Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Unraveling the Impact of Plastic Pollution on Carbon Cycling and Ecosystem Metabolism in Freshwater Environments" **(PROG.1**)
Tipo/Type	Borse di Ateneo / University Scholarships
Borse/Scholarships	1
Abstract	**ENG:** Freshwater ecosystems, crucial for biodiversity and services, are threatened by plastic pollution, which is now found in both urban and remote areas. While research has identified sources and contamination hotspots, most studies focus on plastic characterization and toxicological effects. There is limited understanding of how plastics impact ecological and biogeochemical processes. This Ph.D. project aims to investigate how plastic pollution may impair metabolism and carbon cycling in freshwater ecosystems with varying hydro-morphological features and watershed characteristics. Specifically, the project seeks to determine whether plastics can act as novel sources of organic carbon through leachates or serve as substrates for the growth of both heterotrophic and autotrophic microorganisms (e.g., plastisphere). It will explore whether this microbial growth creates hotspots of activity that alter oxygen production and consumption, thereby impacting overall ecosystem metabolism. By employing innovative techniques and integrating insights from multiple disciplines, the project will identify the mechanisms driving plastic-related impacts. Additionally, it will evaluate the ecological relevance of these impacts by comparing them to natural carbon pulses and autotrophic and heterotrophic metabolisms, assessing whether plastics have a significant effect relative to baseline dynamics. The project will combine modelling approaches with lab-scale and in-field experiments to uncover underlying mechanisms and overarching patterns, conducting the research across different types of ecosystems to understand the relevance of these effects in various pre-existing conditions.
Tutor	Prof.ssa Barbara Leoni
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Alliance between Education and Art for Social Innovation"
Tipo/Type	Borse di Ateneo / University Scholarships (Education in the Contemporary Society PhD Programme, Department of Human Sciences for Education "Riccardo Massa" DISUF)
Borse/Scholarships	1
Abstract	**ENG:** The project aims to study and analyze the educational process for social innovation in the collaboration between public and private entities, with a particular focus on the use of artistic languages for educational policies. Supported by a solid knowledge of critical theory, the project will study and analyze how the processes of co-design and co-production, particularly in the fields of educational policies and cultural transformation, can reduce educational poverty and support social justice practices. The use of art-based research methodologies will be particularly encouraged. The expected profile of the candidates: Candidates should have a background in Humanities.
Tutor	To be defined
Abroad period	*3 months*
Specific rules	*no specific rules*
Expression of interest	*La preferenza per questa borsa andrà espressa in fase di colloquio orale / The preference for this scholarship must be expressed during the oral examination*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Novel Pharmacological Strategies for the Modulation of Voltage-Gated Channels: Development of New Drugs and Drug Repurposing for the Treatment of Channelopathies"
Tipo/Type	Borse di Ateneo / University Scholarships
Borse/Scholarships	1
Abstract	**ENG:** Voltage-gated ion channels play a crucial role in cellular excitability, and their dysfunction is implicated in a variety of channelopathies, including neurological, cardiac, and muscular disorders. This project aims to explore innovative pharmacological approaches for modulating voltage-gated channels, focusing on both the development of novel drugs and the repurposing of existing ones. The project will benefit from the collaboration and expertise of the research group led by Prof. Francesco Peri (Department of Biotechnology and Biosciences, University of Milano-Bicocca). By integrating computational modeling, electrophysiology, and high-throughput screening, compounds that can restore normal channel function will be identified and characterized. Drug repurposing offers a cost-effective strategy to accelerate clinical translation by leveraging known safety profiles. The goal of this research is to provide new therapeutic options for patients affected by channelopathies, improving treatment efficacy and precision medicine approaches. The PhD student will spend min 3 months max 1 year at the Nanion Technology Company (Munich, Germany), a leading biotechnology company specializing in automated electrophysiology solutions and high-throughput drug screening, to test the selected compounds on cellular models. The expected profile of the candidates: Master's degree in medical biotechnology with commitment and interest for the topic of the project (stage, thesis).
