Honest CIs in Nonparametric Regression

Michal Kolesár

2018-01-30

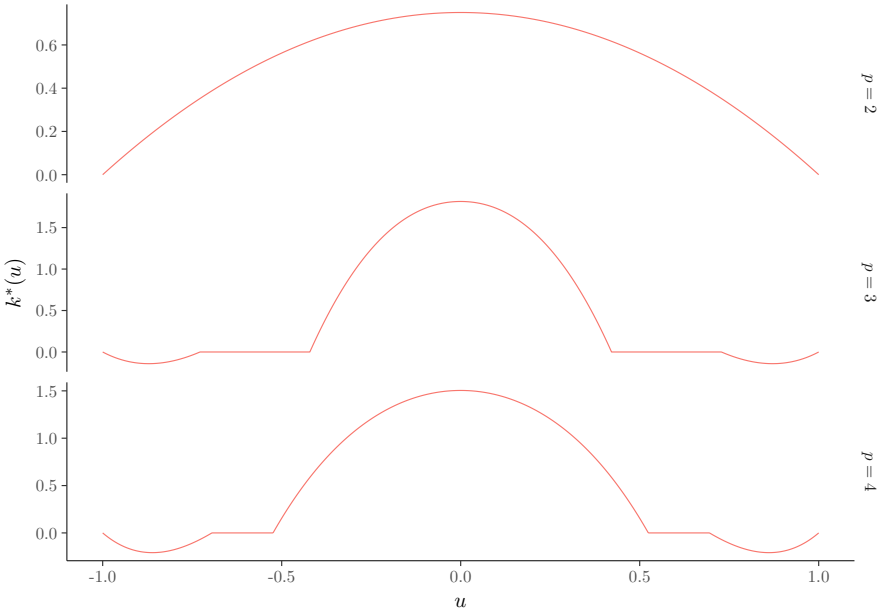
```
library("NPRHonest")
```

1 Optimal kernels

Optimal kernels under Taylor class can be computed using `SYKernel`, and plotted using `plot_SYKernel`.

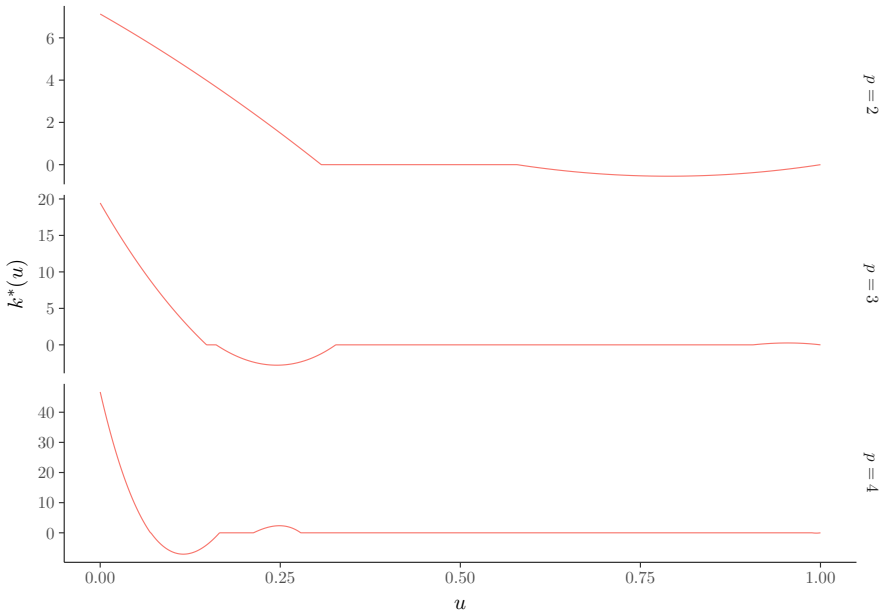
Interior:

```
p1 <- plot_SYKernel(boundary = FALSE)
p1
```



Boundary:

