`Divergences.el`

`Divergences` is a Julia package that makes it easy to evaluate the value of divergences and their derivatives. These divergences are used to good effects in the package MomentBasedEstimators.

Definition

A divergence between $a \in \mathbb{R}^n$ and $b \in \mathbb{R}^n$ is defined as

$$D(a, b) = \sum_{i=1}^{n} \gamma(a_i/b_i)b_i,$$

where $\gamma : D \subseteq \mathbb{R} \to \mathbb{R}_+$ is convex on twice differentiable on the interior of its domain D. The divergence function is normalized as to satisfy

- $\gamma(1) = 0$, $\gamma'(1) = 0$, and $\gamma''(1) = 0$.

Example of divergences

The following divergence types are defined by `Divergences`.

Cressie-Read

The type `CressieRead` is a family of divergences. Members of this family are indexed by a function γ indexed by parameter α

$$\gamma_\alpha^{CR}(a, b) = \frac{\left(\frac{a}{b}\right)^{1+\alpha} - 1}{\alpha(\alpha + 1)} - \frac{\left(\frac{a}{b}\right) - 1}{\alpha}$$

Notice that $\nabla_x \gamma_\alpha^{CR}$

Kullback-Leibler divergence

$$\gamma^{KL}(a, b) = \frac{a_i}{b_i} \log(a_i/b_i) - \frac{a_i}{b_i} - 1$$

Reverse Kullback-Leibler divergence

$$\gamma^{RKL}(a, b) = -log(a/b) + a/b - 1$$

Using `Divergences`

```
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```

Suppose $a = [0.2, 0.4, 0.4]$ and $b = [0.1, 0.3, 0.6]$.

```
a = [0.2, 0.4, 0.4]
b = [0.1, 0.3, 0.6]
```

```
evaluate(KullbackLeibler(), a, b)
```

```
0.0915162218494357
```