



PhD in BIOINGEGNERIA / BIOENGINEERING - 38th cycle

PNRR_352 Research Field: COMPUTER VISION FOR SURGICAL ROBOTICS ASSISTANCE

Monthly net income of PhDscholarship (max 36 months)

€ 1250.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

<p>Motivation and objectives of the research in this field</p>	<p>The research is aimed at studying and developing methods for the new generation of surgical robots which will allow:</p> <ol style="list-style-type: none"> 1) Improving the safety of the intervention by providing the system with assistance methods, as safety technologies provide the driver in modern autonomous cars, such as alert signals or autonomous braking. 2) Decreasing the cognitive load of the user providing autonomous control of the endoscopic camera (which can follow the instruments or autonomously zoom according to the surgical context).
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>During the project, the following methods will be exploited:</p> <ol style="list-style-type: none"> 1) Computer vision for surgical step detection: modern techniques for endoscopic image processing, such as deep learning. 2) Autonomous control: in order to autonomously move the endoscopic camera system, visual-based servoing techniques will be explored, integrating artificial intelligence based methods. <p>In particular, MMI will provide support in the areas of computer vision for tissue detection, augmented reality and endoscopic camera control.</p>
<p>Educational objectives</p>	<p>The research project will pursue the following educational objectives:</p>



	<ul style="list-style-type: none"> - Learning to organize and manage a research project - Programming/ robot control/ data analysis - Team-work capabilities - Student supervision and mentoring - Scientific writing - Public speaking and outreach activities.
Job opportunities	<p>After the completion of the PhD, the candidate will have the opportunity to get a job in the Academia (in Italy or abroad) as well as in Research centers and Hospitals. Other interesting employment opportunities might be in the industry, namely in the fields of medical robotics and industrial robotics.</p>
Composition of the research group	<p>1 Full Professors 1 Associated Professors 0 Assistant Professors 15 PhD Students</p>
Name of the research directors	Prof. Elena De Momi

Contacts	
<p>Prof. Elena De Momi Phone: +39.02.2399.9017 Email: elena.demomi@polimi.it https://nearlab.polimi.it/medical/</p>	

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	625.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	MMI SpA; www.mmimicro.com
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Wellcome / EPSRC Centre for Interventional and Surgical Sciences (WEISS); www.ucl.ac.uk/interventional-surgical-sciences
By number of months abroad	6



Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Attinenza alle tematiche, alle missioni/componenti prescelte del bando PNRR ex. D.M. 352, art.6

Il tema del bando è attinente alla tematica relativa alla costituzione di ¿Hub di eccellenza al servizio della Salute tra ricerca, sviluppo e gestione delle pandemie future¿ della missione 6 del PNRR, con la finalità di ¿Promuovere ricerca e innovazione nel campo della salute¿. In particolare, il candidato si occuperà di realizzare attività all'interno della partnership tra università tecnica e impresa innovativa, favorendone lo sviluppo all'interno del mercato della robotica chirurgica, in rapida espansione a livello mondiale.

I dataset raccolti presso il Politecnico di Milano verranno messi a disposizione della comunità scientifica internazionale seguendo i principi di FAIR.

Impresa, presso cui si svolgerà l'attività esterna

MMI SpA

Settore attività: Chirurgia robotica

www.mmimicro.com

Numero di mesi previsti: 6

Descrizione sintetica attività:

Sviluppo di metodi di computer vision per tissue detection, augmented reality e endoscopic camera control.

Ente, università, azienda, centro di ricerca presso cui si svolgerà il periodo di studio e ricerca all'estero

Wellcome / EPSRC Centre for Interventional and Surgical Sciences (WEISS), London, GB

www.ucl.ac.uk/interventional-surgical-sciences

Numero di mesi previsti: 6

Descrizione sintetica attività:

Metodi innovativi di computer vision per detezione automatica di strutture anatomiche da immagini endoscopiche.

A shared desk and a PC will be given to the student for the time needed to carry out research. A limited budget will be available for travelling and purchases, too.