

Informatica

Computer Science

Progetto di ricerca Research project	<p><i>“Servizi cloud di Mobility as a Service per il trasporto pubblico e on-demand”- INF. 1</i></p> <p><i>“Cloud-based Mobility as a Service involving public and on-demand transportation”</i> - INF. 1</p>
Tipo Type	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex D.M. 118/2023</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>L'obiettivo è quello di fornire la Mobilità come Servizio (MaaS) in un contesto di smart city, implementando una soluzione basata su cloud per la mobilità pubblica e a basse emissioni di carbonio, on-demand e multimodale, che includa i trasporti pubblici e le strutture condivise come e-car, e-scooter ed e-bike. High-performance data analytics supporterà l'elaborazione dell'elevato volume di dati provenienti da fonti diverse, necessari per pianificare i viaggi in tempo reale.</p> <p>Obiettivi e benefici: sviluppo di nuovi servizi che consentano la transizione digitale nella mobilità urbana, servendo un maggior numero di cittadini e creando esperienze che possano portare a un cambiamento di comportamento delle persone; raggiungimento di una consapevolezza situazionale più accurata arricchendo i dati sulla mobilità attraverso l'integrazione semantica di dataset per migliorare l'attrattiva del trasporto pubblico, consentendo così un cambio modale soprattutto in inverno; sviluppo di nuovi modelli di business, promossi dall'accesso interoperabile, sovrano e affidabile alle fonti di dati sui trasporti, per le aziende nel settore dei trasporti e di nuovi servizi di smart city per i cittadini.</p> <p>I dati saranno forniti dall'Urban Mobility Center (UMC) (GPS e tracciamento dell'occupazione dei veicoli del trasporto pubblico), dal Comune di Sofia (monitoraggio della qualità dell'aria e delle reti stradali, ciclabili e dei marciapiedi), da soggetti privati (tracciamento dei viaggi dei servizi di mobilità condivisa), da altre fonti (previsioni meteorologiche, open data) e raccolti nello Urban Data Space, fornito da GATE come hub dell'International Data Space Association (IDSA). L'analisi e le simulazioni saranno integrate nel progetto pilota di GATE su digital-twin della città.</p> <p>ENG</p> <p>The aim is to deliver Mobility as a Service (MaaS) in a smart city context by implementing a cloud-based solution for public and low-carbon, on-demand, multimodal mobility, including public transport and shared facilities such as e-cars, e-scooter, and e-bikes. High-performance data analytics will support the processing of the high volume of data from diverse sources needed to plan trips in real time.</p> <p>Objectives and benefits: development of new services enabling digital transition in urban mobility by serving more citizens and creating experiences that can lead to people's behaviour change; achievement of more accurate situational awareness by</p>

	<p>enriching mobility data by semantic integration of datasets to improve the attractiveness of public transport, thus enabling a modal shift especially in winter; development of new business models for companies in the transportation domain and new smart city services for citizens enabled by interoperable, sovereign, and trusted access to transportation data sources.</p> <p>Data will be provided by Urban Mobility Center (UMC) (GPS and occupancy tracking of public transport vehicles), Sofia municipality (air quality monitoring, and road, cycling and sidewalk networks), private stakeholders (tracking of journeys of shared mobility services), other sources (weather forecasts, open data), and collected in the Urban Data Space, provided by GATE as a hub of the International Data Space Association (IDSA). The analysis and simulations will be integrated into the GATE pilot project on city digital twin.</p>
Tutor	Prof. Alberto Leporati
Mesi previsti in azienda Expected months at the company	GATE, “Big Data for Smart Society” Institute, 125 Tsarigradsko shose Blvd., Block 2, Fl. 3, 1113 Sofia, Bulgaria 6
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

