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%Homework 1 %involved files : reject.m which is my implementation of the rejection %method. ex11.mat , needed for the calculation close all;clear all; load('ex11.mat'); %COVARIANCE----------EX1 if 1 figure hist(P,30); hold on; hist(Q,30); hold on; hist(R,30); legend('P','Q','R') crp=corrcoef(R,P) cpq=corrcoef(P,Q) crq=corrcoef(R,Q) c2=corrcoef(R,2.*R) c3=corrcoef(R,3.*R) c5=corrcoef(R,5.*R) c7=corrcoef(R,7.*R) cc2=corrcoef(R,R.^2) cc3=corrcoef(R,R.^3) cc5=corrcoef(R,R.^5) cc7=corrcoef(R,R.^7) a=(Q(end)-Q(1))/(P(end)-P(1)) b=Q(456)-a*P(456) figure subplot(1,3,1),plot(P,Q,'mo') xlabel('P'); ylabel('Q'); subplot(1,3,2),plot(P,R,'ko') xlabel('P'); ylabel('R'); subplot(1,3,3),plot(Q,R,'bo') xlabel('Q'); ylabel('R'); figure subplot(1,3,1),plot(R,R.^2,'mo') xlabel('R'); ylabel('R^2'); subplot(1,3,2),plot(R,R.^5,'ko') xlabel('R'); ylabel('R^5'); subplot(1,3,3),plot(R,R.^7,'bo') xlabel('R'); ylabel('R^7'); for m=1:100 c=corrcoef(R,R.^m); cof(m)=c(1,2); end figure plot(cof,'mo-.') grid('on') xlabel('n') ylabel('coeff. hors-diag de corr(R,R^n') end %MULTIVARIATE DISTRIBUTIONS AND THE COVARIANCE MATRIX----------EX2 if 1 sigma=[1 2 2 5]; mu=[50, 50]; for i=1:6 n{i}=10^i; rep{i}=mvnrnd(mu,sigma,n{i}); covar=cov(rep{i}); pwet(i)=norm(cov(rep{i})-sigma); end for i=1:6 n{i}=10^i; rep{i}=mvnrnd(mu,sigma,n{i}); covar=cov(rep{i}); chwet(i)=norm(cov(rep{i})-sigma); end for i=1:6 n{i}=10^i; rep{i}=mvnrnd(mu,sigma,n{i}); covar=cov(rep{i}); fwet(i)=norm(cov(rep{i})-sigma); end for i=1:6 n{i}=10^i; rep{i}=mvnrnd(mu,sigma,n{i}); covar=cov(rep{i}) mwet(i)=norm(cov(rep{i})-sigma); end x=[10,10^6]; y=[2,0.004]; nn=[10,10^2,10^3,10^4,10^5,10^6]; figure loglog(nn,pwet,'mo-.',nn,chwet,'k*--',nn,fwet,'b+:',nn,mwet,'gx-') hold on; plot(x,y,'r--'); %the bigger the n, the closer from sigma it is !! x1=rep{4}(:,1); x2=rep{4}(:,2); figure plot(x1,x2,'ro') %interesting... figure hist3(rep{4},[25 25]); xlabel('x1'); ylabel('x2'); set(gcf,'renderer','opengl'); set(get(gca,'child'),'FaceColor','interp','CDataMode','auto'); end %RANDOM NUMBER GENERATION : TRANSFORMATION METHOD----------EX3 if 1 n=20000; y=rand([n,1]); pwet=sqrt(-2*log(y)); x=[0:0.01:5]; p=x.*exp(-x.*x./2); hh=hist(pwet,50); p=p./max(p).*max(hh); xx=[0:5/49:5]; figure hist(pwet,50); hold on; plot(x,p,'ro-'); grid end %RANDOM NUMBER GENERATION :REJECTION METHOD ----------EX4 if 1 n=10000; sup=0.997; x2=[0:0.01:sup]; xmax=[0:0.01:3]; %normalised function: A=1/(sin((pi*max(x2)^2)/2)-(max(x2)^7)/(7*6^6)) p2=A*(pi*x2.*cos(0.5*pi*x2.^2)-(x2./2).^6); Amax=1/(sin((pi*max(xmax)^2)/2)-(max(xmax)^7)/(7*6^6)); pmax=A*(pi*xmax.*cos(0.5*pi*xmax.^2)-(xmax./2).^6); %plotting the normalised function P2(x) on the interval [0,sup] zozom=zeros(length(xmax),1); figure plot(xmax,pmax,'b',xmax,zozom,'k') zozo=zeros(length(x2),1); figure plot(x2,p2,'b',x2,zozo,'k') %rejection method: let's take for f(x) a box, i.e f(x)=1 if x belongs to %(0,sup). %Following the algorithm given in the lecture notes, we have for different %c: for k=1:5 cc(k)=max(p2)+(3*(k-1)); i=0; j=0; while i<n j=j+1; x0=rand(1)*sup; u=rand(1); if u*cc(k)<reject(x0,sup) i=i+1; distrib(i)=x0; end end accrate(k)=i/j; end %distribution with the rejection method bin=50; norm=max(hist(distrib,bin))/max(p2); figure hist(distrib,bin) hold on; plot(x2,p2*norm,'m'); %it works ! %acceptance rate figure plot(cc,accrate) end
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