General project notes

Paper: Shamai et al. (2022) – Deep learning-based image analysis predicts PD-L1 status from H&E-stained histopathology images in breast cancer

PD-L1 = programmed death ligand 1

* Protein that is found on the surface of cancer cells
* Regulates immune response in the body
* Works by binding to a protein called programmed death 1 (PD-1) on immune cells, which signals the immune system to stop attacking the cell that expresses PD-L1
  + This is known as immune checkpoint inhibition
  + This helps prevent the immune system from attacking healthy cells in the body -> usually
* However, cancer cells can also use PD-L1 to evade the immune system and avoid destruction by T cells
  + Express PD-L1 to turn off immune response and continue to grow and spread

Biomarker = a measurable substance or characteristic in the body that can indicate the presence or progress of a disease, infection, or abnormal biological process

* Can be molecules (proteins, DNA), or characteristics like blood pressure etc

Immunohistochemistry (IHC) = a lab technique used to detect specific proteins or other molecules in tissue samples

* Uses antibodies that are specific to the target protein or molecule of interest, which are labeled with a visible marker, such as fluorescent or colored dye

Hematoxylin and eosin (H&E) are two commonly used dyes in histology (studying tissues)

* Hematoxylin is blue-purple
* Binds to negatively charged components of cells (e.g. DNA and RNA)
* Used to stain cell nuclei and other structures with high nucleic acid content (mitochondria, ribosomes, other cytoplasmic granules)
* Eosin is red
* Binds to positively charged components of cells, such as proteins and amino acids
* When combined, can provide good contrast and visualization of tissue structure
* The two are counterstains

Triple-negative breast cancer (TNBC) = type of breast cancer that is defined by the lack of expression of three receptors commonly found on breast cancer cells

* Receptors: estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor 2 (HER2)
* Because TNBC doesn’t have these three receptors, it doesn’t respond to hormonal therapies or drugs that target HER2, which are effective for other types of breast cancer
* Makes up 10-15% of all breast cancers
* More common in younger women and those with family history of breast cancer
* Aggressive, has high risk of recurrence

This paper

* When considering only PD-L1 positive patients, adding immunotherapy to chemotherapy has significantly improved survival time (non-positive patients it had no benefits)

Paper: Staaf et al. (NatMed): Whole genome sequencing of TNBC in a population-based clinical study

Homologous-recombination-repair deficiency = inability of a cell to effectively repair double-strand DNA breaks using the homologous recombination repair (HRR) pathway

* HRDetect is a n algorithm that can detect this deficiency