Tutor	Ilaria Rivolta
Supervisor (Nanion Technology)	Dr. Niels Fertig (Nanion Technology CEO)/ Dr. Nadine Becker (-Team Lead Automated Patch Clamp / Product Manager Patchliner)
Abroad period	*min 3 months max 1 year*
Specific rules	*Any intellectual property generated (in terms of patents, trademarks, copyrights) will be managed balancing the need to protect innovation with the goal of promoting knowledge.*
Expression of interest	*La preferenza per questa borsa andrà espressa in fase di colloquio orale / The preference for this scholarship must be expressed during the oral examination*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Study of thermonuclear fusion plasmas by means of emitted radiation diagnostic techniques" **(PROG.2**)
Tipo/Type	Borse finanziate dal Dipartimento / Scholarships funded by the Department
Borse/Scholarships	1
Abstract	**ENG:** Nuclear fusion research by magnetic confinement is entering the era of burning plasmas, i.e. a state of matter where net gain by the fusion reactions will be obtained for the first time. To this end, there is an increasing demand to develop diagnostic techniques that can provide information on energetic particles by the detection and study of the radiation emitted predominantly by the core of plasmas that approach the burning state. This research project aims at developing instruments and experimental scenarios to study the physics of energetic particles in reactor relevant plasmas. A minimum period of 3 months abroad (extendable to 6 months depending on the project) predominantly dedicated to tests of the diagnostics and to the participation in energetic particle experiments at tokamak devices is foreseen. The ideal applicant holds a master's degree in physics or engineering and has some background in nuclear fusion or related subjects. They are also interested in becoming an active player of the emerging nuclear fusion era by combining knowledge on aspects of both fusion physics and technology towards the development of industrial scale fusion power plants.
Tutor	*da definirsi/to be defined*
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Sustainable Artificial Intelligence and Machine Learning" **(PROG.3**)
Tipo/Type	Borse finanziate dal Dipartimento / Scholarships funded by the Department
Borse/Scholarships	1
Abstract	**ENG:** Recent advances in AI have emphasized its role in addressing sustainability challenges. However, an urgent need emerges: to ensure the sustainability of AI itself by rethinking its entire lifecycle. This PhD research aims to develop novel energy-efficient and eco-friendly Machine Learning (ML) methods, integrating uncertainty estimation (e.g., conformal prediction) and optimization methods to improve the reliability of predictions in resource-constrained environments. A key aspect of the research involves reinforcement learning and sequential experiment design to optimize high-dimensional experimentation, enhancing adaptability while reducing computational costs. Additionally, the project will explore methods underlying generative AI, such as learning and optimization methods over probability measures spaces, like those used for solving PDEs and SDEs, diffusion processes, and distillation. By integrating these approaches, the research seeks to advance AI methodologies that are both statistically robust and energy/environmental-aware, fostering a new paradigm for sustainable AI development.
Tutor	Prof. Matteo Manera
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Strategic Innovation for Justice: Sustainable Artificial Intelligence and Innovative Solutions for the Efficiency of Judicial Ecosystems" **(PROG.4**)
Tipo/Type	Borse finanziate dal Dipartimento / Scholarships funded by the Department
Borse/Scholarships	1
Abstract	**ENG:** Judicial Ecosystems and in particular Judicial Offices are undergoing a deep process of digital and organizational transformation. The research aims to explore and analyze the application of AI and other digital tools and solutions in Judicial Ecosystems, with a focus on innovation and sustainability. The research project should provide an in-depth legal analysis of judicial organizational structures and digital governance practices, proposing methods, applications and solutions that can contribute to improve efficiency, transparency and sustainability in Judicial Offices. The methods employed will include comparative analysis and benchmarking, case studies, questionnaires and interviews, drafting of regulatory proposals. Expected time spent abroad: 3 months. Expected time spent at a company: 6 months. Expected profile of the candidates: master degree, commitment and interest for the topic of the project.
