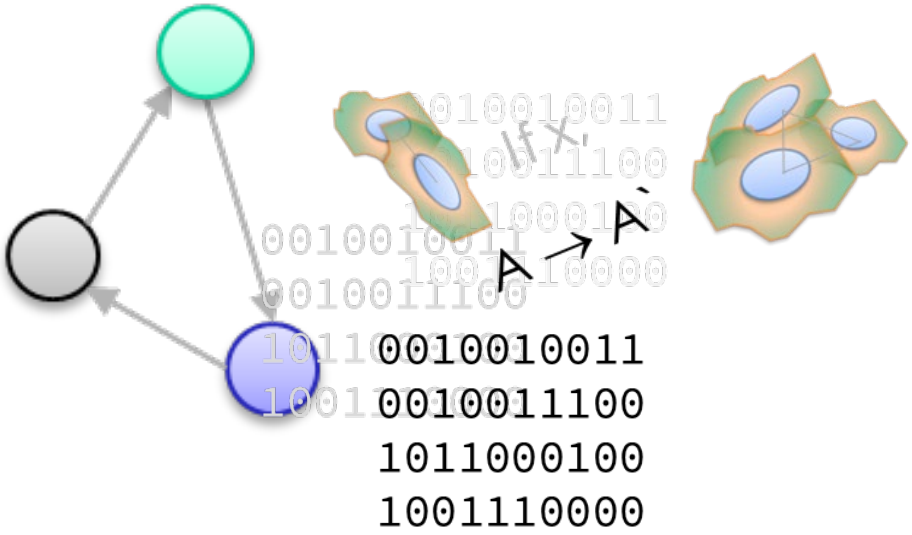
Computational Bioengineering

BME 4803 | BME 6313



Team Projects

Leukemia Project: Determine the best model to predict which AML patients will have Complete Remission or will be Primary Resistant.

Fitness Project: Determine the best model to predict rapid eye movement duration as a fraction of overall sleep duration for volunteers.

Your choice: Covid Project, Senior Design
Confirm this week

Team Presentations & Projects

Organization

1. **Abstract**
2. **Introduction & Rationale**
3. **Methodology & its Justification**
4. **Results**
5. **Discussion & Conclusions**

- 5 page report, appendix for code
- At least 4 impactful figures and/or tables

Peer weighting scales grade

Team Presentations & Projects

Scoring Criteria

1. **Organization**
2. **Clarity**
3. **Methodology & its Justification**
4. **Conclusions**
5. **Impact**
6. **Creativity**

Peer weighting scales grade

5 page report, appendix for code

At least 4 impactful figures and/or tables

Preprocessing of Data Prior to Modeling

Test vs. Training

- 2/3rd for training
- 1/3rd for scoring (done for you, for AML challenge)
- Randomized data tests

Initial Analyses | Preprocessing of Data

- Clustering
- PCA
- Correlation across all variables
- Normalization
- Any weighting for biological knowledge

Scoring Model Predictions

Binary predictions

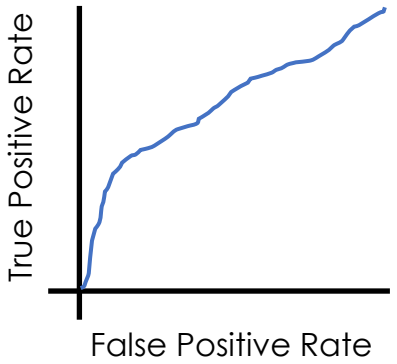
Balanced Accuracy

$$BAC = \frac{1}{2}\left(\frac{TP}{P} + \frac{TN}{N}\right)$$

TP	# correct CR predictions
P	# actual CR patients
TN	# correct PR predictions
N	# actual PR patients

CR Confidence	Prediction
≥ 0.5	CR
< 0.5	PR

Area Under the ROC Curve



True and False Positive rates are functions of k

CR Confidence	Prediction
≥ k	CR
< k	PR

Scoring Model Predictions

Time-dependency

Pearson Correlation Coeff.

$$PCC = \frac{\sum_{i=1}^{n}(p_i - \bar{p})(a_i - \bar{a})}{\sqrt{\sum_{i=1}^{n}(p_i - \bar{p})^2}\sqrt{\sum_{i=1}^{n}(a_i - \bar{a})^2}}$$

p_i	Predicted duration for patient i
a_i	Actual duration for patient i
$\bar{p}$	Mean predicted duration
$\bar{a}$	Mean actual duration

Concordance Index

$$CI = \frac{\sum_{i<j} h(i,j)}{\frac{n(n-1)}{2} - \#censored\ pairs}$$

$$h(i,j) = \begin{cases} 1 & if\ (i,j)\ not\ censored, a_i > a_j, and\ p_i > p_j \\ 1 & if\ (i,j)\ not\ censored, a_i = a_j, and\ p_i = p_j \\ 1 & if\ (i,j)\ not\ censored, a_i < a_j, and\ p_i < p_j \\ 0 & otherwise \end{cases}$$