impl Sample for ZExpFamily<2>

Michael Shoemate

This proof resides in **"contrib"** because it has not completed the vetting process.

Proves soundness of the implementation of `Sample` for `ZExpFamily<2>` in `mod.rs` at commit f5bb719 (outdated[1]).

1 Hoare Triple

Precondition

`self` represents a valid probability distribution.

Pseudocode

```
1 class ZExpFamily2: # analogous to impl Sample for ZExpFamily<1> in Rust
2     def sample(self, shift):
3         return shift + sample_discrete_gaussian(self.scale) #
```

Postcondition

Theorem 1.1. Either returns `Err(e)` independently of the input `shift`, or `Ok(shift + Z)` where `Z` is a sample from the distribution defined by `self`.

Proof. By the precondition, since `self` represents a valid probability distribution, then by the definition of `ZExpFamily`, `self.scale` is non-negative.

Since the preconditions for are met (non-negative scale), then we claim the postcondition that the returned value follows a given distribution. This distribution matches that defined by `self`.

By the addition on line 3, the implementation satisfies the postcondition. □

[1] See new changes with `git diff f5bb719..2de8c7a rust/src/measurements/noise/mod.rs`