Bioinformatics Wrap-Up

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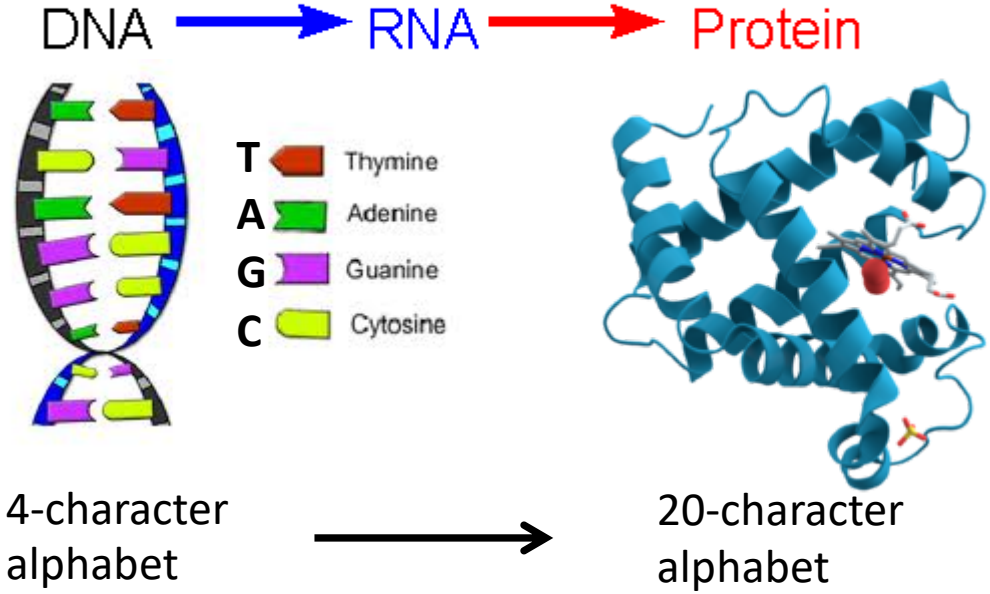
What is bioinformatics

- Bioinformatics:
  - Biology + information
  - the study and utilization of methods for storing, retrieving and analyzing biological data

