

Custom slab+interval geometries using computed variables: x/y, CDF, and PDF mappings



The `stat_sample_slabinterval()` and `stat_dist_slabinterval()` stats compute `cdf` and `pdf` variables representing the cumulative distribution function and the probability density function of the underlying data. Along with x/y position, after the stats are computed these can be mapped onto aesthetics like fill, alpha, or color, or combined with functions like `cut_cdf_qi()` to create more esoteric visualization types.

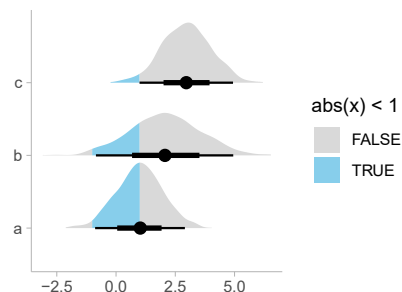
This geometry combined with this mapping does this:	
<pre>stat_gradientinterval() stat_dist_gradientinterval()</pre>	<pre>aes(slab_alpha = stat(cdf))</pre>	Encodes the CDF using opacity. Can be thought of as many transparent bars overlapping each other to build up a “fuzzy” bar chart. Similar to a <i>fuzzygram</i> , per Wilkinson (Graphical displays, <i>Stat Meth in Med Res</i> , 1992)	
<pre>stat_halfeye() stat_dist_halfeye()</pre>	<pre>aes(fill = stat(abs(x) < 1.5))</pre>	Uses a logical condition to select a fill region of the slab to color differently. Useful for highlighting a <i>region of practical equivalence</i> , or ROPE, per Kruschke (Bayesian estimation supersedes the t test, <i>JEP</i> , 2013)	
<pre>stat_gradientinterval() stat_dist_gradientinterval()</pre>	<pre>aes(slab_alpha = stat(-pmax(abs(1 - 2*cdf), .95)))</pre>	Fades the tails of the slab outside a desired interval (here 95%) in proportion to $ 1 - 2F(x) $ where $F(x)$ is the CDF. Correll & Gleicher (Error bars considered harmful, <i>TVCG</i> , 2014) argue that this might reduce dichotomous interpretations, though evidence is unclear.	
<pre>stat_eye() stat_dist_eye()</pre>	<pre>aes(slab_alpha = stat(-pmax(abs(1 - 2*cdf), .95)))</pre>	Fades the tails of the slab as in the previous example, but combines this with an eye plot, per Helske <i>et al.</i> (Are You Sure You're Sure?, <i>arXiv:2002.07671</i>)	
<pre>stat_halfeye() stat_dist_halfeye()</pre>	<pre>aes(fill = stat(cut_cdf_qi(cdf, .width = c(.66, .95, 1))))</pre>	Bins the CDF into an arbitrary number of intervals (here 66% and 95%) and highlights the intervals using the fill color of the slab. Similar in spirit to <code>bayesplot::mcmc_areas()</code> .	

Example from `stat_sample_slabinterval()` sub-family

Using sample data

```
df = data.frame(
  group = c("a", "b", "c"),
  value = rnorm(
    3000,
    mean = c(1, 2, 3),
    sd = c(1, 1.5, 1)
  )
)
```

```
ggplot(df) +
  aes(
    y = group,
    x = value,
    fill = stat(abs(x) < 1)
  ) +
  stat_halfeye() +
  scale_fill_manual(values = c("gray85", "skyblue"))
```



Example from `stat_dist_slabinterval()` sub-family

Using analytical distributions

```
df = data.frame(
  group = c("a", "b", "c"),
  mean = c(1, 2, 3),
  sd = c(1, 1.5, 1)
)
```

```
ggplot(df) +
  aes(
    y = group,
    dist = dist_normal(mean, sd),
    fill = stat(abs(x) < 1)
  ) +
  stat_dist_halfeye() +
  scale_fill_manual(values = c("gray85", "skyblue"))
```

