```
clear all
clc
close all
format short

% Cálculo numérico para engenharia elétrica com Matlab
% Capítulo 8: equações diferenciais parciais
% MEF

%% Poisson's Equation on a Unit Disk

% Create Geometry Using a Geometry Function>.
g = @circleg;
c = 1; a = 0; f = 1;

% PDE Coefficients and Boundary Conditions
% Plot the geometry and display the edge labels for use in the boundary
% condition definition.
subplot(2,2,1), pdegplot(g,'EdgeLabels','on'); axis equal
xlabel('x (m)'), ylabel('y (m)'), title('Geometry')
% Create a PDE Model with a single dependent variable.
numberOfPDE = 1; model = createpde(numberOfPDE);
% Create a geometry entity.
geometryFromEdges(model,g);
% Specify PDE coefficients.
specifyCoefficients(model,'m',0,'d',0,'c',c,'a',a,'f',f);
% The solution is zero at all four outer edges of the circle.
applyBoundaryCondition(model,'dirichlet','Edge',(1:4),'u',0);
% Generate Initial Mesh
hmax = .35; generateMesh(model,'Hmax',hmax);
% Refinement
er = Inf;
while er > 0.001
    hmax =hmax/2;    generateMesh(model,'Hmax',hmax);
    result = solvepde(model); msh = model.Mesh;  u =
result.NodalSolution;
    exact = (1-msh.Nodes(1,:).^2-msh.Nodes(2,:).^2)'/4;
    er = norm(u-exact,'inf');
    fprintf('Error: %e. Number of nodes: %d\n',er,size(msh.Nodes,2));
end
% Plot Final Mesh
subplot(2,2,2), pdemesh(model); axis equal
xlabel('x (m)'), ylabel('y (m)'), title('Mesh')
% Plot FEM Solution
subplot(2,2,[3,4]), pdeplot(model,'XYData',u,'ZData',u,'ColorBar','off'),
grid on
xlabel('x (m)'), ylabel('y (m)'), zlabel('V (Volts)'), title('Poisson s
Equation on a Unit Disk')
```