Tutor	Prof. Alberto Villa
Abroad period	Expected time spent abroad: 3 months
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Psychological Science for Future Life: A Research Ecosystem to Address Future Life Challenges" **(PROG.5**)
Tipo/Type	Borse finanziate dal Dipartimento / Scholarships funded by the Department
Borse/Scholarships	1
Abstract	**ENG:** In today's rapidly evolving digital landscape, sustainable adaptation to future life scenarios has become a critical challenge, prompting a multidisciplinary investigation into the psychological processes that enable individuals to thrive both offline and online. The project aims to dissect behavioral responses and their psycho-physiological correlates during interactions on digital and cyberphysical social platforms—particularly those involving intelligent artificial agents and multi-user scenarios—by leveraging innovative laboratory environments such as the BiConnect laboratory to simulate and analyze real and digital social dynamics. PhD candidates, expected to have a solid foundation in psychology, neuroscience, or related fields and a keen interest in digital human-computer interaction, will develop advanced research programs while engaging in an international research experience of three to six months (or equivalent), thereby contributing both to basic and applied scientific advancements in understanding interactive behavior and brain activation patterns.
Tutor	*da definirsi/to be defined*
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Human-Centred Approach to AI Innovation for social sustainability in technological development and regulation" **(PROG.6**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / **Funding Body**	Intesa Sanpaolo S.p.A.
Borse/Scholarships	1
Abstract	**ENG:** The rapid advancement of AI systems is disrupting traditional decision-making processes within organizations, affecting the satisfaction, well-being, and productivity of both internal and external stakeholders. A significant body of research is currently focused on enhancing algorithmic 'explainability' and 'causality' as key solutions to mitigate the "black box" effect, fostering trust and promoting ethically grounded technological development. However, despite ongoing progress in these areas, the interaction between humans and AI remains far from seamless. Concrete examples of this friction include financial advisors' resistance to relying on AI-driven credit scoring systems and the persistent distrust towards chatbots in customer service contexts. Previous research has highlighted the limitations of existing solutions, emphasizing their failure to account for human psychological processes and individual differences. While some users tend to accept AI-generated recommendations uncritically, others erect unreasonable barriers to adoption (Miller, 2023). This PhD project seeks to make an original contribution to the contemporary debate by adopting a Human-Centred Approach to AI innovation. It is grounded in the assumption that AI-driven innovation must align with social sustainability goals, prioritize the perspectives of users—including the most vulnerable and underrepresented groups—and enhance our understanding of how human decision-making interacts with AI-driven systems across different contexts. The project aims to provide valuable insights into technology design and its ethical implications. The first overarching objective is to describe human decision-making in relation to AI tools, mapping the cognitive and behavioural processes that lead to diverse outcomes across various application domains. A related goal is to identify predictive user personas, enabling AI systems to adapt to individual differences for the mutual benefit of technological adoption and personal well-being. The second major objective involves exploring attitudes and perceptions among vulnerable populations. For instance, experimental studies may compare elderly individuals with younger generations to identify key socio-psychological factors—such as trust and risk perception—that drive intergenerational differences, thereby informing tailored solutions. Furthermore, this research will contribute to more user-centered AI regulation by addressing critical issues such as accountability, privacy, and human agency in decision-making. - Expected profile of candidates: Candidates should have a background in Psychology (preferred in applied psychology and consumer science applied to innovation technology preferable).

	- Period of 6-12 months in the company
Tutor	UNIMIB: Prof. Nadia Olivero Supervisor aziendale: *to be defined (Intesa Sanpaolo S.p.A)*
Abroad period	The expected duration of the period spent abroad 3-6 months
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Integrated approaches to assessing and analyzing strategies for planning, maintaining and restoring soil biodiversity and health"" **(PROG.7**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / Funding Body	A2A S.p.A.
Borse/Scholarships	1
Abstract	**ENG:** It is widely recognised that soil degradation is one of the most pressing global challenges currently facing the world nowadays, with significant impacts on biodiversity which is essential to the functioning of ecosystems. Within this topic, the aim of this project is to identify priority areas of intervention based on soil quality and biodiversity. In order to achieve this goal, a multi-disciplinary and integrated approach is an effective way to address this challenge. The doctoral research will be conducted to understand the underlying causes of soil degradation at selected sites. Vulnerable ecosystems will be mapped, and suitable areas for biodiversity restoration will be identified. To achieve this goal, Geographic Information Systems (GIS) technology will be used for mapping degraded areas and biodiversity hotspots, monitoring land use changes and pinpointing areas that need intervention creating ad hoc cartographic products. The analysis of local management practices is equally important, as it helps determine whether current approaches are contributing to degradation or could be adapted to support restoration efforts. By combining these elements, the project aims to restore and protect biodiversity, creating a pathway toward to healthier ecosystems and more sustainable land management practices. Ultimately, this approach can help to build resilience in ecosystems and local communities, supporting long-term sustainability in the face of ongoing environmental challenges. This research will be conducted in collaboration with the University Wageningen, where we expect the candidate would spend her/his period abroad. The ideal candidate will possess the following qualifications and attributes: • a Master's Degree (or equivalent) in Environmental Science, or a closely related discipline; • proficiency in GIS technology and spatial analysis tools (such as ArcGIS, QGIS, or similar software) to map, analyse, and visualise degraded areas and biodiversity hotspots.