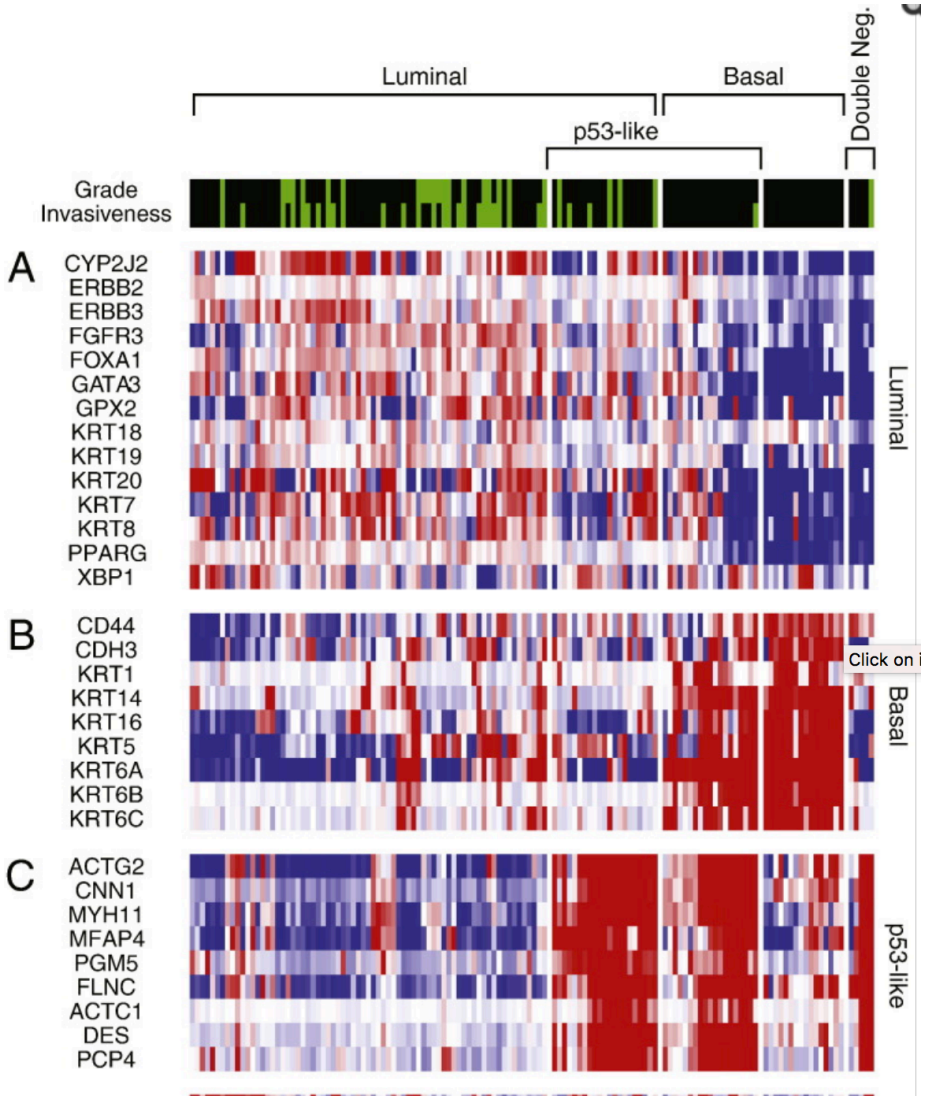


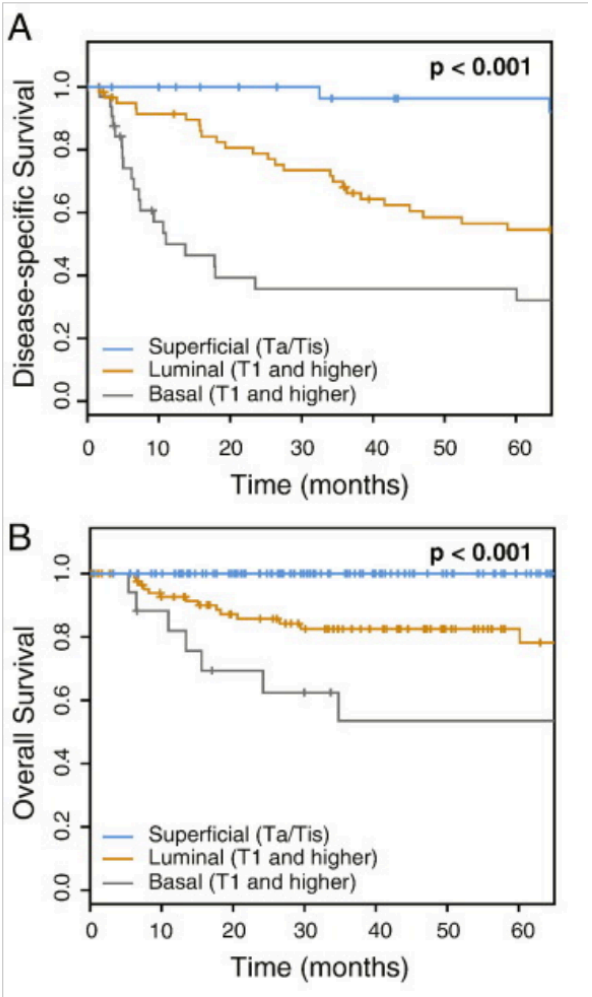
- How much information:
  - Human genome: 3 billion nucleotides
  - ~20,000 genes
    - many more when considering “junk DNA” and alternative splicing
  - >10 million sites of DNA variation
  - Countless possible interactions between DNA, RNA, and proteins

Why do we need bioinformatics?

- To identify genetic mechanisms of diseases and other inherited (or acquired) conditions
  - Nature via nurture
- For personalized treatment of disease

Bladder cancer subtypes





Dadhania *et a*l, *EBioMedicine,* 2016

Additional Examples

- Gene expression analysis:
  - Development of a RNA-Seq Based Prognostic Signature in Lung Adenocarcinoma (https://pubmed.ncbi.nlm.nih.gov/27707839/)
  - RNA-seq transcriptome analysis of breast cancer cell lines under shikonin treatment (https://pubmed.ncbi.nlm.nih.gov/29422643/)
  - Expression of the SARS-CoV-2 cell receptor gene *ACE2* in a wide variety of human tissues (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7186534/)
  - RNA-Seq and molecular docking reveal multi-level pesticide resistance in the bed bug (https://pubmed.ncbi.nlm.nih.gov/22226239/)
- Additional data analysis examples:
  - Facebook Data: http://www.cnn.com/2013/03/11/tech/social-media/facebook-likes-study/
  - Netflix Prize: http://www.wired.com/2009/09/how-the-netflix-prize-was-won/
  - And many more…

Amazon Movie Review Dataset

- Let's analyze data from about 8 million Amazon movie reviews
  - Why not?
  - http://snap.stanford.edu/data/web-Movies.html
  - Processed version is posted on Blackboard