

**APPLICATION FORM: GLOBAL TRAINING PROGRAMME 2017-2018 – INTERNSHIP INFORMATION**

CORPORATIVE INFORMATION	
Name of the company	CSD Labs GmbH
Contact Person	Andreas Schriefl <span style="float: right;">Email:</span>
Location	Country: Austria
	City: Graz
	Address: Nikolaiplatz 4, 8020 Graz
Sector	Medical Software / Medical Engineering

PROPOSED INTERNSHIP INFORMATION	
Number of trainees to host	2 plazas (se ofrecen 3 puestos, ver descripción de ofertas)
<b>Extension time (extra months and salary) OPTIONAL</b>  SEE DOCUMENT: <i>"FORM 2_Global Training 2017 extension preliminary agreement"</i>	Extra months Si al finalizar los 6 primeros meses la empresa y el becario desean prorrogar la estancia, la empresa ofrece la posibilidad de prorrogar la estancia hasta 6 meses
	Monthly payment for extra months (between 0-1358€/month) Si al finalizar los 6 primeros meses la empresa y el becario desean prorrogar la estancia, la empresa ofrece la posibilidad de prorrogar la estancia hasta 6 meses con la siguiente mensualidad: 1358 EUR / month

INTERNSHIP/PLACEMENT INFORMATION	
<b>Department</b> (in case you want more than 1 trainee, indicate the different departments where they will work)	<b>Trainee 1:</b> Research and Development (signal processing and analysis) <b>Trainee 2:</b> Research and Development (server-side backend development) <b>Trainee 3:</b> Research and Development (iOS app development)
<b>Description of project/activities</b> (in case you want more than 1 trainee, indicate the different projects/activities on which they will work)	<b>Trainee 1:</b> Signal processing and analysis <ul style="list-style-type: none"> <li>• Literature research on lung sound and heart sound analysis methods</li> <li>• Development of live noise detection and filtering methods</li> <li>• Implementation of features to differentiate different pathologies based on the types of lung sounds and heart sounds</li> <li>• Integration of the sound analysis module in the existing sound analysis framework</li> <li>• Documentation and testing of developed software</li> </ul> <b>Trainee 2:</b> Server-side backend development <ul style="list-style-type: none"> <li>• Research on technical aspects of hospital information systems (HIS) in Europe and the US</li> <li>• Defining data structures to communicate with HIS</li> <li>• Adaption of CSD Labs' existing data structures and services</li> <li>• Integration of CSD Labs' product into existing HIS               <ul style="list-style-type: none"> <li>○ implementation of interfaces on                   <ul style="list-style-type: none"> <li>▪ the server</li> <li>▪ the mobile application</li> </ul> </li> </ul> </li> <li>• Documentation and testing of developed software</li> </ul> <b>Trainee 3:</b> iOS app development <ul style="list-style-type: none"> <li>• Porting of CSD Lab's Android app to iOS including               <ul style="list-style-type: none"> <li>○ Interfaces to electronic stethoscope (via Bluetooth and sound</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>card)</li> <li>○ Interface to CSD Lab's server via a secure connection</li> <li>○ Adaptation of the current screens and flows of the existing app</li> <li>○ Integration of iOS specific elements (navigation, menus, etc.)</li> <li>○ Implementation for iPhone and iPad</li> <li>○ Testing of the developed iOS app</li> </ul> <p>Documentation of the development process</p>
<b>COMPETENCES, SKILLS and EXPERIENCE REQUIREMENTS</b>	
<p><b>Requested profile(s) information</b> (Studies, previous experience, language skills, other skills...)</p>	<p><b>Trainee 1:</b> <i>Background:</i> Computer Science/Electrical Engineering/Software Engineering/Medical Engineering <i>Skills:</i> Signal processing and analysis, Matlab/C++ programming, software development <i>Language skills:</i> English or German</p> <p><b>Trainee 2:</b> <i>Background:</i> Computer Science/Software Engineering/Medical Engineering <i>Skills:</i> Server side programming, mobile applications, database programming, Java/C# programming favourable <i>Language skills:</i> English or German</p> <p><b>Trainee 3:</b> <i>Background:</i> Software Development/Computer Science/Medical Engineering <i>Skills:</i> iOS development experience (or vast experience with Android and willingness to learn iOS quickly) <i>Language skills:</i> English or German</p>
<p><b>Other commentaries</b></p>	