	The candidate will possess a comprehensive understanding of soil degradation processes and instruments to assess biodiversity. A multidisciplinary approach to environmental challenges is also required, with an interest in the intersection of ecology and environmental science.
Tutor	UNIMIB: Prof.ssa Sara Villa, Prof. Alberto Bosino Supervisor aziendale: Dott.ssa Anna Ferrari, Dr. Emilio Pafumi
Abroad period	*no specific rules*
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "New Drug Hits and Chemical Probes Targeting Histone Deacetylase 10 (HDAC10)" **(PROG.8**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / Funding Body	Italfarmaco S.p.A
Borse/Scholarships	1
Abstract	**ENG:** This project aims to develop new substrates, tool compounds and innovative drug hits targeting Histone Deacetylase 10 (HDAC10). Notably, HDAC10 is a member of the class IIb HDAC family, alongside HDAC6, and it is the sole polyamine deacetylase among the eleven zinc-dependent HDAC. Despite the enigmatic role of HDAC10 in health and disease is far from being fully understood, inhibiting polyamine metabolism via HDAC10 might offer a promising therapeutic strategy for both oncologic and non-oncologic diseases. In the past, HDAC10 received limited attention from medicinal chemistry, but over the last few years, the first inhibitors targeting HDAC10 have been emerging. These inhibitors are designed to mimic HDAC10's polyamine substrates and typically contain hydroxamic or thiol as zinc binding groups. However, these moieties display sub-optimal PK, potential mutagenicity and often exhibit limited selectivity towards HDAC6, its closest relative. Hence, there is a need to explore and develop HDAC10 inhibitors that employ alternative zinc-binding groups, and enhanced selectivity for HDAC10. The know-how developed in the rational design of a selective HDAC10 binder and inhibitor will be used to produce probes allowing to localize and track in vivo the HDAC10 levels using emission tomography. - Expected duration of the period spent at a company: from 3 to 6 months, longer periods are allowed - Candidates for this position should have a strong background in synthetic organic chemistry as well as in medicinal chemistry and pharmacology
Tutor	UNIMIB: Prof. Francesco Peri Supervisor aziendale: Dr. Christian Steinkhuler
Abroad period	Expected duration of the period spent abroad: from 3 to 6 months
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Contributions to Psychometrics: Optimizing the Number of Items per Construct for Enhanced Diagnostic Accuracy" **(PROG.9**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / Funding Body	Fondazione AVSI
Borse/Scholarships	1
Abstract	**ENG:** Valid, reliable, and fair assessments are fundamental to psychometrics, as the accurate measurement of latent traits relies on rigorous test design. One critical and challenging aspects in this process is the determination of the optimal number of items per construct necessary to achieve stable psychometric properties. Although the application of Classical Test Theory (CTT) and, more recently, Item Response Theory (IRT) approaches have significantly advanced the field, challenges remain in balancing test length, parameter stability, and sample size requirements, especially in diverse educational contexts. Test length has a direct impact on the reliability and validity of assessments. A test that is too short may fail to capture the complexity of the construct being measured, while an overly long test can lead to respondent fatigue, increased costs, and logistical challenges (Embretson & Reise, 2000). Determining the minimal number of items required to achieve stable item and person parameter estimates is crucial for optimizing test efficiency without compromising diagnostic accuracy. In addition, parameter stability is influenced by sample size, with smaller samples posing greater challenges for precise estimation (Reeve et al., 2007). The interplay between test length and sample size becomes particularly complex in large-scale assessments, such as those conducted in educational or psychological research where resources may be limited, and populations are diverse. Despite its importance, limited empirical guidance exists on the optimal number of items per construct needed to maintain the psychometric properties of measures across dichotomous and polytomous response formats, and varying sample sizes, contexts. This study aims to address this gap by investigating the optimal number of items required per construct to ensure stable parameter estimates for dichotomous and polytomous items. Using both simulated, and empirical datasets from the Action for Life Skills and Values in East Africa (ALiVE) project—which assessed over 45,000 adolescents in problem-solving, collaboration, self-awareness, and respect across East Africa—the research explores the relationship between test length, sample size, and parameter stability. By providing evidence-based guidelines, the study seeks to enhance the efficiency and diagnostic accuracy of assessments, contributing to the broader field of psychometrics and supporting the development of effective and scalable tools for educational and psychological measurement.