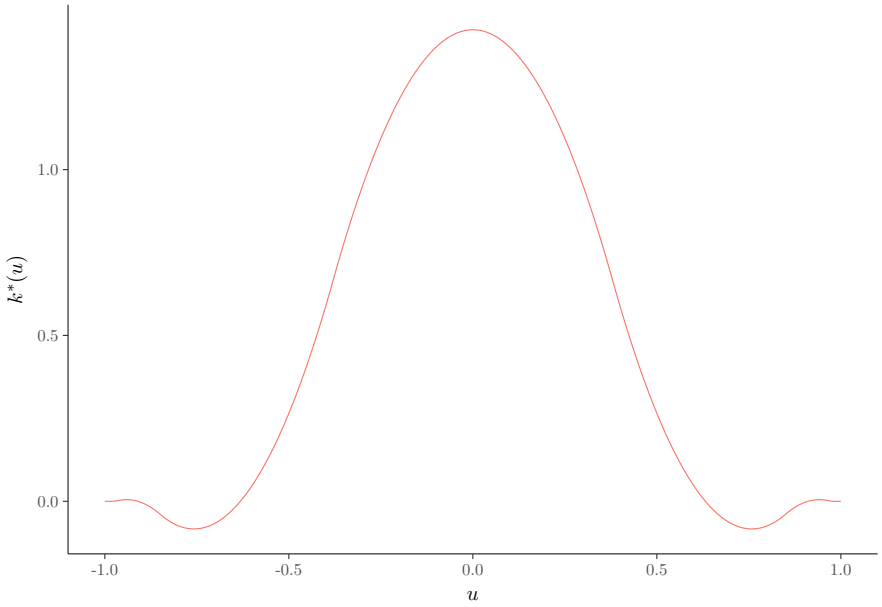
```
p2 <- plot_SYKernel(boundary = TRUE)
p2
```



Under Holder class, the corresponding functions are `HolKernel`, and plotted using `plot_HolKernel`.

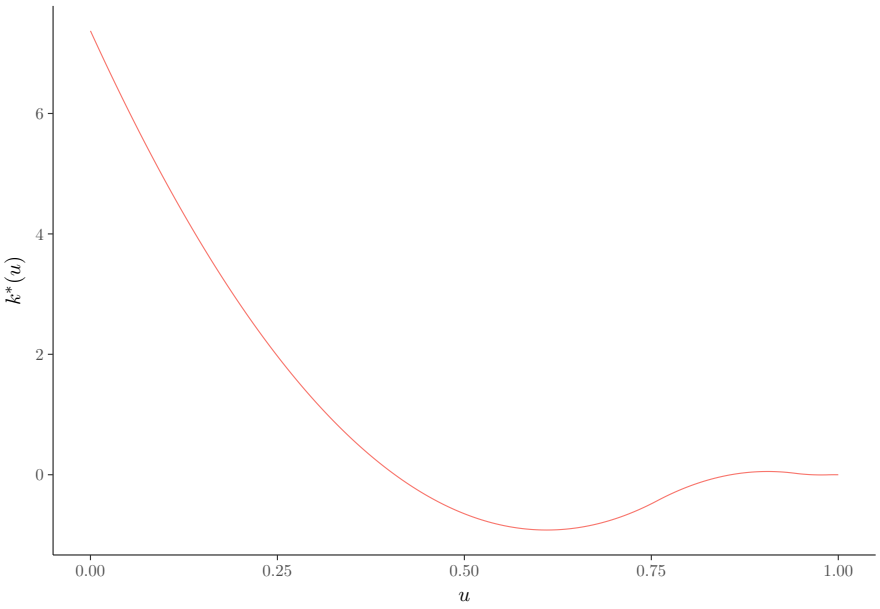
Interior:

```
p3 <- plot_HolKernel(boundary = FALSE)
p3
```



Boundary:

```
p4 <- plot_HolKernel(boundary = TRUE)
p4
```



2 Kernel efficiency

Bias constants under Holder and Taylor smoothness class

```
rt <- tbl_KerEfficiency("T")
rh <- tbl_KerEfficiency("H")
pander::pandoc.table(cbind(rt$interior[, 1:6], rh$interior[, 4:6]), round = 4)
```

kernel	order	R	B1	B2	B3	B1	B2	B3
uniform	0	0.5	0.5	NA	NA	0.5	NA	NA
uniform	1	0.5	0.5	0.3333	NA	0.5	0.3333	NA
uniform	2	1.125	0.4875	0.2789	0.1975	0.2898	0.0859	0.0625
triangular	0	0.6667	0.3333	NA	NA	0.3333	NA	NA
triangular	1	0.6667	0.3333	0.1667	NA	0.3333	0.1667	NA
triangular	2	1.329	0.3116	0.1399	0.0844	0.2103	0.0517	0.0327
epanechnikov	0	0.6	0.375	NA	NA	0.375	NA	NA
epanechnikov	1	0.6	0.375	0.2	NA	0.375	0.2	NA
epanechnikov	2	1.25	0.3603	0.1718	0.1067	0.2347	0.0604	0.0391

```
pander::pandoc.table(cbind(rt$boundary[, 1:6], rh$boundary[, 4:6]), round = 4)
```

kernel	order	R	B1	B2	B3	B1	B2	B3
uniform	0	1	0.5	NA	NA	0.5	NA	NA
uniform	1	4	0.5926	0.3642	NA	0.2963	0.1667	NA
uniform	2	9	0.7055	0.4374	0.3294	0.2352	0.0691	0.05
triangular	0	1.333	0.3333	NA	NA	0.3333	NA	NA
triangular	1	4.8	0.375	0.1875	NA	0.2109	0.1	NA
triangular	2	10.29	0.4293	0.2147	0.14	0.1699	0.0439	0.0286
epanechnikov	0	1.2	0.375	NA	NA	0.375	NA	NA
epanechnikov	1	4.498	0.4382	0.229	NA	0.2369	0.1158	NA
epanechnikov	2	9.816	0.5079	0.2662	0.1777	0.1913	0.0508	0.0335