**INFORMATION ABOUT THE COMPANY/INSTITUTION**

<b>LOGO</b>	
<b>WEBSITE</b>	<a href="http://www.csdlabs.com">www.csdlabs.com</a>
<b>INFORMATION ABOUT THE CITY AND THE AREA WHERE THE COMPANY/STITUTION IS LOCATED</b> (General information about SECURITY, ACCOMODATION, PUBLIC TRANSPORT...)	<a href="http://www.graz-cityofdesign.at/en/graz-design/graz---city-of-design">http://www.graz-cityofdesign.at/en/graz-design/graz---city-of-design</a> <a href="http://graz.at/EN/">http://graz.at/EN/</a> <a href="https://www.graztourismus.at/en">https://www.graztourismus.at/en</a>
<b>GENERAL INFORMATION ABOUT THE COMPANY/INSTITUTION</b>	<p>Founded in 2014 by physicist &amp; biomedical engineer Dr. Andreas Schriebl and computer scientist &amp; biomedical engineer Andreas Reinisch, CSD Labs develops high-end medical technology applications by combining machine intelligence with state of the art computational engineering approaches and in-house pioneering research &amp; development.</p> <p>CSD Labs is at the forefront of innovation in the analysis and classification of complex human data.</p> <p>The company specializes in Machine Intelligence approaches, ranging from classic AI, simple neural networks and visual processing, to state of the art prediction classifiers. That, combined with patent-pending technologies, a deep understanding of associated clinical data, and the company's in-house expertise on the legal requirements dictated by medical device regulations, makes CSD Labs a pioneer in applying Machine Intelligence to medical device applications.</p>
<b>MAIN ACTIVITY OF THE COMPANY/INSTITUTION</b>	Development of medical software.
<b>A BRIEF EXPLANATION OF MAIN PROJECTS</b>	See project descriptions above.
<b>PREVIOUS COLLABORATION IN INTERNSHIP/TRAINING PROGRAMMES?</b>	Yes, multiple times.
<b>OTHER COMMENTARIES</b>	



CAMPUS OF  
INTERNATIONAL  
EXCELLENCE



# CSDlabs<sup>®</sup>

COMPUTATIONAL SIGNAL DETECTION

## About CSD Labs

Computational Signal Detection Laboratories (CSD Labs<sup>®</sup>) develops high-end medical software using state of the art engineering approaches in combination with in-house pioneering research. Specialized in the analysis and classification of complex data, CSD Labs offers clinically verified medical software for the objective, automated detection of heart defects. The portable technology solution was developed in close collaboration with medical experts and assists physicians in performing auscultation during their daily routine.

## Winner of international MedTech award

CSD Labs wins the special MedTech award at the seventh international business plan competition “Best of Biotech”. The competition awards excellence in the areas of life science and medical technology, is organised by Austria Wirtschaftsservice GmbH (aws) and commissioned by the Federal Ministry of Science, Research and Economy. In total, 30 projects with economic potential from six countries were selected by an international jury comprised of experts from the fields of industry, finance and economics. In the end, CSD Labs was awarded the prestigious prize worth EUR 10,000.

## Our Mission

CSD Labs’<sup>®</sup> core principle is to develop medical software under stringent medical device regulations in order for it to be successful and fulfill its potential and promise. In our experience, common state-of-the-art approaches to algorithm-based murmur detection do not withstand blinded testing of real-world, noisy clinical data. This is why we have developed novel approaches to meet the highest standards in computer-aided auscultation (CAA). Performing costly clinical trials on hundreds of patients has allowed us to determine and improve the performance characteristics (sensitivity, specificity, etc.) required to develop a high-end medical product that will meet the needs of clinicians, patients, and health care providers.