Tutor	*da definirsi/to be defined*
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Innovative functional materials to accelerate nuclear fusion" **(PROG.10**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / **Funding Body**	Eni S.p.A.
Borse/Scholarships	1
Abstract	**ENG:** Nuclear fusion research is advancing toward burning plasmas, where net energy gain from fusion reactions will be achieved. The Ph.D. fellowship aims to develop materials that ensure resilience under the extreme conditions experienced in fusion reactors. The research will focus on functional materials able to enhance corrosion resistance or reduce gas diffusion and at the same time to provide an adequate resistance to irradiation. The activities will include materials production and characterization moreover irradiation experiments could be considered to assess performances at representative operative conditions. The ideal candidate holds a master's degree in physics or engineering and is motivated to contribute to the emerging era of nuclear fusion by advancing fusion physics, technology, and industrial-scale reactor development. The fellowship includes a minimum period of 3 months abroad experience (extendable to 6 months depending on the project) aligned with the selected specialization and the collaborative research objectives of the Joint Center. A possible period spent in the company could be considered and discussed according to the needs of the detailed research program.
Tutor	UNIMIB: da definire/to be defined Supervisor aziendale: Dott.sa Maria Elena Gennaro
Abroad period	*no specific rules*
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "Advancing Nuclear Fusion: Research and Innovation within the Eni-UNIMIB Joint Center" **(PROG.11**)
Tipo/Type	Borse finanziate da enti/aziende convenzionati / Scholarships funded by partner organizations/companies
Azienda o ente finanziatore / Funding Body	Eni S.p.A.
Borse/Scholarships	1
Abstract	**ENG:** Nuclear fusion research by magnetic confinement is advancing toward the era of burning plasmas, where net energy gain from fusion reactions will be achieved for the first time. In this context, accurate and robust diagnostic techniques are essential to monitor and control the plasma in next-generation reactors, such as SPARC and ARC. The Eni-UNIMIB Joint Center is actively contributing to this effort by developing advanced diagnostics for fusion plasmas, with a particular focus on radiation emission analysis and plasma behavior characterization. This Ph.D. project aims to develop and validate diagnostic techniques for plasma conditions in SPARC or ARC-class reactors. The research will comprise experimental and computational approaches. The candidate will engage in the development and optimization of diagnostic systems, participate in experimental campaigns on existing tokamaks, and contribute to data analysis and interpretation using advanced modeling techniques. Additional Information: Expected duration of the period spent abroad: Minimum 3 months, maximum 6 months, at international fusion research facilities or collaborating institutions. Expected duration of the period spent at a company: The candidate will have opportunities to spent up to 6 months at Eni or in other industrial entities. Expected profile of the candidates: The ideal candidate holds a Master's degree in physics or engineering, with a background in nuclear fusion, plasma physics, or related fields. Strong analytical skills, familiarity with experimental techniques, and experience with numerical modeling are desirable. The candidate should be highly motivated to contribute to the advancement of fusion diagnostics and reactor development.
