic Tool
Statutes: Start-up to be incorporated

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