Computer Assignment # 3

Due: May 8, 2024, 23:59:59

In this assignment you are asked to implement standard convex problem using cvx:

- **Linear programming problem (LP)**

$$\begin{aligned} \min_{\mathbf{x}} \ & \mathbf{c}^T\mathbf{x} \\ \text{s.t } & \mathbf{A}\mathbf{x} = \mathbf{b} \\ & \mathbf{C}\mathbf{x} \leq \mathbf{d} \\ & \mathbf{x} \succeq 0 \end{aligned} \tag{1}$$

  Implement it as a function called `mylp.m`, where function is declared as
  `function [xopt, optval] = mylp(c,A,b,C,d)`

- **Quadratically Constrained Quadratic Programming Problem (QCQP)**

$$\begin{aligned} \min_{\mathbf{x}} \ & \frac{1}{2}\mathbf{x}^T\mathbf{P}_0\mathbf{x} + \mathbf{q}_0^T\mathbf{x} \\ \text{s.t } & \frac{1}{2}\mathbf{x}^T\mathbf{P}_1\mathbf{x} + \mathbf{q}_1^T\mathbf{x} + r_1 \leq 0 \\ & \mathbf{A}\mathbf{x} = \mathbf{b} \end{aligned} \tag{2}$$

  Implement it as a function called `myqcqp.m`, where function is declared as
  `function [xopt, optval] = myqcqp(P_0,q_0,P_1,q_1,r_1,A,b)`

- **Semidefinite Programming Problem (SDP)**

$$\begin{aligned} \min_{\mathbf{X}} \ & \frac{1}{2}\mathbf{q}^T\mathbf{X}\mathbf{q} + tr(\mathbf{F}^T\mathbf{X}) \\ \text{s.t } & tr(\mathbf{A}^T\mathbf{X}) \leq b \\ & \mathbf{X} \succeq 0 \end{aligned} \tag{3}$$

  Implement it as a function called `mysdp.m`, where function is declared as
  `function [Xopt, optval] = mysdp(q,F,A,b)`

- **General convex problem with complex variables**
  Very often in engineering applications we have to deal with complex data, therefore for following problem please consider complex inputs (and complex output)

$$\begin{aligned} \max_{\mathbf{X}} \ & tr(\mathbf{H}_0\mathbf{X}\mathbf{H}_0^H) - \alpha * \|\mathbf{X}\|_F^2 \\ \text{s.t } & tr(\mathbf{H}_1\mathbf{X}\mathbf{H}_1^H) \leq b \\ & tr(\mathbf{X}) \leq P \\ & \mathbf{X} \succeq 0 \end{aligned} \tag{4}$$

  Implement it as a function called `mycvxprob.m`, where function is declared as
  `function [Xopt, optval] = mycvxprob(H0,H1,alph,P,b)`

As in ca02, you are given a script `ca03_test.m` to test the correctness of your implementation, you have to PASS all the test cases

Submission Policy

- Place all your scripts inside the folder called "codes".
- Put "codes" inside zip file called `ca3_xxxxxx.zip`, where `xxxxxx` is your student ID and submit it to e3.