Tutor	*da definirsi/to be defined*
Abroad period	*no specific rules*
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca **Research project**	**ENG:** "New "Carbon-negative" Functional Fillers for Green Tyres: investigation of Biochar materials" **(PROG.12**)
Tipo/Type	Borse finanziate da enti esterni / Scholarships funded by external organizations
Azienda o ente finanziatore / **Funding Body**	Corimav
Borse/Scholarships	1
Abstract	**ENG:** A key element in rubber compounds is represented by Functional Fillers, which represent the "skeleton" of the compounds, largely determining their stiffness and abrasion resistance. In this context, the most used filler for rubber is Carbon Black, a material derived from fossil sources (e.g. heavy oil) and characterized by a significant surface area for interaction with the polymer and by a sufficient electrical conductivity. The ultimate target of this research project is the development of a sustainable alternative to Carbon Black: the family of biochar materials derived from diverse waste biomasses will be investigated, aiming at the definition of materials and processes that could fit the above purpose. The research activity will encompass the synthesis and functionalization of biochar materials, compounding activities to create new compounds based on the biochar and comprehensive chemical, physical and mechanical characterization of the biochar and the related green and cured compounds. The research activity will include 6 months spend abroad and a strong interaction with the company laboratories.
Tutor	UNIMIB: Prof. Carlo Santoro, Prof.ssa Barbara Di Credico Supervisor aziendale: Dr.ssa Silvia Guerra (Pirelli Tyre)
Abroad period	The research activity will include 6 months spend abroad
Specific rules	Intellectual property clauses agreed with the Company apply to this scholarship

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca Research project	**ENG:** "Human rights as guardrails for the age of Artificial Intelligence"
Tipo/Type	Dipendenti aziende convenzionate / Employees of partner companies
Azienda o ente finanziatore / Funding Body	Intesa Sanpaolo S.p.A.
Posti riservati a dipendenti - collaboratori / Executive PhD position	1
Abstract	**ENG:** The incredible benefits and results achievable using Artificial Intelligence (AI) systems make their application indispensable in almost all domains. They also foster a spontaneous trust in humans who genuinely believe they are the users of a highly capable artifact. Actually, AI algorithms have a vast and profound impact on multiple dimensions of human nature and lives: self-determination, freedom, and control may be threatened not only in everyday decisions and actions, but also on the possibilities of shaping one's own future. The process of datification of the world – which takes place also through the virtualization of the physical environment by means of the dissemination of increasingly "integrated" devices – seems unavoidable, and not participating in it is in fact not feasible. With many prominent organizations (e.g., ONU, CEPS) raising the concern that opens the fork in the road between governing or being governed in the humans-AI technologies relationship, the issue of control and sovereignty appears crucial. People cannot refrain from the datification of their lives and of the environment in which they live, as it often happens beyond the awareness threshold. Also, explainability plays an essential role in this sense, since people can easily lose control and exhibit over-reliance with respect of AI systems, when their functioning remains obscure due to elevated complexity. Nowadays, many research efforts are being made to maintain control over the behaviour of AI systems and different explainability approaches try to make AI outputs as comprehensible as possible. Moreover, the dimension of temporality – that deeply characterises the category of freedom – could strongly be impacted by AI systems applications, in a dynamic that attempts to cancel out the uncertainty inherent in human phenomena with the "certainty" of computation. In fact, the unprecedented predictive and analytical power afforded by AI systems may generate a compression of the openness of the future, starting from a past, accurately described by the mass of data, that remains always influential and, therefore, present. From a legal point of view, especially with the entry into force of the General Data Protection Regulation in May 2018 and the forthcoming publication in the EU Official Journal of the AI Act (May/June 2024), much has been done to give substance and concreteness to the ethical values shared in the union territory. More broadly, the global race to regulate AI is no longer in its infancy, with countries around the world setting tone for binding or non-binding

	regulatory standards. But the time is not yet ripe to assess the effectiveness of the regulatory frameworks, especially in helping to address the challenges posed by the inherently transnational nature of AI. For these underlying reasons, it is highly desirable to try to observe the impact that AI algorithms can imprint on people from a human rights perspective. In the wide sphere of human rights, in fact, not only are the strands of research that commonly fall under the umbrella concept of Trustworthy AI founded (e.g., privacy preserving, fairness, explainability, human oversight), but also the basis for ethical ramifications of data-driven approaches and for designing optimal policies to drive effectively and responsibly future digital environment. The intent of this research project is to explore the fertile fields in which AI technologies and human rights intertwined, since there are the roots of ethical foundations needed to "operationalise" values in algorithmic practices and there are the potentially most effective normative derivations that follow. Such topics are of great interest even in the banking sector, and they would receive the needed effort and dedication.