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Computer Science

Progetto di ricerca Research project	<p><i>“Ricostruzione 3D compatibile con le esigenze del mondo automotive” - INF. 2</i></p> <p><i>“Automotive – grade 3D reconstruction” - INF. 2</i></p>
Tipo Type	<p>Borsa PNRR cofinanziata ex D.M. 118/2023</p> <p>Scholarship PNRR co-funded ex D.M. 118/2023</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>Nel mondo automotive si hanno condizioni spesso estreme: vibrazioni, umidità relativa, temperature, etc. rendono poco praticabili soluzioni normali in altri contesti. Un esempio è quello della ricostruzione 3D. Questa viene usualmente svolta mediante sensori che osservano la scena affrontata dal veicolo. Allo stato dell’arte i sensori di tipo LiDAR, soprattutto a causa dei sistemi meccanici di deflessione del raggio, faticano a soddisfare i requisiti automotive tenendo il costo accettabile. C’è un grande fermento per ottenerne, con approcci che vanno dalla deflessione del raggio basato su optoelettronica a stato solido, alle matrici di microspecchi MEMS. Una alternativa, non priva di limitazioni sia computazionali che di prestazione, è quella della stereoscopia. Ad oggi non è chiaro quale alternativa sopravviverà e nemmeno se sarà una sola di queste tecnologie.</p> <p>Il progetto di ricerca ha come primo argomento quello della stereoscopia ad ampia linea di base, corrispondente all'avere le telecamere costituenti lo stereo-rig all'interno dei fari. Una ampia linea di base consente una elevata precisione nella ricostruzione, a fronte di una maggiore difficoltà nella ricerca corrispondenze e sul mantenere la rigidità della posa delle camere. Sul primo aspetto si va infatti violando l'ipotesi fondamentale della stereoscopia; sul secondo aspetto, l'elasticità della struttura ed il suo essere soggetta a piccoli urti, comporta una non costanza della posa relativa delle camere, con grandi effetti sulla qualità della ricostruzione 3D.</p> <p>ENG</p> <p>In the automotive context extreme conditions are quite common: vibrations, humidity temperature, etc. make solutions, which would be deemed normal in other contexts, not admissible. An example comes from 3D reconstruction. This is usually done by means of sensors that observe the scene tackled by the vehicle. State-of-the-art LiDAR sensors, mainly because of the mechanical deflection of the beam, have troubles to satisfy automotive requisites. This is an area where innovation is taking place, with approaches that range from solid-state opto-electronic beam deflection to matrices of MEMS micro-mirrors. An alternative, which also has its limitations, both computational and in performance, is stereoscopy. As for today it is not clear which alternative will survive and neither if it will be just one.</p>

	The research project aims first to wide-baseline stereoscopy, corresponding to putting the cameras that make up the stereo-rig inside the lights. A wide baseline allows for a large accuracy in reconstruction but implies a greater difficulty in stereo-matching as well as in the keeping rigid the pose of the cameras. The first aspect violates the fundamental hypothesis of stereoscopy; the second aspect, due to elasticity of the vehicle structure, its being subject to small punches, turns into the relative pose of the cameras being not constant, which greatly impacts on the accuracy of the 3D reconstruction
Tutor	Prof. Alberto Leporati
Mesi previsti in azienda Expected months at the company	Marelli 6
Mesi previsti all'estero Expected months abroad	6
Specific IPR rules: standard	

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Computer Science

Progetto di ricerca Research project	<i>"Investigating the mechanisms regulating the human gut microbiome and its impact on host health using Bayesian networks" – INF. 3</i>
Tipo Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 NLYTICS PTE. LTD.
Borse Scholarships	1
Abstract	ENG Over the last few years human gut microbiome dysbiosis has been associated with a growing number of health conditions, including type-2 diabetes, obesity and multiple neurological and autoimmune diseases. The gut microbiome is a complex system made of a multitude of entities (bacteria) interacting with one another through a wide range of relationships, such as competition, mutualism, commensalism, and including cascading effects as well as feedback loops. The gut microbiome composition and functionality can be modulated by diet and other exogenous factors, making the microbiome's dynamics hard to decipher without the aid of computational whole-system approaches oriented at causality discovery. In addition, a microbiome is non-deterministic by nature and characterised by a high degree of uncertainty (about events, about states). Uncertainty is inherently present also when data about the system is fully observed and is exacerbated when subsets of variables are not observed. The objective of this PhD program is to investigate and model the mechanisms regulating the human gut microbiome and its impact on host health using Bayesian networks and causal networks with specific reference to knowledge elicitation, structural learning from observational and experimental data, and subsequent causal inference.
Tutor	Prof. Fabio Stella
Mesi previsti in azienda Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: standard	

