

NantHealth and NantOmics Reveal a Novel AI Based Machine-Learning Digital Pathology Software for Lung Cancer by Identifying Tumor Infiltrating Killer Cells From Whole Slide Images

January 28, 2020

Derived from deep-learning models, the findings demonstrate novel AI methods of identifying tumor-infiltrating lymphocytes (TILs) in lung cancers

BURLINGAME, Calif.--(BUSINESS WIRE)-- [NantHealth, Inc.](#) (NASDAQ: NH), a next-generation, evidence-based, personalized healthcare company and [NantOmics, LLC](#), the leader in molecular analysis, today presented a novel artificial intelligence platform for aiding pathologists in image-based lung cancer subtyping at the Society for Imaging Science and Technology's International Symposium on Electronic Imaging 2020. This novel machine vision software platform accurately subtypes lung cancer pathology and achieves high concordance with analysis performed by trained medical pathologists.

An initial report of the AI technology was presented at the Sixth American Association for Cancer Research (AACR) and the International Association for the Study of Lung Cancer (IASLC) International Joint Conference. The study entitled, "Tumor-infiltrating lymphocytes (TILs) found elevated in lung adenocarcinomas (LUAD) using automated digital pathology masks derived from deep-learning models" concluded that despite lower overall TMB (tumor mutation burden) and lymphocyte levels, there exists a subset of lung cancers with very high infiltrating lymphocyte counts.

Derived from deep-learning models, together, the findings demonstrate a novel AI-based method for subtyping lung cancer pathologies which impacts treatment options for patients and improved methods of identifying tumor infiltrating white cells found elevated in lung cancer.

"Accurately identifying and quantifying tumor-infiltrating white cells is extremely important for prognosis and treatment decisions in this era of personalized medicine, yet it currently requires manual review of whole slide images by medically trained pathologists, and incurs significant delays and cost," explains Dr. Patrick Soon-Shiong, MD, Chairman and CEO of NantHealth. "Our goal was to develop a scalable remote cloud-based diagnostic imaging system, a NORAD of pathology diagnosis so to speak. To accomplish this, machine vision of digitally transmitted images of tumor tissue would facilitate a scalable cloud-based infrastructure, with an image patch-based, automated system to classify cancers by their immune status."

Non-small cell lung cancer (NSCLC) is the most common form of lung cancer, which is further classified as 40 percent adenocarcinoma (Adeno), 30 percent squamous cell carcinoma (Squamous) and the remainder, large cell carcinoma¹. As analyses show that lung adenocarcinomas (LUAD) receive slightly more survival benefit from anti-PD1 therapy than squamous-cell lung carcinomas (LUSC), which have a higher TMB, a team of researchers explored whether lymphocyte

distribution in the tumor microenvironment may give a rational explanation for the different responses to immuno-oncology agents independent of TMB.

“By focusing on classifying regions detected as tumorous, we achieved identification of adenocarcinomas versus squamous cell carcinomas in non-small-cell lung cancers with an approximate accuracy rate of 86 percent,” explained Soon-Shiong. “With highly accurate tumor-region and lymphocyte detection, oncologists may better treat their patients with adeno versus squamous-based therapies and the use of immunotherapies may result in better outcomes.”

Study Design:

The system was trained and tested on 876 subtyped NSCLC gigapixel-resolution diagnostic whole slide images (WSI) from 805 patients obtained from The Cancer Genome Atlas (TCGA) sources. Samples were randomly split into training (711 WSIs from 664 patients) and testing (165 WSIs from 141 patients) sets.

Findings show that NantOmics and NantHealth’s fully-automated histopathology subtyping AI method outperforms other algorithms reported in literature for diagnostic WSIs. The system also generated maps of (tumor) regions-of-interest within WSIs, providing novel spatial information on tumor organization.

