Understanding Entropy

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1 Introduction

Entropy is one of those words that many people use, but few really understand. This might be because the concept is invoked in seemingly very different contexts. For example, your physics teacher might have told you, "The entropy of the universe is increasing!" Or perhaps you encountered the word while reading about compression. "This algorithm compressed our file to within 10% of the entropy limit." Or maybe you vaguely remember entropy as something your chemistry teacher told you about and maybe it had something to with reactions, but you can't quite remember. Well, hopefully by the end of this chapter you will have a decent grasp of what entropy is and why it is useful concept.

2 Entropy is information you don't have

That's right. Entropy is the amount of information that you don't have. Okay, but what does that even mean? Well, apparently, entropy is a kind of information. You probably a good working definition for what information is, but would you know how to quantify it? Would you be able to recognize when you have precicely 2.7 times more information about something than you did yesterday? Let me pose an artificial situation that I think nicely illustrates a really useful way to think about quantifying information.

2.1 The library of information

Imagine if you will, that I have a library in which I have collected exactly 1000 books. I have been very careful in selecting the titles that go into my collection. I have only included books whos title's begin with the first ten letters of the alphabet, A-J. As a matter of fact, there are exactly 100 books that begin with A, 100 books that begin with B, and so on all the way through the letter J. I now have 1000 books equally distributed among my 10 bins.

MAYBE INSTEAD OF USING ALPHABETIZED BOOKS, USE CALL NUMBERS BECAUSE THIS WILL MORE CLOSELY TIE INTO ENTROPY