



**JOB DESCRIPTION**

**Job Title :** Post-doctoral Researcher (12 months contract): *“Exploiting wearable sensor network data for individual grip force profiling and the predictive modeling of precision skill evolution”*

**Job Summary :** The successful applicant will be expected to conduct fundamental research on a topic that exploits wearable sensor technology for individual grip force profiling. Grip force data from multiple sensor locations on the hands of experts and novice operators will be recorded in real time during the execution of manual tasks and/or interventional gestures, as in generic laparoscopy, endoscopy, and other image-guided precision tasks. Statistical analyses and predictive neural network modeling of task skill evolution will be performed to highlight specific characteristics of the grip force profiles reflecting variable levels of motor control. The project requires expertise in Artificial Intelligence, embedded systems, electronics, and signal analysis. Good programming skills are mandatory.

**Job Description:** This post-doctoral research project is concerned with the study of individual grip force profiling for assessing the evolution of manual performance and grip force control during training in precision tasks. Wearable sensor technology is exploited for collecting multiple grip force data from various sensor locations on the skin of individuals’ dominant and non-dominant hands. The project requires good skills in electric and electronic engineering and signal analysis, and the successful applicant will be expected to be able to improve and, if necessary, redesign the already existing workstation, which was used in our previous, already published, research. The new workstation will be exploited for finger-by-finger grip force profiling of experts and novice operators during the execution of manual tasks and/or interventional gestures, as in generic laparoscopy, endoscopy, and other image-guided precision tasks. The individual grip force profiles will be submitted to statistical analyses, and fed into a neural network for performance classification. Task protocols, methods for collecting the grip force data, and the principles of their statistical analysis are described in full detail in our previous *open access* publications. In this project here, the wearable device will be perfected, and tested on different manual control systems involving different operator tasks, among which a generic laparoscopic task simulation where both hands are performing similar procedures in the image-guided surgical task space, and an endoscopic task simulation where both hands are performing different procedures in the image-guided surgical task space. As previously, the evolution of grip force profiles of novice operators, recorded in real time during training, will be compared against the profiles of task experts. For predictive performance modeling, training profiles will be fed into a biologically inspired neural network architecture (Self-Organizing Map), which uses *winner-take-all* learning, i.e. the most generic form of *deep learning*, within a fully connected, topologically organized neural network structure capable of mimicking functional properties of tactile or visual neurons. The modeling part of this research requires good programming skills (Python or C/C++). Since the success of this research will also depend on the candidate’s ability to interact with researchers and surgeons who have extremely constrained timetables, good organizational skills, proactive planning abilities, and the capability to communicate cooperatively and promptly with other partners will help move the project along. The research is carried out at the **ICube Laboratory, CNRS UMR 7357-Strasbourg University**, under the supervision of B. DRESP-LANGLEY (Principal Investigator) and in close collaboration with lab members F. NAGEOTTE and P. ZANNE, who participate in this project.

**Main research fields :**

Embedded Systems / Artificial Intelligence / Computer Science / Biomedical Engineering / Technology

**Requirements :** Candidates must have a PhD in **either** Biomedical Engineering **or** Electronic Engineering **or** Computer Science

**Eligibility criteria :** Candidates must **either** have a PhD awarded after January 2016 by a university other than Strasbourg University **or**, if they have a PhD awarded by Strasbourg University, possess a minimum of 2 years international experience at the post-doctoral level

**JOB DETAILS**

Type of contract : One-year contract/CDD

Status : Temporary

Company / Institute : Strasbourg University

Country : France

City : Strasbourg
Postal Code : 67000
Street : 4, rue Blaise Pascal

**APPLICATION DETAILS (mandatory)**

Provisional start date : December 1 <sup>st</sup> 2020
Application deadline : September 31 <sup>st</sup> 2020
<b>Application e-mail : birgitta.dresp@unistra.fr</b>