

problem with Random.nextGaussian()

Asked 15 years, 9 months ago Modified 9 years, 11 months ago

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7



Random.nextGaussian() is supposed to give random no.s with mean 0 and std deviation 1. Many no.s it generated are outside range of $[-1, +1]$. how can i set so that it gives normally distributed random no.s only in the range -1 to 1.

java

random

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edited Mar 10, 2009 at 11:52



dirkgently

111k ● 16 ● 134 ● 190

asked Mar 10, 2009 at 11:47



BHS

1,021 ● 3 ● 14 ● 26

6 Answers

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17

A Gaussian distribution with a mean 0 and standard deviation one means that the average of the distribution is 0 and about 70% of the population lies in the range $[-1,$



1]. Ignore the numbers that are outside your range -- they form the fringe 16% approx on either side.



Maybe a better solution is to generate a distribution with `mean=0` and `std.dev=0.5`. This will give you a distribution with about 96% of the values in the range `[-1, 1]`.



An even better solution is to work backward as above and use the idea that approx. 99.7% of the values lie in the 3-sigma range: use a `std.dev = 1/3`. That will almost nullify the amount of not-so-useful values that you are getting. When you do get one, omit it.

Of course, if you are working on a math intensive product, all of this bears no value.

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edited Mar 10, 2009 at 12:05

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answered Mar 10, 2009 at 11:55



[dirkgently](#)

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4 Except, of course, ignoring those numbers means that your random values aren't really normal any more, are they?

– [S.Lott](#) Mar 10, 2009 at 11:57

1 By that definition, any clamping you do on any random number generator is introducing a bias. – [dirkgently](#) Mar 10, 2009 at 12:03

@dirkgently: Absolutely. It's not a normal distribution any more, just one which is "quite like" a normal distribution.

– [Jon Skeet](#) Mar 10, 2009 at 12:32

- 2 @Jon Skeet: I understand the implications of my suggestion. I'm only saying that S. Lott's observations are right on spot and the OP's question is a paradoxical one. Mais,c'est la vie.
– [dirkgently](#) Mar 10, 2009 at 12:43
-



11



Doesn't the normal distribution include numbers arbitrarily far from the mean, but with increasingly small probabilities? It might be that your desires (normal and limited to a specific range) are incompatible.

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answered Mar 10, 2009 at 11:54



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[Ned Batchelder](#)

375k ● 77 ● 578 ● 673



6



A normal distribution gives a non-zero (but "becoming extremely small") probability of seeing values outside $[-1, +1]$ whatever variance you give - you're just squishing the curve, effectively.



You could use a small variance and then just run the results through a map which cropped anything less than -1 to -1, and anything greater than 1 to 1, but it wouldn't (strictly speaking) be a normal distribution any more.



What do you need this distribution for, out of interest?

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[Jon Skeet](#)

1.5m ● 889 ● 9.3k ● 9.3k

-
- 1 It's not that small. Close to 30% of the values have to be outside 1 standard deviation. Something like 5% will lie outside 2 standard deviations. – [S.Lott](#) Mar 10, 2009 at 11:58
-

The "becoming extremely small" was intended to imply that as you get further away from the mean, the probability of generating the value gets smaller, but still non-zero.

– [Jon Skeet](#) Mar 10, 2009 at 12:01

i am implementing a statistical analysis program. It uses normal distribution. – [BHS](#) Mar 10, 2009 at 12:11

- 4 BHARATH, If your statistical program requires a normal distribution, why do you not want to use a normal distribution, i.e. why don't you want to let it have its natural range? – [John D. Cook](#) Mar 10, 2009 at 12:20
-



2



Gaussian distribution with your parameters. is has density $e^{(-x^2/2)}$. In general it is of the form

$e^{(\text{linear}(x)+\text{linear}(x^2))}$ which means whatever settings you give it, you have some probability of getting very large and very small numbers.

You are probably looking for some other distribution.



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answered Mar 10, 2009 at 12:05



[SurDin](#)

3,341 ● 4 ● 27 ● 29



A standard deviation of 1.0 entails that many values will lie outside the $[-1,1]$ range.

1



If you need to keep within this range, you should use another method, perhaps `nextDouble()`.



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answered Mar 10, 2009 at 11:56



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[Tor Haugen](#)

19.6k ● 9 ● 47 ● 64



This code will display *count* number of random Gaussian numbers to console (10 in a line) and shows you some statistics (lowest, highest and average) afterwards.

1



If you try it with small *count* number, random numbers will be probably in range $[-1.0 \dots +1.0]$ and average can be in range $[-0.1 \dots +0.1]$. However, if *count* is above 10.000, random numbers will fall probably in range $[-4.0 \dots +4.0]$ (more improbable numbers can appear on both ends), although average can be in range $[-0.001 \dots +0.001]$ (way closer to 0).



```
public static void main(String[] args) {
    int count = 20_000; // Generated random numbers
    double lowest = 0; // For statistics
    double highest = 0;
    double average = 0;
    Random random = new Random();

    for (int i = 0; i < count; ++i) {
        double gaussian = random.nextGaussian();
        average += gaussian;
        lowest = Math.min(gaussian, lowest);
    }
}
```

```
        highest = Math.max(gaussian, highest);
        if (i%10 == 0) { // New line
            System.out.println();
        }
        System.out.printf("%10.4f", gaussian);
    }
    // Display statistics
    System.out.println("\n\nNumber of generated random
Gaussian distribution: " + count);
    System.out.printf("\nLowest value:  %10.4f\nHighest
%10.4f", lowest, highest, (average/count));
}
```

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answered Jan 25, 2015 at 19:51

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Hardzsi

41 ● 1 ● 3
