Nonlinear Optimization with Gradient based Methods
(OM for ML-II)

We had spent considerable amount of time in this course on linear optimization. A large class of problems gets formulated as "nonlinear optimization". Nonlinear optimization could be convex or non-convex.

A popular class of optimization method is based on Gradient Based optimization. They become very important and popular in machine learning in the last decade with the resurgence of neural networks in the machine learning.

1. To start with, watch the following lecture videos:
   - Go to the course web page and details at: https://www.stat.cmu.edu/ ryantibs/convexopt-F18/
   - See Gradient Desent Lecture on Sep 12
   - See Newton's Method Lecture on Oct 17
2. Download and play with the notebooks from
   - Link1:https://www.dropbox.com/s/4lh4scu5j87llum/gradient
   - Link2:https://www.dropbox.com/s/um2l0ttdq1ptr5p/gradient

   Similar to last time. Thanks Aditya Arun again.
3. At the end of this, you should be able to appreciate:
   - Gradient descent for convex and non-convex optimization problems.
   - Optimal learning rates, back tracking
   - Convergence analysis and bounds
   - Newton's method
   - Comparison of first and second order methods.
4. You are given exercises and questions to think and work. We will also ask you to submit answers to such questions separately.
5. We could arrange a special online clinic for help in understanding the associated issues. There will be regular chat/thread for regular discussions too. Please post your questions in the channel on "Gradient based Optimization"
6. Optional/additional resources, minor changes to the content (eg. any errata or low level details) will be posted over the next few days. Please start soon, if not today.