- The syntax for fmincon

[x,fval,exitflag]=fmincon(objfun,x0,A,b,Aeq,beq,lb,ub,
nonlcon,options);

- x: optimal solution; fval: optimal value; exitflag: exit condition
- objfun: objective function (usually written in a separate M file)
- x0: starting point (can be infeasible)
- A: matrix for linear inequalities; b: RHS vector for linear inequalities
- Aeq: matrix for linear equalities; beq: RHS vector for linear equalities
- lb: lower bounds; ub: upper bounds
- Nonlcon: [c,ceq]=constraintfunction(x)

*Look How here how the first inequality (in blue) is treated…as A: matrix for linear inequalities*

$$\min \quad f(x) = \left(x_1^2 + x_2^2 - 1\right)^2$$

$$-1 \le x_1 \le 1, -1 \le x_2 \le 1,$$

$$\text{s.t.} \quad x_1 + x_2 \ge 1$$

$$x_1 x_2 \ge 1/2, x_2 \ge x_1^2, x_1 \ge x_2^2$$

$$A = [-1,-1]; b = -1;$$

$$lb = [-1;-1]; ub = [1;1];$$

$$c(x) = \begin{bmatrix} \frac{1}{2} - x_1 x_2 \\ x_1^2 - x_2 \\ x_2^2 - x_1 \end{bmatrix}; ceq(x) = [];$$

```
% myobj.m
function  f=myobj(x)
f = (x(1)^2+x(2)^2-1)^2;

% mycon.m
function [c, ceq]=mycon(x)
c=[1/2-x(1)*x(2);
   x(1)^2-x(2);
   x(2)^2-x(1)];  % nonlinear inequalities c(x) <= 0
ceq=[ ];   % nonlinear equalities ceq(x) = 0;

% main file for fmincon
[x,fval] = fmincon(@myobj,xo,A,b,[],[],lb,ub,
                   @mycon,options);
```