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Computer Science

Progetto di ricerca Research project	<p><i>“Costruire un funzionario virtuale: Modelli linguistici di grandi dimensioni e IA generativa per il mercato delle telecomunicazioni” – INF. 4</i></p> <p><i>“Constructing a Virtual Officer: Large Language Models and Generative AI for the Telecommunications Market” – INF. 4</i></p>
Tipo Type	<p>Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023</p> <p>Fastweb S.p.A.</p>
Borse Scholarships	1
Abstract	<p>ITA</p> <p>Lo scopo di questo progetto è quello di sviluppare un Virtual Officer for Customer Service (VOCOS) sfruttando tecniche avanzate di IA generativa, in particolare i modelli linguistici di grandi dimensioni (o modelli di base), per trasformare radicalmente le interazioni con i clienti nel settore delle telecomunicazioni. L'obiettivo del progetto è quello di progettare un sistema di intelligenza artificiale in grado di comprendere le richieste dei clienti, risolvere i problemi e fornire soluzioni personalizzate in tempo reale.</p> <p>Il progetto si avvarrà di modelli di elaborazione del linguaggio naturale allo stato dell'arte, come il GPT-4, perfezionati con dati specifici per le telecomunicazioni. Questo processo di messa a punto mira a promuovere una comprensione profonda dei concetti del settore e delle esigenze dei clienti, facilitando così la creazione di soluzioni efficaci. Il VOCOS sarà dotato di un'interfaccia facile da usare per scambi vocali o testuali fluidi, in grado di emulare le dinamiche naturali della conversazione tra umani.</p> <p>Sarà anche esplorata la possibilità di integrazione con le piattaforme di telecomunicazione esistenti per consentire l'accesso in tempo reale ai dati dei clienti, migliorando ulteriormente la personalizzazione delle soluzioni. Saranno inoltre condotti studi completi sugli utenti per valutare le prestazioni del sistema e convalidare le capacità di VOCOS utilizzando metodologie di progettazione basate sull'evidenza. Il progetto prevede anche l'esplorazione di potenziali estensioni ad altri settori applicativi.</p> <p>ENG</p> <p>The purpose of this project is to develop a Virtual Officer for Customer Service (VOCOS) leveraging advanced AI, specifically large language models, and generative techniques to significantly transform customer interactions in the telecommunications sector. The project's goal is to engineer an AI system capable of understanding customer inquiries, troubleshooting problems, and providing personalized, real-time solutions.</p> <p>The project will employ State-Of-The-Art natural language processing models, such as GPT-4, fine-tuned with telecommunications-specific data. This tuning process</p>

	<p>aims to foster a deep understanding of industry concepts and customer needs, thereby facilitating the creation of effective solutions. The VCSO will feature a user-friendly interface for smooth voice or text-based exchanges, mimicking natural conversational dynamics.</p> <p>Potential integration with existing telecommunications platforms will be explored to enable real-time access to customer data, further enhancing the customization of solutions. Comprehensive user studies will be conducted to evaluate the system's performance, and to validate the VOCOS' capabilities using evidence-based design methodologies. The project also envisions potential extensions to other application domains.</p>
Tutor	Prof. Federico Cabitza
Mesi previsti in azienda Expected months at the company	18
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: Intellectual property clauses agreed with the Company apply to this scholarship.	

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Computer Science

Progetto di ricerca Research project	<i>"3D Geometric tools for Clinical Pediatric Medical Imaging Solutions"</i> – INF. 5
Tipo Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 IRCCS Eugenio Medea – sezione scientifica dell'Associazione "La Nostra Famiglia"
Borse Scholarships	1
Abstract	ENG In the last decade, we have witnessed fast and significant growth in the availability of technological devices and software for the acquisition of 3D data that provide a digital twin of different real assets that are involved in several industrial applications. In the medical setting, this enhancement coincides with the wide diffusion of laboratories that can acquire different anatomic parts and the entire body of patients. This step forward comes with two main drawbacks: i) different laboratories exploit their hardware and a selected preprocessing, encoding the data in a representation that becomes specific and suitable only for the laboratory which performs the acquisition; ii) the majority of the clinical tools to analyze these data focus on a sort of standard representative shape for each organ, commonly the most probable one in the population (male, adult, and healthy patient) generating many biases in the outcomes of these instruments. The former limitation makes exchanging these resources difficult, making the implementation of statistical shape analysis and machine learning solutions in this scenario very challenging. The latter gives rise to inconsistent analysis and unreliable assessments of categories that correspond to a restricted part of humanity. Infants and toddlers constitute a prominent example of these categories. These examples apply to all institutes focusing on rare diseases and/or on the developmental age (e.g. the Scientific Institute IRCCS Eugenio Medea). Our project, which will be mainly developed by the PhD we will involve through this position, aims to fill this gap between the available devices and structures to acquire medical 3D shapes and the limitations of the tools and analysis we can perform on these data. The goal of this project is to release Computer-Aided Diagnosis tools for the detection and quantitative characterization of the structures of the central nervous system robust to instances from the pediatric population and/or with rare genetic diseases. This project will impact both academic research and industrial and medical applications giving rise to new opportunities and future directions.
Tutor	Prof. Simone Melzi
Mesi previsti in azienda Expected months at the company	18
Mesi previsti all'estero	6-12