Kernel efficiency

```
pander::pandoc.table(cbind(rt$interior[, c(1:2, 7:9)], rh$interior[, 7:9]), round = 4)
```

kernel	order	Eff1	Eff2	Eff3	Eff1	Eff2	Eff3
uniform	0	0.9615	NA	NA	0.9615	NA	NA
uniform	1	0.9615	0.9712	NA	0.9615	0.9662	NA
uniform	2	0.74	0.7277	0.9267	0.88	0.9162	0.979
triangular	0	1	NA	NA	1	NA	NA
triangular	1	1	0.9943	NA	1	0.9892	NA
triangular	2	0.8126	0.7814	0.9741	0.9263	0.9487	1
epanechnikov	0	0.9959	NA	NA	0.9959	NA	NA
epanechnikov	1	0.9959	1	NA	0.9959	0.9949	NA
epanechnikov	2	0.7902	0.7686	0.9672	0.9116	0.9425	1.001

```
pander::pandoc.table(cbind(rt$boundary[, c(1:2, 7:9)], rh$boundary[, 7:9]), round = 4)
```

kernel	order	Eff1	Eff2	Eff3	Eff1	Eff2	Eff3
uniform	0	0.9615	NA	NA	0.9615	NA	NA
uniform	1	0.5724	0.9163	NA	0.7211	0.9711	NA
uniform	2	0.4121	0.6387	0.8671	0.5944	0.8372	0.9775
triangular	0	1	NA	NA	1	NA	NA
triangular	1	0.6274	0.9728	NA	0.76	0.9999	NA
triangular	2	0.4652	0.6981	0.9254	0.6336	0.8691	1
epanechnikov	0	0.9959	NA	NA	0.9959	NA	NA
epanechnikov	1	0.6087	0.9593	NA	0.7471	0.9966	NA
epanechnikov	2	0.4467	0.6813	0.9124	0.6186	0.8602	0.9974

3 Alternative CIs

CCT:

```
aci <- function(sclass, ptwise, what = "CCT") pander::pandoc.table(tbl_AltCIEfficiency(sclass,
    ptwise = ptwise, what = what), round = c(0, 0, 2, 3, 3))
aci("T", FALSE)
```

kernel	boundary	relative.length	coverage	t
uniform	Yes	1.35	0.931	0.4
triangular	Yes	1.32	0.932	0.391
epanechnikov	Yes	1.33	0.932	0.393
uniform	No	1.35	0.941	0.279
triangular	No	1.27	0.94	0.297
epanechnikov	No	1.3	0.94	0.298

```
aci("H", FALSE)
```

kernel	boundary	relative.length	coverage	t
uniform	Yes	1.35	0.948	0.138
triangular	Yes	1.32	0.947	0.15

kernel	boundary	relative.length	coverage	t
epanechnikov	Yes	1.33	0.947	0.148
uniform	No	1.35	0.949	0.086
triangular	No	1.27	0.949	0.11
epanechnikov	No	1.3	0.949	0.105

```
aci("T", TRUE)
```

kernel	boundary	relative.length	coverage	t
uniform	Yes	1.15	0.859	0.875
triangular	Yes	1.16	0.887	0.733
epanechnikov	Yes	1.16	0.878	0.778
uniform	No	1.35	0.941	0.279
triangular	No	1.27	0.94	0.297
epanechnikov	No	1.3	0.94	0.298

```
aci("H", TRUE)
```

kernel	boundary	relative.length	coverage	t
uniform	Yes	1.35	0.948	0.138
triangular	Yes	1.32	0.947	0.15
epanechnikov	Yes	1.33	0.947	0.148
uniform	No	1.35	0.949	0.086
triangular	No	1.27	0.949	0.11
epanechnikov	No	1.3	0.949	0.105

Naive CIs:

```
aci("T", TRUE, "naive")
```

kernel	boundary	relative.length	coverage	t
uniform	Yes	0.77	0.806	1.093
triangular	Yes	0.79	0.845	0.938
epanechnikov	Yes	0.78	0.833	0.989
uniform	No	0.9	0.921	0.5
triangular	No	0.9	0.921	0.5
epanechnikov	No	0.9	0.921	0.5

For other cases, (`ptwise=FALSE` or `"H"`), the results are the same as in the last 3 rows.