Since Pearl has invented the Belief Propagation Algorithm, many researchers around the world applied his ideas to a variety of different applications. SAT, the satisfiability problem for boolean formulas, is one of them.

First you will have to understand the basic concepts common to all Message Passing Algorithms and if you miss some knowledge about SAT, we will give you an overview and something to read about that.

After you have acquired the necessary knowledge about the problem domain, you should implement one of the algorithms you have read about, like Warning Propagation (WP), Belief Propagation (BP), or Survey Propagation (SP), in Matlab. This should give you an even deeper insight into the topic.

After you have shown that your algorithm does its job, we can tackle the core work of your Thesis: generalizing these algorithms (WP, BP, SP, and many others...) and implementing a Factor Graph Framework. In order to test this framework you will also have to write some pre-/postprocessing routines, which can translate a k-SAT formula in an corresponding Factor Graph and vice versa.

Once we see, that our Factor Graph Framework can solve the Random k-SAT problem, it can additionally be very interesting to use the exact same routines to color graphs, correct errors on received codewords, or do other things which are not directly related to the SAT problem at all.

**Prerequisites:** Basic knowledge in algorithm design and programming.

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