Expected months abroad	
Specific IPR rules: standard	

Informatica
Computer Science

Progetto di ricerca Research project	<i>"Causal models for prediction and decision making from multiple-data sources" – INF. 6</i>
Tipo Type	Borsa finanziata da ente esterno D.M. 117/2023 Scholarship funded by external body D.M. 117/2023 Fondazione IRCCS Istituto Nazionale Tumori
Borse/Scholarships	1
Abstract	ENG Artificial intelligence has the potential to predict and make decisions in healthcare by integrating expert knowledge with clinical data. However, both expert knowledge and clinical data present several difficulties to develop artificial intelligence models which can be truly applied, understood and governed by physicians. While expert knowledge is difficult to elicit and use, clinical data suffers from several issues as; data paucity, sparsity, missingness, and noise, to mention just a few. Furthermore, clinical data is typically available by different sources as hospitals, research centers and administrations. The goal of the project is to study, design and develop structural and parametric learning algorithms for causal models, including causal inference and causal discovery where both prediction and decision making by counterfactual analysis. The main tool is the one of causal networks and Bayesian networks while also other machine learning models will be taken into account for comparison purposes.
Tutor	Prof. Fabio Stella
Mesi previsti in azienda Expected months at the company	6
Mesi previsti all'estero Expected months abroad	6-12
Specific IPR rules: standard	

Informatica Computer Science	
Progetto di ricerca Research project	<i>“Intelligenza artificiale responsabile, affidabile, sicura e interpretabile” – INF. 7</i> <i>“Responsible, dependable, secure and interpretable AI” – INF. 7</i>
Tipo Type	Borsa Dipartimento di Eccellenza 2023-2027 2027 ReGAIoS (Budget MUR), Scholarship Department of Excellence 2023-2027 2027 ReGAIoS (Budget MUR)
Borse Scholarships	1
Abstract	ITA Il progetto di tesi deve prevedere lo sviluppo di ricerche che integrino approcci volti a garantire responsabilità, correttezza e sicurezza dei risultati prodotti dai sistemi di IA, anche in presenza di incertezza. ENG The project shall develop and integrate approaches that can guarantee the fairness, correctness and security of AI systems, also in presence of uncertainty.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica Computer Science	
Progetto di ricerca Research project	<p><i>"Intelligenza Artificiale per il miglioramento del benessere sociale e individuale"</i> - INF. 8</p> <p><i>"Artificial Intelligene for the improvement of the individual and social well-being"</i> - INF. 8</p>
Tipo Type	Borsa Dipartimento di Eccellenza 2023-2027 2027 ReGAIoS (Budget MUR), Scholarship Department of Excellence 2023-2027 2027 ReGAIoS (Budget MUR)
Borse Scholarships	1
Abstract	<p>ITA</p> <p>Il progetto prevede lo sviluppo di ricerche finalizzate alla definizione di sistemi "human centered" che siano adattabili e personalizzabili in contesti applicativi rilevanti per la società e per l'industria quali la salute, la produzione e fruizione di informazioni veritiere (in particolare, sui social media), la mobilità sostenibile e l'industria 4.0.</p> <p>ENG</p> <p>The project shall develop approaches for the definition of human-centered systems that are adaptable to domains relevant to the society and the industry, such as health, information veracity (in social media in particular), sustainable mobility, and industry 4.0.</p>
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica

Computer Science

Progetto di ricerca Research project	<p><i>“Applicazioni dell’Intelligenza artificiale alla ricerca biomedica e alla salute”</i> – INF. 9</p> <p><i>“AI Applications for Healthcare and Biomed Research”</i> - INF. 9</p>
Tipo Type	Borsa Dipartimento di Eccellenza 2023-2027 2027 ReGAIInS (Budget MUR), Scholarship Department of Excellence 2023-2027 2027 ReGAIInS (Budget MUR)
Borse Scholarships	1
Abstract	<p>ITA</p> <p>Il progetto prevede lo sviluppo di ricerche relative a scienze della vita che mirino a produrre tecniche e strumenti di intelligenza artificiale che siano in grado di formulare ipotesi sull’andamento di patologie sulla base di dati multiomici e di proporre terapie personalizzate.</p> <p>ENG</p> <p>The project shall include a description of Biomed relevant research topics that would benefit from the development and deployment of AI-based technologies. The main goals will be to formulate pathology progression hypotheses and personalized therapies on the basis of multi-omics data analysis.</p>
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all’estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica

