How to Integrate Diverse Sources of Evidence

Learnings from the Lens Reputation System

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How do I integrate diverse sources of reputational evidence?

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Represent your **beliefs** about **reputation signals** as **beta distributions** and use **Bayesian updating** to combine them.

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What not to do:

$$W1 \times \begin{bmatrix} S1 & S2 & S3 \end{bmatrix} = \text{Reputation}$$
$$W2$$
$$W3$$

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What not to do:

$$W1 \times S1 + W2 \times S2 + W3 \times S3 = \text{Reputation}$$

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Information about the **variance** of your signals is lost.

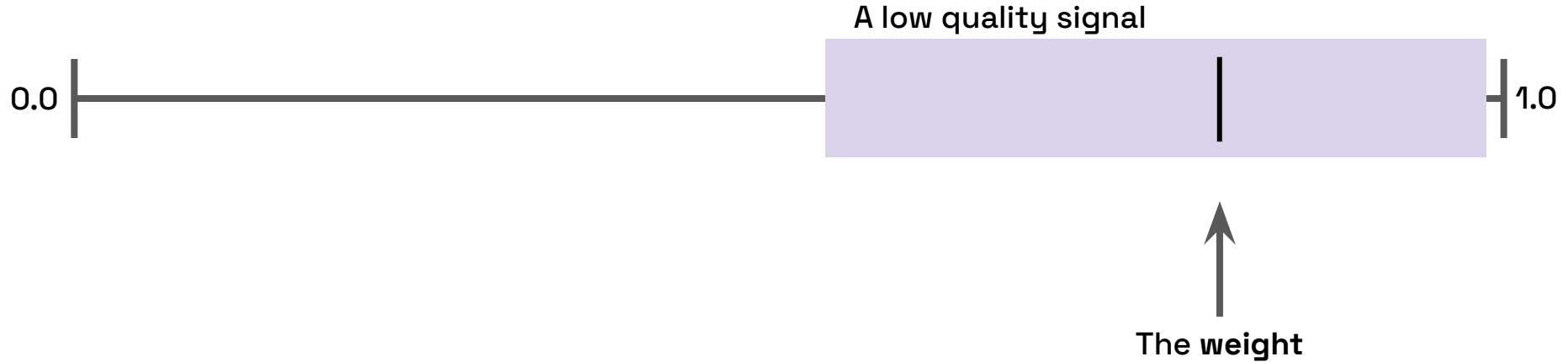Variance is how the **quality** of a signal is represented.

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You're throwing away information about quality.

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Weighting without variance

0.0 |————————————————————————————|————————————| 1.0

The weight

Weighting with variance

A low quality signal

0.0

1.0

The **weight**

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Weighting with variance

A high quality signal

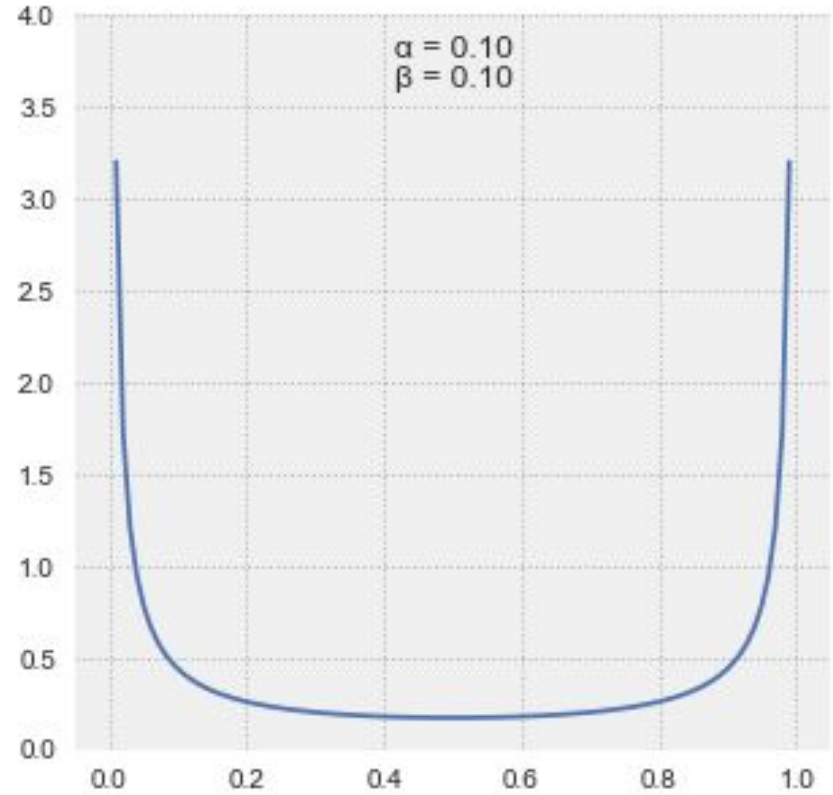0.0 |————————————————————————————————| 1.0

The **weight**

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The **beta distribution** is bound between 0 and 1 and takes two parameters: **alpha** and **beta**.

α = 0.10
β = 0.10

Holds rAave POAP (high quality)

Beta(999, 1) ≈ 1 out of every 1000 is a sybil

Has ENS address (medium quality)

Beta(99, 1) ≈ 1 out of every 100 is a sybil

Has Twitter account (low quality)

Beta(9, 1) ≈ 1 out of every 10 is a sybil

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Bayesian updating is a way of combining beliefs.

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It's **really easy** to update the beta distribution. **Just add alphas and betas.**

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$$\text{Beta}(999, 1)$$
$$+$$
$$\text{Beta}(99 \ , 1)$$
$$+$$
$$\text{Beta}(9 \quad , 1)$$
$$=$$
$$\text{Beta}(1107, 3)$$

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Beta(3, 1) x 50 signals

=

Beta(150, 50)

Represent your **beliefs** about **reputation signals** as **beta distributions** and use **Bayesian updating** to combine them.

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Thanks!

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