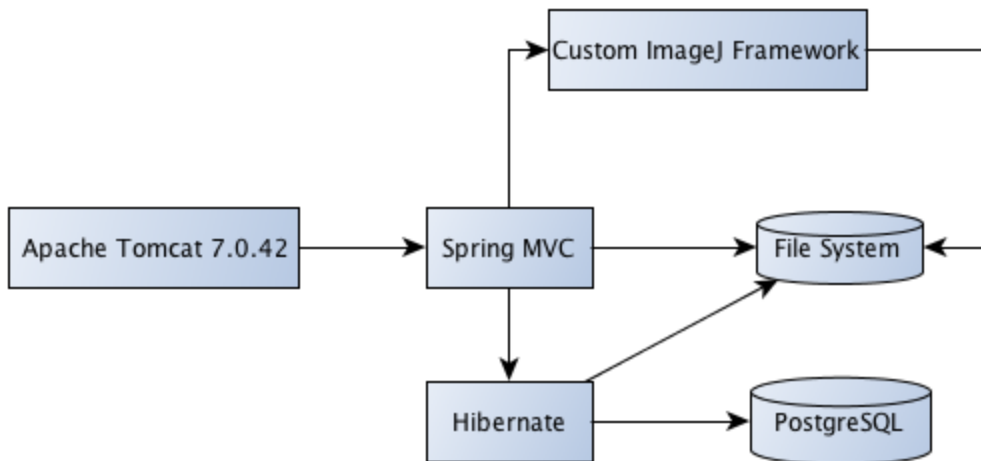# Thesis

In collaboration with the Center for Neurological Imaging (CNI), Brigham and Women's Hospital – Harvard Medical School, Boston, MA, U.S.A

Project Description: SPINE (Structured Planning and Implementation of New Explorations) is a virtual laboratory designed to **accelerate** scientific discovery, while **educating** and actively involving curious minds. The basis of many experiments consists in measuring brain structures by outlining them on images. In fact, identifying and measuring anatomical structures on brain MRI images is the centerpiece of many neurological, psychiatric, and neurosurgical studies. This task is currently performed by MDs, PhDs, college students, experts. We do believe that everybody can help with this: hence, we are building a dedicated web-portal to enable the participation of lay-people, and in particular adolescents.

Technical description: The architecture of the system relies on software design pattern MVC (Model-view-controller) and makes use of the ORM pattern (Object-Relational Mapping) in order to achieve the best representation of the information to the final user. The architecture is composed by two state-of-art implementation of MVC and ORM patterns: **Spring** (http://www.springsource.org/) and **Hibernate** (http://www.hibernate.org/). In order to use the ORM pattern, the database management system (DBMS) **PostgreSQL** (http://www.postgresql.org/) is employed. The network architecture relies on the well-known Web server **Apache Tomcat** (http://tomcat.apache.org/).

The following picture represents a small diagram of the current architecture:

Custom ImageJ Framework

Apache Tomcat 7.0.42   Spring MVC   File System

Hibernate   PostgreSQL

Goals:

1. Implementation of a management and update system for the user's profile.
2. Implementation of security services for the users:
    a. Safe authentication
    b. Safe registration
    c. Safe passwords/data storage
3. Improve the style of the SPINE website
4. Design and implement user-friendly website navigation

Required Skills: HTML, CSS, Java, Javascript, Hibernate framework, Spring MVC, Apache Tomcat, SQL.

What for YOU:

1. Interaction with an *international team* (Italy, France, USA)
2. Research opportunities
3. Improve competences in:
    a. web development
    b. database
    c. medical informatics