Tutor	UNIMIB: Prof. Fabio Bellini Supervisor aziendale: Dr. Andrea Cosentini
Abroad period	the expected duration of the period spent abroad 3 months
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca Research project	**ENG:** “Unveiling the Al Mind: Mechanistic Interpretability for Trustworthy Systems”
Tipo/Type	Dipendenti aziende convenzionate / Employees of partner companies
Azienda o ente finanziatore / Funding Body	Intesa Sanpaolo S.p.A.
Posti riservati a dipendenti - collaboratori / Executive PhD position	1
Abstract	**ENG:** Recent strides in artificial intelligence have led to systems whose capabilities often surpass their originai design, revealin g sophisticated behaviors t hat developers neither predicted nor fully underst and. Although these rapid gains in performance have ushered in extraordinary achievements, they also present considerable challenges related to reliability, account abilit y, and public trust. As these models become ever more integrai to complex , high-stakes decision- making processes, it becomes increasingly important to shin e a light on the internal reasoning that guides their behavior. Research on interpretability has evolved over time to address different aspects of these challenges. Early approaches emphasized creating models that were transparent by design, making it easier to grasp how inputs translated into outputs. When large-scale, nonlinear models grew in prominence, effort s shifted toward explaining why a network arrived at a particular decision, leading to a variety of visualization and attribution methods. More recently, a line of inquiry known as mechanistic interpretability has emerged with the aim of deciphering how advanced, extremely complex Al systems handle entire classes of problems. Rather than focusing on individuai prediction s, t h is research seeks to identify how a model's components, represent ation al structures, and computational pathways give rise to its remar kable capacity for generalization. Pursuing mechanistic int erpretabilit y opens avenues for significant practical and scientific benefits. Better insight into the inner workings of Al can support more effective control, improving our ability to adapt and refine a model ' s parameters so that it behaves as intended. lt can also enhance our capacity to predict how a system will act in unfamiliar scenarios or under novel condit ions, and to detect early signs of potentially dangerous or misalig ned behavior. Moreover, understanding these hidden processes offers a unique opport unity to uncover the representations and abstractions Al creates, which can in turn deepen our own grasp of complex phenomena. With these goals in mind, the proposed research seeks to develop systematic methods for examining and modifying the computations that govern modem Al systems. By achieving a cl earer, more fine-grained picture of how neural networks process and transform information, we can better steer them toward desirable outcomes while avoiding

	unforeseen risks. Ultimately, a deeper command of mechanistic interpretability promises not only greater safety and ethical alignment in emerging Al technologies, but also a wealth of insights into how intelligent syst ems- artificial or ot herwise - can be harnessed to address a wide spectrum of societal needs.
Tutor	UNIMIB: da definire / to be defined Supervisor aziendale: Dr. Andrea Cosentini
Abroad period	*no specific rules*
Specific rules	*no specific rules*

Strategic Innovation for Sustainable and Smart Ecosystems (SIS2E) 134R	
Progetto di ricerca Research project	**ENG:** "Exploring the Functions of HDAC10: a biochemical and biological study"
Tipo/Type	Dipendenti aziende convenzionate / Employees of partner companies
Azienda o ente finanziatore / Funding Body	Italfarmaco S.p.A
Posti riservati a dipendenti - collaboratori / Executive PhD position	1
Abstract	**ENG:** Histone Deacetylase 10 (HDAC10) is the sole polyamine deacetylase within the Zn-dependent HDAC family. It plays crucial roles in cancer biology and non-oncologic diseases by regulating polyamine metabolism and other pathways. This project aims to enhance the biochemical and biological characterization of HDAC10, focusing on its enzymatic activity and inhibition, the development of new selective inhibitors and characterization of the binding modes of new molecular entities. The research will employ various methods, including enzymatic assays, surface plasmon resonance, structural biology, and computational studies to investigate the mechanism of action of known and novel HDAC10 inhibitors. The project will also involve the validation of HDAC10 inhibitors in cellular models. Candidates for this position should have a strong background in biochemistry, molecular biology, or related fields with interests in enzymology and drug discovery.
Tutor	UNIMIB: Prof. Francesco Peri Supervisor aziendale: Dr. Gianluca Fossati
Abroad period	Expected duration of the period spent abroad: from 3 to 6 months
Specific rules	*no specific rules*