Lecturer: Prof. Homrighausen Scribe: Ryan Hicks

There were 5 presentations given today:

- Veronica - Adaptive Baggin[sic]
- Ryan - Gap Statistic
- Yewon - Ridge Regression
- Soo Young - Archetypal Analysis
- Lyuou - Binary Classification

After the presentations, Darren briefly talked about Normal means. This document will pick up from slide 1 of Some Theoretical Tools and continue through slide 4.

The normal means model is:

Assume $Y \sim (\mu, 1)$ and let

$$L_q(\mu) = 2^{q-2}(Y - \mu)^2 + \lambda|\mu|^q$$

where

$$\hat{\mu}_q = \arg\min_{\mu} L_q(\mu)$$

We cannot solve this optimization problem for all values of q in the usual way, as the absolute value function's kink is non-differentiable. However, we can generalize the idea of a derivative to a *subderivative*, which will allow us to deal with kinks in functions.

We call c a subderivative of f at X_0 if $f(X) - f(X_0) \geq c(X - X_0)$ is satisfied. Thus, a convex function can be optimized by setting the subderivative equal to 0. The *subdifferential* $\partial f|_{X_0}$ is the set of subderivatives.