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% gda02_07
%
% 2D Normal distribution, correlated
% Supports Figure 2.6

clear all;

% d-axis
Dd = 0.1;
N = 101;
d1 = Dd*[0:N-1]';
d2 = Dd*[0:N-1]';
dmin=0;
dmax=10;

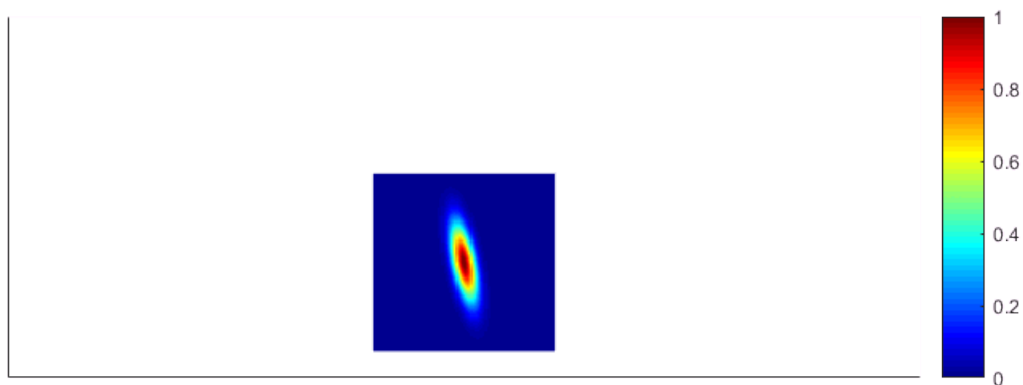
d1bar = 5;
d2bar = 5;
sd1 = 1.5;
sd2 = 0.5;
cov = 0.4;
C=zeros(2,2);
C(1,1)=sd1^2;
C(2,2)=sd2^2;
C(1,2)=cov;
C(2,1)=cov;
norm = 2*pi*sqrt(det(C));
CI=inv(C);

P=zeros(N,N);
for i = [1:N]
for j = [1:N]
    dd = [ dmin+Dd*(i-1)-d1bar, dmin+Dd*(j-1)-d2bar ]';
    P(i,j) = exp(-0.5*dd'*CI*dd)/norm;
end
end

A = sum(sum(P))*(Dd^2);

gda_draw(' ',P);
colorbar;

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% Figure 2.6 The probability density function $p(d_1, d_2)$ is displayed as an image, with values of $p(d_1, d_2)$ indicated by the accompanying color bar. These data are positively correlated, since large values of d_1 are associated with large values of d_2 .

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% are especially probable if d1 is large. The function has means  $\langle d1 \rangle = 5$  and  $\langle d2 \rangle = 5$  and widths  
% in the coordinate directions  $\sigma_1 = 1.5$  and  $\sigma_2 = 0.5$ . The angle  $\theta$  is a measure of the degree of  
% correlation and is related to the covariance  $\text{cov}(d1, d2) = 0.4$ . MatLab script gda02_07.
```