## Background

Heart auscultation (derived from the Latin verb auscultare meaning “to listen”) with a stethoscope is the standard examination method worldwide in the screening of heart defects and related cardiovascular problems. It is used by medical professionals on patients of all ages for the purpose of identifying pathological heart sounds.

## Problems

Auscultation is often referred to as an art, since a correct diagnosis can be challenging for various reasons and is exclusively dependent on the medical professional’s qualifications. The practice has not changed in the last 200 years and objective evaluation tools are lacking. This inevitably creates issues concerning consistency, accuracy and objectivity, and creates increased risk of human error and associated legal vulnerabilities.

Across the board, traditional auscultation is problematic for all stakeholders: for **medical professionals** who are often faced with high heart rates, unsettled patients, breathing and other noises, proper auscultation can be difficult and stressful. For the **patient**, delayed or failed diagnoses can lead to long waiting times, cumbersome procedures, neurological damage, additional life-long medical care,

emergency surgery or even result in sudden death. **Health care providers** are faced with having no objective documentation of auscultation, are often left legally vulnerable, and experience high rates of unnecessary specialist referrals, all of which result in significant financial burdens.

### Solution

The solution to these problems can be found in CAA, a clinical decision support system designed to assist medical professionals in identifying pathological heart sounds. For example, Aetna, an American health insurance company, succinctly quantifies the situation in their 2013 clinical policy bulletin on Acoustic Heart Sound Recording and Computer Analysis: *“Unfortunately, accurate interpretation of heart sounds by primary care providers is fraught with error, leading to missed diagnosis of disease and/or excessive costs associated with evaluation of normal variants. Thus, automated heart sound analysis, also known as CAA, has the potential to become a cost-effective screening and diagnostic tool in the primary care setting.”*

### Need

Currently the lack of clinical proof is one of the main obstacles for health care providers in supporting computer-assisted auscultation (CAA). For example, the Blue Cross considers CAA to be *“investigational”* and states in their 2011 policy that *“There is inadequate evidence of the validity of computer-aided electronic auscultatory devices, or their impact on clinical outcomes in the peer-reviewed published medical literature.”* Further, the Blue Cross remarks that *“Clinical studies are necessary to determine the performance characteristics (sensitivity, specificity, and predictive values) of computer-aided electronic auscultatory devices and their impact on clinical management and patient outcomes.”* Similar statements have also been published by UnitedHealthcare in 2013, the largest single health care provider in the United States.

### Innovative Leaders in Computer Aided Auscultation

CSD Labs® develops high-end medical software using state of the art engineering approaches in combination with in-house pioneering research and clinical data. A team of highly qualified biomedical engineers, lead by an international management team experienced in business development, strategy and technology, together with an accomplished medical advisory board ensure expertise in

- heart sound analysis
- decision support systems for diagnosis
- workflow-integrated documentation
- medical device-regulated quality management
- regulatory approval processes
- technology commercialization

The combination of patent pending technologies, clinical studies and close collaboration with medical professionals makes CSD Labs the innovative leader in heart sound analysis that will bring computer-aided auscultation to the market.

### Technology

Heart sounds are sophisticated and complex biological signals, which become even more complex to analyze because they are usually concealed by a lot of noise and other sounds (like breathing, moving, crying, etc). Therefore, the commonly used signal analysis methods generally do not suffice in producing a diagnosis-supporting result that is continuously robust enough to be used by medical professionals in their daily work. At CSD Labs the most advanced research is combined with newly developed approaches, resulting in more accurate and reliable results for all age groups, ranging from premature newborns to the elderly. Moreover, CSD Labs supports medical professionals in their workflow by



CAMPUS OF  
INTERNATIONAL  
EXCELLENCE



providing them with tools to easily document and integrate their findings into the hospital information system.

### **Product Focus**

Creating a high-end medical device for computer-aided murmur detection requires more than just cutting edge algorithms. CSD Labs keeps the final product as the focal point of all operative management decisions, ensuring that software, hardware, usability and workflow integration come together seamlessly. The product development adheres to all aspects of medical device regulations, including quality management, risk management and software development lifecycle management. The patient's safety, improved diagnosis and optimal usability are top priorities, ensured through continuous feedback from clinicians.