Details of the oral presentation at the IS&T International Symposium on Electronic Imaging 2020 outlined below:

Title: “Pathology image-based lung cancer subtyping using deep-learning features and cell-density maps”

Authors: Mustafa I. Jaber, Christopher W. Szeto, Bing Song, Liudmila Beziaeva, Stephen Benz, Patrick Soon-Shiong, and Shahrooz Rabizadeh

Session and Number: Image Processing: Algorithms and Systems XVIII (IPAS-064)

Location: Hyatt Regency San Francisco Airport, Burlingame, CA

Date and Time: [January 27, 2020 at 4:10 PM](#)

About NantOmics

NantOmics, a member of the NantWorks ecosystem of companies, delivers molecular diagnostic capabilities with the intent of providing actionable intelligence and molecularly driven decision support for cancer patients and their providers at the point of care. NantOmics is the first molecular diagnostics company to pioneer an integrated approach to unearthing the genomic and proteomic variances that initiate and drive cancer, by analyzing both normal and tumor cells from the same patient and following identified variances through from DNA to RNA to protein to drug. NantOmics has a highly scalable cloud-based infrastructure capable of storing and processing thousands of genomes a day, computing genomic variances in near real-time, and correlating proteomic pathway analysis with quantitative multi-plexed protein expression analysis from the same micro-dissected tumor sample used for genomic analysis. For more information please visit www.nantomics.com and follow Dr. Soon-Shiong on Twitter [@DrPatSoonShiong](#).

About NantHealth:

NantHealth, a member of the NantWorks ecosystem of companies, provides leading solutions across the continuum of care for physicians, payors, patients and biopharmaceutical organizations. NantHealth enables the use of cutting-edge data and technology toward the goals of empowering clinical decision support and improving patient outcomes. NantHealth's comprehensive product portfolio combines the latest technology in payor/provider platforms that exchange information in near-real time (NaviNet and Eviti), connected care solutions that deliver medical device interoperability (DCX device connectivity platform and VCX patient vitals software) and molecular profiling services that combine comprehensive DNA & RNA tumor-normal profiling with pharmacogenomics analysis (GPS Cancer[®]). For more information, please visit www.nanthealth.com or follow us on [Twitter](#), [Facebook](#) and [LinkedIn](#).

Forward-Looking Statements: NantHealth

This news release contains certain statements of a forward-looking nature relating to future events or future business performance. Forward-looking statements can be identified by the words "expects," "anticipates," "believes," "intends," "estimates," "plans," "will," "outlook" and similar expressions. Forward-looking statements are based on management's current plans, estimates, assumptions and projections, and speak only as of the date they are made. Risks and uncertainties include, but are not limited to: our ability to successfully integrate a complex learning system to address a wide range of healthcare issues; our ability to successfully amass the requisite data to achieve maximum network effects; appropriately allocating financial and human resources across a broad array of product and service offerings; raising additional capital as necessary to fund our operations; achieving significant commercial market acceptance for our sequencing and molecular analysis solutions; establish relationships with, key thought leaders or payers' key decision makers in order to establish GPS Cancer as a standard of care for patients with cancer; our ability to grow the market for our Systems Infrastructure, and applications; successfully enhancing our Systems Infrastructure and applications to achieve market acceptance and keep pace with technological developments; customer concentration; competition; security breaches; bandwidth limitations; our ability to continue our relationship with NantOmics; our ability to obtain regulatory approvals; dependence upon senior management; the need to comply with and meet applicable laws and regulations; unexpected adverse events; clinical adoption and market acceptance of GPS Cancer; and anticipated cost savings. We undertake no obligation to update any forward-looking statement in light of new information or future events, except as otherwise required by law. Forward-looking statements involve inherent risks and uncertainties, most of which are difficult to predict and are generally beyond our control. Actual results or outcomes may differ materially from those implied by the forward-looking statements as a result of the impact of a number of factors, many of which are discussed in more detail in our reports filed with the Securities and Exchange Commission.

¹ M Jaber, C. Szeto, B. Song, L. Beziaeva, S. Benz, P. Soon-Shiong and S. Rabizadeh, "Pathology image-based lung cancer subtyping using deep-learning features and cell-density maps," *To be published as part of the proceedings from the IS&T International Symposium on Electronic Imaging 2020*.

View source version on [businesswire.com](https://www.businesswire.com/news/home/20200127005739/en/): <https://www.businesswire.com/news/home/20200127005739/en/>

NANT

Jen Hodson

Jen@nant.com

562-397-3639

Source: NantHealth, Inc.