Meeting Notes:

20/03/18

* First meeting, w/ Paul and Robin
* Going over project knowledge base
* With the project, techniques required to compensate for the very poor SNR in underground oil detection with how NMR used
  + A magnetic field when constant results in a constant spin characteristic of the protons itself (\omega = \beta\gamma)
  + When sending a pulse to redirect the spin (90 degrees for example), we have the regrow to normal spin T1 and the much faster decay in T2.
  + We have T2\* for a non-constant magnetic field, dealing with decay caused by a non-uniform magnetic field since the 2D vectors drift until they oppose.
  + To get around this faster decay, we send a 180 degree pulse of RF radiation to reorient it so that it acts in the envelope of the T2 decay curve – we get discretised measurements of T2. (these are called echos)
* When a molecule is closer to the surface, for a fluid (bound) rather than deeper inside (free), it will decay faster
  + We can get different t2s for different protons and their different physical positioning
  + If we take several measurements of T2 exponential decays we can make a statistical reference of this data and see the prominence of both (we have sum of exponentials with different modifiers on T2)
* Looking at either T2 or T1 combined gives a 2.5D representation of it, this is in the paper Vol. 50, no 5. May 2002 IEEE transactions on Signal Processing
  + This paper utilised solving for the distribution from discretised data with the Kroncher product
  + Note that SNR is defined differently in this paper than its conventional meaning.
* Initially, will try to get the distributions sorted for a very simplified version of this problem, look up the Bulter-Reed-Dawson algorithm
  + WILL NEED to consider a priori that can allow the data to converge so it can be used properly.
* Given book: Principles of Magnetic Resonance Imaging (A Signal Processing Perspective), look at eq 3.69 (the Bloch equation), it is the effect of the applied magnetic field used for MRI
* Project will be done in MATLAB

Plans ahead:

* Implement Butler-Reed-Dawson algorithm and a simplified version of the method in the paper with 1 dimension for T2