**Master thesis project: Evaluating the utility of brightfield image data**

**for cell viability prediction using Deep Neural Network**

**Introduction:**

A close-up of a black and white grid

Description automatically generated**A diagram of a cell line

Description automatically generated**

* 384 well plate: It has 16 rows from A TO P and columns from 1 to 24. (16\*12 = 384)
* Kuramochi cell line1: High grade ovarian serous adenocarcinoma
* Wet lab experiment: We made Kuramochi cells grow together in little 3D balls, kind of like tiny spheres. After that, we treated them with different drugs/medication. We used special stains2 (dyes/colors) to mark the cells, so we can easily see which ones alive and which ones are not after we give them the medicines. Finally, we used a microscope (called high throughput microscope) that can quickly look at a lot of cells at once to see what's happening to them.

**Limitations:**

* The dyes may not always show the true picture, and they can be affected by the drugs we use or the conditions in the lab.
* The timing of when we do the staining is crucial. Staining too early or too late might give us the wrong idea about whether the cells are healthy or not.
* Sometimes, the dyes we use to color the cells can themselves be a bit harmful. This can make it tricky to get accurate results without affecting the cells

1. ***Human cell lines*** are groups of cells that have been removed from a human tissue or organ and are grown and maintained outside the body in a laboratory setting. These cells can continuously divide and replicate under specific conditions. In simpler terms, imagine taking a small sample of cells from a person, such as skin cells or cells from an organ, and growing them in a dish in a controlled environment. These cells can be used for various scientific experiments, drug testing, and medical research. They provide a way for researchers to study human biology, test new drugs, and understand diseases without having to constantly take cells directly from individuals.
2. ***Staining cells*** is a technique in the lab where scientists use special dyes or colors to make different parts of cells more visible under a microscope. It's like using highlighters to emphasize specific details in a textbook. These dyes can target various components of cells, such as the nucleus, or the cell membrane etc.

**Aim:**

Build AI framework to stain cells virtually/digitally for live and dead states offering dynamic visualization of cell responses to different drug treatments.

**Dataset description:**

Naming notation for each image- r\_\_c\_\_f\_\_p\_\_-ch\_sk1fk1fl1

*Ignore this field it is always the same*

row

column

field

plane

channel

**A diagram of a tall building

Description automatically generated**

01 =< r =< 16 (i.e from A to P)

01 =< c =< 24 (i.e. columns 1 to 24)

f = 01 (for this dataset we did not acquire images from different fields (angles) hence we only have 1 field of view

37 stacks

01 =< p =< 37 (for each well, for example, A1(row1col1) we acquired 37 stacks hence no. of planes is 37)

01 =<ch =< 3 (3 channels where channel 1 is Sytox green (dead cells), channel 2 is TMRM (live cells), channel 3 is brightfield)

Example:

*r01c01f01p01-ch1sk1fk1fl1*

r01: row 1 (Row A)

c01: column 1

f01: field of view 1

p01: plane/stack no. 1

ch1: channel 1 (Sytox green: dead cells)

**Initial preprocessing steps:**

Step 1: Get Maximum Intensity projected images for each well

Step 2: Crop the region of interest

**References:**  
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