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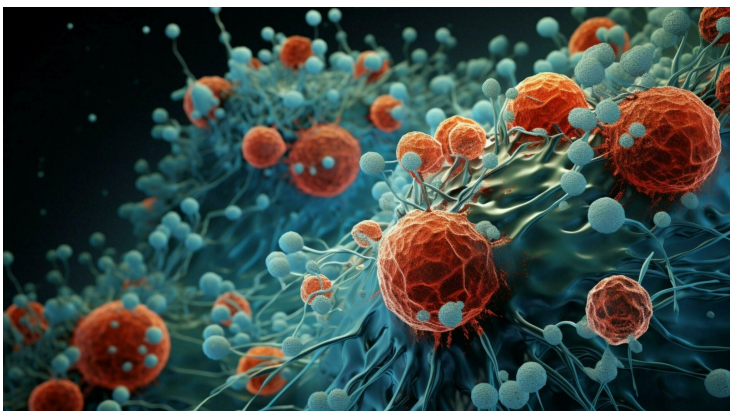
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IIT Kanpur's new computational tool Renoir uncovers hidden signals in cancer progression

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Renoir works across the major spatial-profiling platforms used by laboratories worldwide



Researchers at the Indian Institute of Technology Kanpur (IIT-K), led by Prof. Hamim Zafar, have developed an advanced computational tool, Renoir, that enables researchers to decode how cells communicate within complex tissues.

Published in Nature Communications, the study introduces a new way to map how signals between cells influence gene activity in specific spatial contexts, addressing a long-standing challenge in biomedical research.

Every organ in the body depends on constant communication between cells. Cells constantly exchange signals to coordinate essential processes such as tissue development, immune responses, and disease progression. While recent technologies can measure gene activity across tissues, it has remained difficult to understand how signals from one cell actually influence the behaviour of another—especially within the complex spatial organisation of tissues.

Renoir addresses this challenge by utilising spatial transcriptomics data, high-resolution snapshots of gene activity that preserve the location of each cell, and maps not just which cells are “talking” to each other, but how these signals affect downstream genes in specific locations within tissues. This allows researchers to identify “communication niches” where particular signalling pathways are active.

The study was conducted in collaboration with Prof. Ankur Sharma’s laboratory at the Garvan Institute of Medical Research, Australia, where spatial transcriptomic datasets from foetal liver and liver cancer were generated to evaluate Renoir. The method successfully uncovered biologically meaningful interactions, including those associated with tumor progression and developmental processes.

Spatial transcriptomics is one of the fastest-growing technologies in modern biology, and Renoir works across the major spatial-profiling platforms used by laboratories worldwide.