2. Motivation and real world application

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In this lecture, we are going to learn a method for visualizing the graph of a three dimensional surface by slicing the surface with planes to obtain curves, and extrapolating based on these simpler images.

An analogy is the medical imaging process used to visualize the organs and tissues in the body using Magnetic Resonance Imaging, or MRI for short. An MRI works by using large magnets to get the different tissues of your body to react to different frequencies. These frequencies determine the type of material the organ or tissue is made of. However, once this data is collected, more work must be done in order to actually visualize these tissues and organs within the body.

The mechanism for visualization uses the idea of "slices". You restrict the view to specific slices of the body, imagining what you would see if you cut through the body from a specific direction and looked only at the tissues along that slice. Then by looking at slices from three different vantage points — a side view, a front view, and a top view — one can extrapolate an understanding of the tissues in three dimensions.

Figure 9: Slices from a brain MRI shown successively. From left to right you see the side, front, and top view.
MRI gif created by Miykael Gotter, used with permission. (image source)

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