

Bootstrap Confidence Intervals Explained

Click through a small, fixed-seed set of resamples below to see exactly what a bootstrap interval is built from before it summarizes everything into two numbers.



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Original sample (fixed): 4, 7, 5, 9, 6

Resamples drawn	0
Latest resample (with replacement)	—
Latest resample mean	—
2.5th and 97.5th percentile of all resample means so far	—

Run a full bootstrap on your own data: [Bootstrap Confidence Interval Calculator](#)

What this answers

This page answers "what is a bootstrap confidence interval actually built from, step by step?" A bootstrap interval is constructed from many resamples drawn with replacement from your original data, each one the same size as the original sample, with the spread of their means forming the interval.

Sampling with replacement

Each bootstrap resample is drawn from the original sample with replacement, meaning the same original value can appear more than once, or not at all, in a single resample. This mimics drawing a new sample from the same underlying population without requiring any assumption about that population's distribution shape, which is the main advantage of the bootstrap over formula-based intervals.

From resamples to an interval

After drawing many resamples, typically thousands in a real analysis, and calculating the statistic of interest, such as the mean, for each one, the resulting distribution of resample statistics approximates the sampling distribution of that statistic. A percentile bootstrap interval takes the 2.5th and 97.5th percentiles of that distribution as the bounds of a 95 percent interval. This site's calculators use a seeded, deterministic random number generator so results are reproducible rather than changing on every reload.

Worked example

Click "Draw next resample" a few times above. Each resample reuses the same five original values but in a different combination, since sampling is with replacement. As you draw more resamples, the running percentile interval of the resample means stabilizes toward the range a full bootstrap with thousands of resamples would report.

Assumption audit

Calculated from your data: the resample means and their percentile interval, automatically, once you run the full calculator with thousands of resamples on your own data.

Evidence to review: whether your original sample size is large enough to represent the population's shape; a bootstrap cannot invent information that was not in the original sample.

You must verify: that your original observations were independently collected, since the bootstrap resampling process assumes independence in the original data.

Source

This explanation follows the bootstrap methodology described in Efron and Tibshirani's standard reference and the shared statistical reasoning contract every StatReason engine is built against.

Limitations

This page uses a tiny five-value example with only a few manual resamples to illustrate the mechanism; a real bootstrap interval requires thousands of resamples, which the linked calculator performs automatically using a seeded generator.