Computer Science

Progetto di ricerca Research project	<i>"Bayesian causal networks for personalized treatment of patients suffering Myasthenia Gravis"</i> – INF. 10
Tipo Type	Borsa Dipartimento finanziata da ente Unione Europea tramite Fondazione Regionale per la Ricerca Biomedica (FRRB) Scholarship Department funded by European Union – Fondazione Regionale per la Ricerca Biomedica (FRRB)
Borse Scholarships	1
Abstract	ENG The problem of personalized treatment of patients suffering Myasthenia Gravis will be studied. A Bayesian (causal) network will be developed to allow clinicians to make informed and explainable decisions about the dynamic treatment of a given patient characterize by a rich set of covariates including genetic data.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica

Computer Science

Progetto di ricerca Research project	<i>“Artificial intelligence for data and technology driven diagnoses and therapies” –</i> INF. 11
Tipo Type	Borsa PNC progetto ANTHEM CUP B5322006670001 - Iniziativa 1 “Ricerca per tecnologie e percorsi innovativi in ambito sanitario e assistenziale” PNRR Scholarship ANTHEM project CUP B5322006670001
Borse Scholarships	1
Abstract	ENG The problem of personalized treatment of patients suffering from neurodegenerative diseases with specific reference to the Alzheimer disease. A Bayesian (causal) network model will be developed by combining clinical/medical knowledge, experimental data and observational data to obtain a an explainable dynamic treatment regime. Verrà studiato il problema del trattamento personalizzato del paziente affetto da malattie neurodegenerative, con particolare riferimento alla malattia di Alzheimer. Verrà realizzata una rete Bayesian (causale) combinando conoscenza clinica e medica, dati sperimentali e osservazionali al fine di ottenere regimi dinamici di trattamento spiegabili.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica

Computer Science

Progetto di ricerca Research project	<i>"A digital platform for the digital health"</i> – INF. 12
Tipo Type	Borsa PNC progetto ANTHEM CUP B5322006670001 - Iniziativa 1 "Ricerca per tecnologie e percorsi innovativi in ambito sanitario e assistenziale" PNRR Scholarship ANTHEM project CUP B5322006670001
Borse Scholarships	1
Abstract	ENG The research activity is within the ANTHEM (AdvaNced Technologies for Human-centrEd Medicine) project, in particular is part of Spoke 2, which aims to improve proximity medicine through the development of adaptive environments and the use of intelligent sensors. The activities carried out within Spoke 2 will contribute to validating and optimizing remote monitoring of chronic diseases, improving home care approaches, and reducing relapses and disease burden. In this context, the student will contribute to the definition, prototyping, and validation of a digital platform that acquires, stores, and processes data from sensors and other sources. The platform should comply with national standards and integrate with existing resources.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica Computer Science

Progetto di ricerca Research project	<i>"Intelligent Sensing for Healthcare"</i> – INF. 13
Tipo Type	Borsa PNC Iniziativa 1 "Ricerca per tecnologie e percorsi innovative in ambito sanitario e assistenziale" – progetto ANTHEM CUP B5322006670001 PNRR Scholarship ANTHEM project CUP B5322006670001
Borse Scholarships	3
Abstract	ENG Students will contribute to the definition, implementation and validation in a laboratory and industrially relevant environment of Artificial Intelligence algorithms for the analysis, recognition and interpretation of different types of signals acquired with environmental, wearable, skin and transcutaneous sensors. This may involve contributing to the design and development of hardware/software prototypes of new intelligent sensors that can be used for validation in a laboratory environment.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	

Informatica
Computer Science

Progetto di ricerca Research project	<i>"Artificial Intelligence for patient-specific optimization of diagnosis and therapy based on multi-omics data and digital pathology" – INF. 14</i>
Tipo Type	Borsa PNC Iniziativa 1 "Ricerca per tecnologie e percorsi innovative in ambito sanitario e assistenziale" – progetto ANTHEM CUP B5322006670001 PNRR Scholarship ANTHEM project CUP B5322006670001
Borse Scholarships	1
Abstract	ENG The problems of identifying diagnostic molecular signatures and optimizing the patient-specific therapeutic treatment in the context of high incidence diseases (e.g. thyroid lesions) will be investigated. The methodology will be based on the design and implementation of machine learning and deep learning models to integrate multi-omics data and digital pathology imaging obtained from bioptic and cytological samples.
Tutor	Da definire To be defined
Mesi previsti in azienda Expected months at the company	/
Mesi previsti all'estero Expected months abroad	Da definire To be defined
Specific IPR rules: standard	