Empowering personalized care: Cancer treatment to benefit from AI-driven imaging platform

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SFU engineering science professor Mirza Faisal Beg is spearheading research that could help to redefine cancer treatment. Using artificial intelligence (AI) his breakthrough research enables imaging of the

human body and organ measurements much faster than traditional methods, signaling a leap forward in harnessing AI for individually personalized health care solutions.

Beg and his team have created the Data Analysis Facilitation Suite (DAFS), a sophisticated, first-of-its-kind computer program delivering AI automation to provide measurements of many internal organs and tissues within the human body—in a matter of minutes.

The tool analyzes digital body CT scans and quantifies muscle, fat, and organ health. Rapid assessments offer insights into treatment responses, enabling tailored interventions and minimizing inadvertent side effects.

As Beg explains, in cancer treatment workflows, "staging the tumor" involves determining the extent of disease within a patient's body, guiding treatment strategies. Conversely, "staging the host" involves understanding the patient's overall health to define limits of treatment tolerance, a crucial aspect for selecting the appropriate treatment and dose.

"While there are sophisticated tools for tumor staging, tools for assessing the patient's overall suitability for treatment and health condition have been limited," says Beg. "Current methods, such as using Body Mass Index (BMI) based solely on weight and height, do not provide an accurate representation of an individual's unique body composition. Vital factors underlying individual response to treatment like muscle mass, fat distribution, and organ health are neglected in these simplistic metrics."

Beg says this void in precise host staging highlights the need for innovative approaches that encompass individual variations comprehensively as factors like muscle and fat content influence disease onset and treatment outcomes.

While computed tomography (CT) images are routinely acquired during cancer treatment and can provide measurements to stage the host, they are time-consuming for already busy clinicians to analyze, taking hours to days to complete manual assessment for a single patient, highlighting the need for automation to expedite the process.

To address this critical gap, Beg's team incorporates AI-powered technology to provide swift and accurate measurements of internal organs and tissues, bridging the divide between these workflow activities. With each patient's unique body composition, a personalized treatment plan responsive to both disease and individual traits can lead to improved health outcomes while minimizing adverse side effects.

Designing treatments more tailored to patients' profiles

Beg says there are also critical concerns that numerous decisions regarding individual treatments stem from conclusions drawn from the average outcomes observed across groups of patients.

"Each patient may present distinct and important deviations from these averages, potentially resulting in sub-optimal treatment choices and delayed detrimental health consequences," he explains. His objective is to pioneer transformative technologies that empower clinicians to design treatments tailored to each patient's unique profile, offering milder options for those vulnerable and more robust approaches for those equipped to endure them effectively.

The innovation recently secured a Canadian Institutes of Health Research (CIHR) project fund to expand the team's work and make its platform more accurate and comprehensive.

The team will continue to leverage the capabilities of AI in refining the pioneering technology to enable measurements of human body composition and their change due to disease and intervention that were not previously possible.

Already in use by more than a hundred research labs worldwide, the platform shows potential to help accelerate health research across many diseases and application areas ranging from oncology, surgery, radiation therapy planning, nutrition, metabolism and more.

Beg's research holds promise for a future where personalized care becomes the norm. "Our hope is that this technology may allow clinics to craft personalized treatment strategies for each individual patient. This not only solidifies Canada's position but also propels SFU to the forefront of an AI revolution that's transforming the landscape of personalized clinical medicine workflows and lead to improved health outcomes."

Provided by Simon Fraser University

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