

How to Find Approximate Size of Unzipped NIFTI File

Header information

The `ls -l <filename>` command provides information about the size (in bytes) of a file. In order to calculate the approximate byte size of a NIFTI file yourself, you must review the file's header information using `fsinfo <filename>`. Headers contain information about the type and size of data stored in a file. This information is used to reconfigure binary code (comprised of an array of ones and zeros) into a 4 dimensional shape.

The following information will print to your terminal screen after executing `fsinfo`:

<code>data_type</code>	<i>data_type</i> : the type of data (e.g. integer, character, etc.) and a value will be printed on this row. <i>INT</i> signifies that the data is an integer and the proceeding value will indicate the number of bits per voxel.
<code>dim1</code>	
<code>dim2</code>	
<code>dim3</code>	
<code>dim4</code>	<i>dim1</i> : the x coordinates.
<code>datatype</code>	
<code>pixdim1</code>	<i>dim2</i> : the y coordinates.
<code>pixdim2</code>	
<code>pixdim3</code>	<i>dim3</i> : the z coordinates.
<code>pixdim4</code>	
<code>cal_max</code>	<i>dim4</i> : the amount of 3D images in the file and is used as an indicator of the time span of the 4D image.
<code>cal_min</code>	
<code>file_type</code>	<i>datatype</i> : code for type of data in file

pixdim1: the x coordinate in millimeters of each voxel

pixdim2: the y coordinate in millimeters of each voxel

pixdim3: the z coordinate in millimeters of each voxel

pixdim4: indicates the number of seconds that has elapsed between each 3D image. Referred to as repetition time (TR). The TR supplied in the header information may not be accurate.

How Data are Represented in each Voxel

BOLD signal level in each voxel of a 4D fMRI image is represented by a single integer. This integer value is stored in binary code (one's and zero's). The *data_type* row in the header of the NIFTI image gives details about the bits stored in each voxel. In order to calculate how many possible integer values that can be stored in each voxel, you would raise 2 to the amount of bits/voxel. For example, if there are 16 bits representing each voxel, then that means there are 2^{16} different possible integers that can be stored in each voxel.

Steps for Calculating Approximate Uncompressed NIFTI File Size

- 1) The calculation of approximate uncompressed NIFTI file size begins at the voxel level by converting the amount of bits/voxel into bytes. There are 8 bits/byte so:

$$\text{data_type} / 8 = (\text{bytes/voxel})$$

- 2) Next, you will multiply the amount of bytes/voxel by the amount of voxels in your uncompressed NIFTI image:

$$\text{dim1} \times \text{dim2} \times \text{dim3} \times \text{dim4} \times (\text{bytes/voxel}) = (\text{bytes} / \text{4D image})^*$$

**This calculation will only provide an approximate size of the NIFTI image because it does not take into account the header information.*