COMP331/557: Optimisation
An Introduction to Gurobi[1]

1. Login to the Linux system through Windows:
   - Login to Windows using your university account.
   - Open the application **MobaXterm Personal Edition**.
     (It will be on your desktop, otherwise search for it in the "Search Windows" bar)
   - Click on the button **Session** (top left corner).
   - In the new window that appears, click on the button **SSH**. In the *Basic SSH Settings*, in the *Remote host** bar, type: "XXX.csc.liv.ac.uk" (without the quotes), where XXX is an element from {lxfarm01, ..., lxfarm08}.
   - A terminal (shell) should aytomatically open in your screen where you will be asked to "Login as". Give your departmental account this time.
2. Create a directory (folder):
   - 'pwd': shows your home directory,
   - 'ls': shows the content of the current directory,
   - 'mkdir COMP557': creates a new directory with name "COMP557",
   - 'cd namefolder': redirects you to the folder with name "namefolder".
3. Play around with Python
   - type `python` to start python shell
   - to quit python shell type `quit()`
4. Download an lp file and save it to the folder "COMP557" you just created:
   Easy way:
   - Go to the COMP557 directory.
   - `cp /opt/gurobi751/linux64/examples/data/coins.lp .`

   Alternative way:
   - Create a new Text Document file "coins.txt" and save it in your Desktop.
   - Go to the website "Gurobi.com" and search for "The model file".
   - Copy and paste this to the Desktop file "coins.txt" you created.
   - Next to your terminal, there is a list with your account files. Drag the "coins.txt" from your desktop into the folder "COMP557". Rename it as "coins.lp".
   - Now you are ready to run Gurobi.

[1]For more on Gurobi, check: `http://www.gurobi.com/resources/seminars-and-videos/seminars-videos`.

5. Basic Gurobi commands:

   - 'gurobi': starts the LP solver Gurobi,
   - 'm=read("test.lp")': reads the file "test.lp" into the Model m,
   - 'm.optimize()' : computes optimal solution
   - 'm.printStats()' : shows the statistics of m (LP from "test.lp"),
   - 'm.getVars()': returns a list with the names of all variables,
   - 'm.getVars()[0]': returns the variable in position 0,
   - 'm.getConstrs(): returns a list with the names of all contraints,
   - 'm.getConstrs()[0]: returns the constraint in position 0,
   - 'm.printAttr("X")' : returns the variables with nonzero values in the optimal solution,
   - 'm.printAttr("X","b*")' : returns all the variables, beginning with 'b', with nonzero values in the optimal solution,

6. Further resources:

   - Short LP file documentation:
     `http://www.gurobi.com/documentation/7.5/refman/lp_format.html`
   - Creating Model from scratch and using Gurobi in a Python script:
     `http://cgi.csc.liv.ac.uk/~gairing/COMP557/slides/gurobi.pdf`