Reference Solution to "Bifurcation Diagram for the Logistic Map"

```
mu_min=2.4; mu_max=4; %range of mu values
n_mu=500; %number of mu pixels
n_x=400; %number of x pixels
mu_edges=linspace(mu_min,mu_max,n_mu+1); %edges of mu pixels
mu=(mu_edges(1:n_mu)+mu_edges(2:n_mu+1))/2; %middle values of mu
x_edges=linspace(0,1,n_x+1);   %edges of x pixels

n_trans=20000; %transient iterations
n_data=10000;  %number of x values per mu value

x_data=zeros(n_data,n_mu); %x data used to construct figure

x_0=0.5; %initial condition

%computational engine: After discarding an initial transient,
%for each value of mu, collect a sample of x data.
%Store all the data in the variable x_data(1:n_data,1:n_mu)

for i=1:n_mu %loop over mu pixels
  x=x_0;
  for k=1:n_trans %loop over transient
    x=mu(i)*x*(1-x);
  end
  for k=1:n_data %collect data
    x=mu(i)*x*(1-x);
    x_data(k,i)=x;
  end
end

%%%%% bin data and plot image
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
x_histogram=zeros(n_x,n_mu); %binned values of x
for i=1:n_mu
x_histogram(:,i)=histcounts(x_data(:,i),x_edges);
x_histogram(:,i)=255*x_histogram(:,i)/max(x_histogram(:,i));
end
colormap(flipud(gray(256))); brighten(-0.8); cmap=colormap;
im=image([mu_edges(1) mu_edges(end)], [x_edges(1) x_edges(end)], x_histogram);
set(gca,'YDir','normal');
xlabel('$\mu$','Interpreter','latex','FontSize',14);
ylabel('$x\;\;$','Interpreter','latex','FontSize',14);
title('Logistic Map Bifurcation Diagram','Interpreter','latex','FontSize',16)
```