

```

function K = MTGP_covPeriodicisoUU(hyp, x, z, i)

% Stationary covariance function for a smooth periodic function, with period p:
%
% Based on the covPeriodicisoUU.m function of the GPML Toolbox -
% with the following changes:
% - only elements of x(:,1:end-1)/z(:,1:end-1) will be analyzed,
% - x(:,end)/z(:,end) will be ignored, as it contains only the label ✓
information
% - independent of the label all x values will have the same hyp
% - feature scaling hyperparameter is fixed to 1
% - output scaling hyperparameter is fixed to 1
%
%  $k(x, y) = \frac{\sigma_f^2}{l^2} \exp(-2 \sin^2(\pi |x-y|/p))$ 
% where the hyperparameters are:
%
% hyp = [ log(p) ]
%
% by Robert Duerichen
% 04/02/2014

if nargin<2, K = '1'; return; end % report number of parameters
if nargin<3, z = []; end % make sure, z exists
xeqz = numel(z)==0; dg = strcmp(z,'diag') && numel(z)>0; % determine mode

n = size(x,1);
p = exp(hyp(1));

% precompute distances
if dg % vector kxx
    K = zeros(size(x(:,1:end-1),1),1);
else % symmetric matrix Kxx
    if xeqz % cross covariances Kxz
        K = sqrt(sq_dist(x(:,1:end-1)', z(:,1:end-1)')));
    else
        K = sqrt(sq_dist(x(:,1:end-1)', x(:,1:end-1)'));
    end
end

```

Handwritten notes in the image:

- Next to  $k(x, y)$ :  $\frac{\sigma_f^2}{l^2}$
- Next to  $\exp(-2 \sin^2(\pi |x-y|/p))$ :  $l = 1$  and  $\sigma_f = 1$
- Next to  $K$  in the  $K_{xx}$  section:  $K_{xx}$
- Next to  $K$  in the  $K_{xz}$  section:  $K_{xz}$
- Next to  $x(:,1:end-1)'$ :  $n \times m$
- Next to  $z(:,1:end-1)'$ :  $D \times n$
- Next to  $x(:,1:end-1)'$  (in the else branch):  $D \times m$

```
K = pi*K/p;
if nargin<4                                     % covariances
    K = sin(K); K = K.*K; K = exp(-2*K);
else                                             % derivatives
    if i==1
        R = sin(K); K = 4*exp(-2*R.*R).*R.*cos(K).*K;
    elseif i==2
        K = sin(K); K = K.*K; K = 2*exp(-2*K);
    else
        error('Unknown hyperparameter')
    end
end
```