Holmusk Announces New Publication: Deep Learning-Based Natural Language Processing Models that Translate Unstructured Psychiatry Notes into Quantifiable Measures

Publication details how Holmusk's NLP models can transform unstructured psychiatry notes from EHRs into a structured, quantifiable format to enable analysis and rich insights

SINGAPORE & NEW YORK, NY, February 16th, 2021

Holmusk, a leading global data science and digital health company building the largest Real-World Evidence (RWE) platform for behavioral health, today announced the publication of its scientific article "*Natural Language Processing-Based Quantification of the Mental State of Psychiatric Patients*", in Computational Psychiatry (MIT Press). Full text here: https://cpsyjournal.org/articles/10.1162/cpsy_a_00030/.

With this publication, Holmusk has validated its unique library of proprietary Natural Language Processing (NLP) models that translate unstructured psychiatry notes into quantifiable indicators of patient statuses (e.g., symptoms, side effects, and external stressors). Used to enrich data that reside within health systems, these quantifiable indicators can estimate patient disease severity across the spectrum of behavioral health disorders and create longitudinal trajectories of patient status. By establishing these quantifiable indicators, Holmusk's models generate robust Real-World Evidence of disease progression and treatment efficacies for psychiatric disorders for the first time. Holmusk will use the objective measures from these models to support measurement-based care and personalize care delivery in behavioral health across health systems.

"Using the NLP labels, we can generate structured information about mental states of patients from free text clinician notes and can quantify the severity of mental illnesses based upon these labels using deep learning algorithms. What is more, by extracting important psychiatric labels directly from clinical notes, we are able to bypass the arduous anonymizing process, which opens up exciting possibilities of applying quantitative analytical techniques to all available psychiatric notes." said Sankha Mukherjee, Senior Data Scientist at Holmusk and lead author.

In creating this library, the Data Science (AI) Team at Holmusk leveraged its specialty behavioral health Electronic Health Records (EHR) system, MindLinc. The models convert 20+ years of electronic health record notes from Holmusk's MindLinc Global Database into over 240 psychiatrically relevant dimensions. Combined with machine learning, these dimensions bring greater precision to the everyday management and treatment of illnesses.

"Holmusk's reliable and systematic compilation of clinician notes to assess outcomes across patients, clinicians, and health systems is a major advance in enabling a learning healthcare system. It allows decisions and outcomes made with prior patients to inform us with Real-World Evidence about how to best care for future patients," said A. John Rush, MD, Professor Emeritus in Duke-NUS Medical School, Adjunct Professor of Psychiatry and Behavioral Sciences at Duke Medical School, and scientific advisor to Holmusk.

Robust and scalable, Holmusk's NLP models allow information to be extracted from unstructured EHR data collected in behavioral health clinical practice, a previously time-consuming and manual process.

"At Holmusk, we are not waiting to collect perfect data to analyze and generate insights. Being able to analyze the rich and diverse information in clinician notes in a structured, quantifiable format, is a potential gamechanger for behavioral health. For the first time, our approach will allow us to truly segment the patient population not just by diagnosis but clusters of patient symptoms and severity that can be matched appropriately to drugs both for clinical trials and in real-world practice," said Holmusk's Chief Analytics Officer, Joydeep Sarkar.

Scientific citation data: **Mukherjee S.S.,** Yu J., Won Y., McClay M.J., Wang L, Rush A.J., Sarkar J. (2020). Natural Language Processing-Based Quantification of the Mental State of Psychiatric Patients. *Computational Psychiatry*, Volume 4, 76-106. https://doi.org/10.1162/cpsy_a_00030

About Holmusk:
Holmusk is on a mission to transform the lives of people with behavioral health and chronic diseases through evidence driven medicine. Headquartered in Singapore with a global footprint, Holmusk develops digital solutions to advance health innovation, research, and care, and is building the world's largest real-world evidence platform for behavioral health and chronic diseases. In 2020, Holmusk raised US$21.5 million during their series A fundraising led by Optum Ventures and Health Catalyst Capital.

Holmusk's analytics platform synthesizes Real-World Data (RWD) with proprietary disease progression models to create actionable insights for behavioral health research, innovation, and care delivery. Holmusk's Real-World Evidence platform, NeuroBlu, is powered by one of the largest longitudinal de-identified behavioral health databases, with data from more than 550,000+ patients collected over 20+ years and 20+ million visits. Holmusk is continuously enhancing its database by partnering with health systems globally. In addition, Holmusk builds digital health solutions that enhance patient engagement, support disease self-management, and capture patient-reported outcomes to guide clinical decisions and analytics. For more information, please visit www.holmusk.com

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