Cells derive their mechanical properties from the structure and dynamics of their intracellular components, which, in turn, emerge from cell type-specific genetic, epigenetic, and biochemical processes. The ability to identify differences within a population of one cell type or different cells among heterogeneous populations, or to detect changes due to disease or environmental interactions based on cellular mechanical properties has important implications for cell and tissue biology and clinical metrics. We have developed an innovative single cell mechanophenotyping platform, mechano-node-pore sensing (mechano-NPS)[7-9], which utilizes a four-terminal electrical measurement to detect the current pulse caused by a cell traversing across, and squeezing through, a microfluidic channel segmented by a series of "nodes". By analyzing the recorded pulse, we can derive information on a cell's diameter, stiffness, and recovery from deformation. In this Seed project, we will advance mechano-NPS platform so that cells can be measured under multiple strains and with high throughput. Our overall success can result in numerous applications, including screening cells cultured under different conditions and confluences, and determining whether cells coming out of culture are in a similar state from day-to-day. Moreover, mechano-NPS could be integrated or used in combination with Agilent real-time cellular impedance instruments, e.g. xCELLigence RTCA.