

What is the Fourier Transform?

The Fourier Transform: what's it for? What does it do and how does it work?

We use the Fourier transform to tell us what a signal is made out of. Just as this car can be made out of individual Lego bricks, each brick with its shape, colour, and position in the car, so signals can be built out of individual sinusoids with properties like their frequency, amplitude and position in the signal.

But can a complicated signal like the sound of my voice really be built out of something so basic as a collection of sinusoids? Let's begin with a single sinusoid. Here it is in the time domain; and here it is, in the frequency domain represented as a single line. The height of the line on the y-axis tells us its magnitude and the position of the line on the x-axis tells us its frequency. Doesn't sound like much though does it?

Adding in more sinusoids at higher frequencies changes the sound, but it still doesn't sound much like my voice. Let's add in some more sinusoids around the frequencies already playing. Now it is starting to sound interesting. And some more, and some more. As I add more and more sinusoids, it begins to sound more like my voice until...

I've just built my voice out of individual sinusoids. I've performed an inverse Fourier transform.

So why is the Fourier Transform so useful? Once you know which sinusoids a signal is built out of, there is no end to what you can do with that information. For example, you can compress it making it easier to store or send over a network, you could filter it and get rid of frequencies you don't want, you could process images with it, predict future events with it, measure distances with it. Every day, new ways are being found to make use of the information the Fourier transform gives us.

In this course we're going to study each of the core concepts of the Fourier Transform visually and in detail until you have an intuitive and comprehensive understanding of how the Fourier Transform works.

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By the end of the course, not only will you have a comprehensive and intuitive understanding of how the Fourier Transform works, but this rather strange looking equation, the Fourier Transform equation is actually going to make sense.

What secrets are hiding in your signal just waiting to be revealed?

Join me as we find out, one sinusoid at a time.