

```
clear  
clc
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% Programa para gera??o da funcao covariancia empirica-----  
% Desenvolvido por Rogers uppedkestrel464  
% C?lculo com Base na teoria de Pedro Correia (2010) - Uma intr. a Geoestat.  
% [X Y Qtde]
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coord=[
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-227300.27184503 150441.94688687 12.712179124412  
-149514.91176738 151770.36060813 10.671903563696  
-32949.675328012 194932.06539799 9.1237783277485  
50510.089414245 148447.98655834 9.5521495165089  
141342.7705411 156098.19315752 8.8142116401181  
270207.00052404 195905.68853914 7.5268147740682  
359938.54498505 151133.05205034 6.782818043309  
353851.22821755 77445.829035651 6.2753600575881  
422935.16356827 53882.504713055 2.5692232989279  
357525.83127575 -34557.370034501 4.0365271123144  
260753.83394349 -42352.069095381 6.3418965622119  
248305.30763921 50799.276015716 5.8002888817168  
110693.03060765 57278.583184319 9.1421299112185  
128084.81336355 -25202.37873444 9.1139808576188  
35082.845409789 -41382.632329337 11.526086956383  
51890.899142619 49275.951815361 9.7834513284233  
-61350.000357739 -43609.389560543 12.610673124521  
-65545.359693221 49202.599712662 10.916002340584  
-21573.343815146 83136.034147946 10.614168112981  
-122379.40191001 44493.984079106 11.556568123082  
-170438.87449917 -48996.319128172 13.845857381697  
-126844.61335308 -44178.065535745 13.26516032616  
-143653.28583862 -147781.30085864 15.004547489569  
-252508.35193032 -40046.385559274 14.527822135498  
-40830.204966371 -176436.26177314 14.085798463882  
54531.182919625 -153288.27140458 12.960302296241  
131527.62749469 -189826.71088832 10.407693665635  
160939.43660417 -143806.33776104 9.8468589454287  
240245.05199058 -145288.01173771 7.6399823930719  
259149.81292818 -183716.71738215 6.7153105153888  
339953.39677973 -185979.64203895 6.4149840777428
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330483.61925526 -84360.550967479 5.212112479719
 236940.84863824 -292942.88031674 7.4558115311981
 211073.85253918 -252299.92508102 7.9256030782469
 172637.52996381 -310690.72034716 9.0004902980036
 126877.69977436 -278391.90994456 10.372487201709
 59238.499812978 -277798.27000213 12.117988190576
 -35110.790299792 -275581.03032679 14.177031810096
 -53377.86483975 -182821.20445466 14.30042389149
 73048.899269059 196850.11670177 9.0332228445282
 207287.69045681 17889.737857895 6.2409114588693
 -52477.052129074 -262093.43463352 14.3611245308
 -124462.26095448 -262693.17795487 15.494619812088
 -118419.56334555 -195102.23158583 15.266345334068
 28116.529253535 -86775.970768603 12.650564336148
 167732.54271944 -76788.317997804 9.2518602527415
 -126742.08550465 -68191.359930454 13.710972296283
 -230260.49016414 -143865.19668236 15.604682965208
 -29684.848450713 -154298.09208842 13.896438304149
 -235823.14364842 -264582.59597595 16.666137080179
 -249811.0710328 -305102.78103015 16.964168647913
 -146143.58820456 -364255.63388412 15.955691780092
 -69337.865598416 -382760.00295299 14.930065841339
 -45561.329278318 -290997.91991382 14.555703332327
 346209.09401589 237422.33179301 6.4971975424876

];

%Testes Anisotropia - 1

%coord(:,1)=coord(:,1)*10

%Separacao das componentes para calculo da distancia-----

X=coord(:,1);

Y=coord(:,2);

mag=coord(:,3);

%Tamanho da amostra-----

tam=size(coord);

tam=tam(1,1);

%Distancia entre todos os pontos-----

%listaespec gera lista com | d |(h(1)-h(2))^2 | X1 | Y1 | X2 | Y2 |

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espacamento=0;
contador=1;

tic
listespac=zeros(tam*tam,4);
for j=1:(tam)
    for i=j+1:(tam) % nao pode ir ate o final da amostra-----
        espac=((coord(j,1)-coord(i,1))^2+(coord(j,2)-coord(i,2))^2)^0.5;
        %-----
        % Var Experimental
        var=(coord(j,3)-coord(i,3))^2;
        % Vagner Cov
        covemp=(coord(j,3)*coord(i,3));
        %-----
        listaespac(contador,1)=espac;
        listaespac(contador,2)=var;
        listaespac(contador,3)=covemp;
        % listaespac(contador,3)=coord(j,1);
        % listaespac(contador,4)=coord(j,2);
        % listaespac(contador,5)=coord(i,1);
        % listaespac(contador,6)=coord(i,2);
        contador=contador+1;
    % i
    % j
    end
end
format bank;

% Ordenando as distancias, da menor para a maior-----
B=sortrows(listaespac,1);

% Definindo h-----
h1=10000 % espa?amento cont?nuo a ser incrementado
h=h1 % espa?amento atualizado a cada separa??o de classes
% Classificacao das distancias, usando operadores logicos-----
intinf=min(listaespac(:,1)); % intervalo inferior dist?ncia
intsup=max(listaespac(:,1)); % intervalo superior dist?ncia
k=1 % contador

% Fun??o Gama Isotr?pica-----
intinf=0;
for dist=intinf:h1:intsup

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Dist=(B(:,1)).*(and ( (B(:,1)>intinf), (B(:,1)<=h) ) );
Cov=Dist;
Covvalor=(B(:,2)).*(and ( (B(:,1)>intinf), (B(:,1)<=h) ) );
Cov(:,2)=Covvalor;
covempvalorfin=(B(:,3)).*(and ( (B(:,1)>intinf), (B(:,1)<=h) ) );
GAMA(k,1)=sum(Covvalor)/(2*nnz(Dist));
GAMA(k,2)=h;
GAMA(k,3)=nnz(Covvalor);
GAMA(k,4)=sum(covempvalorfin)-(mean(covempvalorfin))^2;
intinf=h;
h=h+h1;
k=k+1;

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end
%GAMA cont?m |COVARI?NCIA| DIST CORRELA??O
toc
subplot(2,1,1)
plot(GAMA(:,2),GAMA(:,1),'-mo');
legend('Variograma');grid on
ylabel('m^2')
xlabel('m')
subplot(2,1,2)
plot(GAMA(:,2),GAMA(:,4),'-*');
legend('Cov. empirica');grid on
ylabel('m^2')
xlabel('m')
magmedia=mean(mag);
af1=mag-magmedia;
af2=(5+af1)*50
%figure
%%scatter(X,Y,af2);grid on;

% GAMA % h % num.produtos

GAMA;

%Testes Anisotropia 2
%Fun??o Gama Anisotr?pica-----

%coord2=sortrows(coord,2);

%dist2=sqrt( (bsxfun(@minus,X,X').^2)+(bsxfun(@minus,Y,Y').^2));

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```
% matdist=triu(dist2)
% matdist2=nonzeros(matdist)
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