```
s = [4 2];
u = [3];

% initiating two variables based on vector s
u1 = sym('u', size(s));
c1 = sym('c', size(s));

% getting the s vector mapped into the RKHS
K_s = expand((1 + dot(u1,c1))^2) % we expand the polynomial kernel
```

K_s = $c_1^2\,(\overline{u_1})^2 + 2\,c_1\,c_2\,\overline{u_1}\,\overline{u_2} + 2\,c_1\,\overline{u_1} + c_2^2\,(\overline{u_2})^2 + 2\,c_2\,\overline{u_2} + 1$

```
coef = sqrt(coeffs(K_s)) % we get the coefficients square rooted
```

coef = $(1 \quad \sqrt{2} \quad 1 \quad \sqrt{2} \quad \sqrt{2} \quad 1)$

```
coef2 = coeffs(K_s) % we get the coefficients without being square rooted
```

coef2 = $(1 \quad 2 \quad 1 \quad 2 \quad 2 \quad 1)$

```
coef_c = coeffs(K_s, c1) % we get the coefficients w.r.t c
```

coef_c = $\left(1 \quad 2\,\overline{u_2} \quad (\overline{u_2})^2 \quad 2\,\overline{u_1} \quad 2\,\overline{u_1}\,\overline{u_2} \quad (\overline{u_1})^2\right)$

```
map_s = subs(coef_c ./ coef2 .* coef, u1, s) % (coef_c / coef2) to get rid
```

map_s = $(1 \quad 2\sqrt{2} \quad 4 \quad 4\sqrt{2} \quad 8\sqrt{2} \quad 16)$

```
% of the not square rooted coefficients and then multiply by the square
% rooted coefficients, and replace u by s vector

% -------

% initiating two variables based on vector u
u2 = sym('u', size(u));
```

u2 = u_1

```
c2 = sym('c', size(u));
```

c2 = c_1

```


% getting the s vector mapped into the RKHS
K_u = expand((1 + dot(u2,c2))^2) % we expand the polynomial kernel
```

K_u = $c_1^2\,(\overline{u_1})^2 + 2\,c_1\,\overline{u_1} + 1$

```
coef = sqrt(coeffs(K_u)) % we get the coefficients square rooted
```

coef = $(1 \quad \sqrt{2} \quad 1)$

```
coef2 = coeffs(K_u) % we get the coefficients without being square rooted
```

coef2 = $\begin{pmatrix} 1 & 2 & 1 \end{pmatrix}$

```
coef_c = coeffs(K_u, c2) % we get the coefficients w.r.t c
```

coef_c = $\begin{pmatrix} 1 & 2\overline{u_1} & (\overline{u_1})^2 \end{pmatrix}$

```
map_u = subs(coef_c ./ coef2 .* coef, u2, u) % (coef_c / coef2) to get rid
```

map_u = $\begin{pmatrix} 1 & 3\sqrt{2} & 9 \end{pmatrix}$

```
% of the not square rooted coefficients and then multiply by the square
% rooted coefficients, and replace u by s vector

% -----------

% Calculate the tensor product
feature_mat = (kron(map_s, map_u))'
```

feature_mat =

$$\begin{pmatrix} 1 \\ 3\sqrt{2} \\ 9 \\ 2\sqrt{2} \\ 12 \\ 18\sqrt{2} \\ 4 \\ 12\sqrt{2} \\ 36 \\ 4\sqrt{2} \\ 24 \\ 36\sqrt{2} \\ 8\sqrt{2} \\ 48 \\ 72\sqrt{2} \\ 16 \\ 48\sqrt{2} \\ 144 \end{pmatrix}$$