

Bachelor thesis: (medical informatics or any other student of computer science / engineering degrees with interests in medicine and/or biomedical data)

Heidelberg University Hospital, Spinal Cord Injury Center, Experimental Neurorehabilitation
Schlierbacher Landstraße 200a; 69118 Heidelberg

Title:

Porting classification algorithms of the International Standards for Neurological Classification of Spinal Cord Injury from C++ to JavaScript

Expose:

Due to the dermatomal (Figure 1a) and myotomal (Figure 1b) organization of the spinal cord, a spinal cord injury (SCI) can be characterized most prominently by its injury level, which is defined as last normal segment below which the first deficits exist.

The structured examination of dermatomes and myotomes is standardized in the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI). Based on 134 segmental motor and sensory scores, ISNCSCI defines a classification system for several variables including level and severity of an SCI. This classification system is for several reasons complex and requires extensive training to be well applicable. We developed ISNCSCI's classification algorithms in C++ [doi: 10.1089/neu.2011.2085], which are currently used in the back-end of our web-based "ISNCSCI calculator": <https://calculator.emsci.org/beta> to support ISNCSCI users.

For this calculator we strive to move the back-end classification into the front-end for speed and data economy reasons (sensitive medical data should stay in the browser).

Accordingly, the task for this bachelor thesis is to port existing C++ classes to JavaScript (roughly ~3k lines of code). The unit tests (roughly 2.5k lines of code) should be ported to JavaScript as well as.

To validate the correct implementation, a set of ~5000 ISNCSCI datasets with verified classifications is available. The bachelor thesis is passed if the new JavaScript implementation classifies all 5000 data sets correctly (and the according thesis is written).

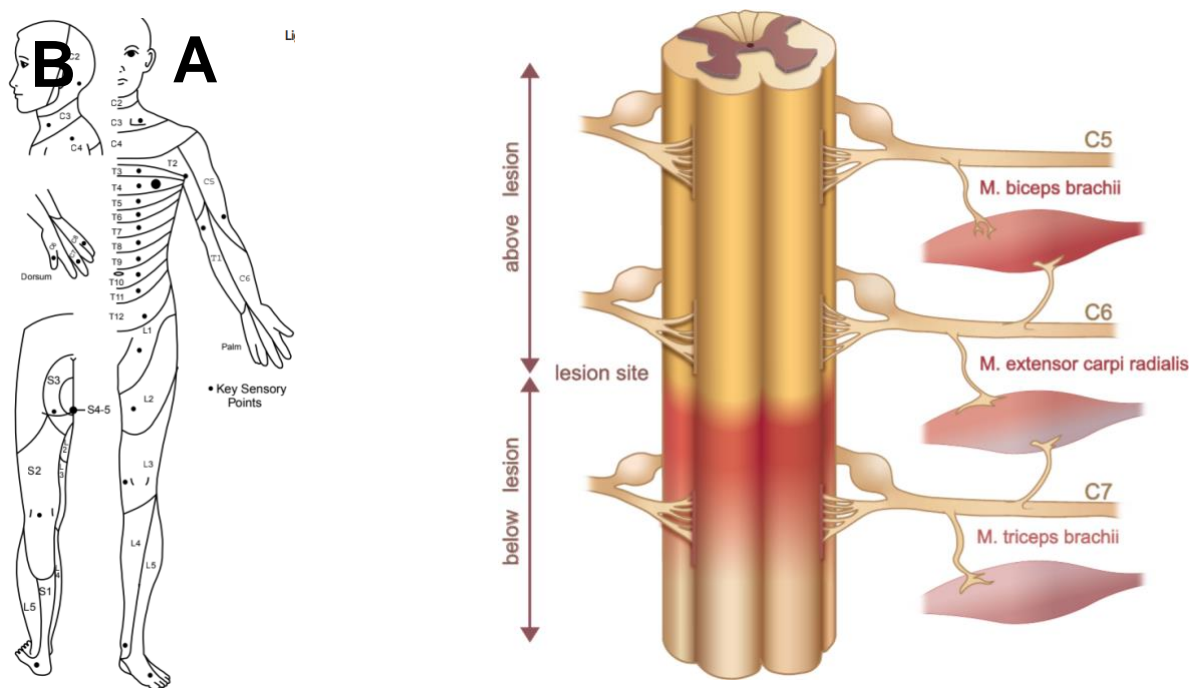


Figure 1: Schematics of the dermatomal and myotomal organization of the spinal cord with key sensory points for the sensory examination (A) and the bi-segmental innervation of the key muscles for the motor exam (B).

Skills required:

Programming skills in C++ and JavaScript using the object-orientated programming paradigm. The thesis can be written in English (preferred) or German.

Contact:

Dipl.-Inform. Med. Christian Schuld christian.schuld@med.uni-heidelberg.de