38esimo ciclo								
Area Società								
Università degli Studi di Pisa								
N.	**Università ed EPR PARTECIPANTI**	**N. Borse**	**50%**	**50%**	**Referente scientifico**	**E-mail referente scientifico**	**Titolo**	**Tema**
1	Università di Pisa	1	Unipisa	FOE CNR	Dino Pedreschi/Anna Monreale	dino.pedreschi@unipi.it, anna.monreale@unipi.it	Artificial Intelligence for Society	Objective: to build the foundations of **Human-centered AI** along three main goals: **"human-in-the-loop" machine learning and reasoning**: allowing humans to understand and steer learning and reasoning of AI systems and interact synergistically to solve complex tasks. Specific goals include explainable AI, neuro-symbolic learning, and lifelong learning, all with the "human-in-the-loop" **social-aware AI**: understanding and governing the societal outcomes of large-scale, networked socio-technical systems of humans and AIs, e.g., social media and online marketplaces. Specific challenges include modeling such systems and decentralized networked learning design of **trustworthy AI systems:** the responsible (co-)design, development, validation and use of trustworthy AI systems, including certification, to make sure to incorporate "by-design" European laws, ethical values and human rights Extensive empirical experiments, case studies and pilots of Human-centered AI systems are integral part of the research plan.
2	Università di Pisa	1	Unipisa	FFO Pisa				
3	Università di Pisa	1	Unipisa	FFO Pisa				
4	Università di Pisa	1	Unipisa	FFO Pisa				
5	Università di Pisa	1	DM 351					
6	Università di Pisa	1	DM 351					
7	Università di Pisa	1	DM 351					
8	Università di Pisa	1	DM 351					
9	Università di Pisa	1	DM 351					
10	Università di Pisa	1	DM 351					
11	Università di Pisa	1	DM 351					
12	Università di Pisa	1	DM 352 (Beam me up)				AI Aided Education: Ricerca e Sviluppo di soluzioni di Intelligenza Artificiale per il supporto all' apprendimento"(AI Aided Education: Research and Development of AI Solutions for supporting educational activities)	
13	Università di Pisa	1	DM 352 (Genius Loci)				GLO-DT: formalizzazione ed enrichment di geospatial data (Data Science and AI for analysis and enrichment of geospatial data)	
14	Università di Pisa	1	DM 352 (Octo Telematics)				"Sensor data fusion over telematic services"	
15	CNR	1	FOE CNR	CNR-ICAR	Giovanni Pilato (ICAR Palermo)_		Artificial intelligence methodologies and cognitive architectures for "computational explanation" in social robots.	La ricerca riguarda lo studio e la messa a punto di un sistema di Intelligenza Artificiale, orientato alla spiegabilità computazionale, finalizzato all'interazione uomo-robot e basato sulla "dual process theory of mind", che permette di integrare meccanismi reattivi/percettivi e logico/deliberativi.
16	CNR	1	FOE CNR	CNR-ISTI	Raffaele Perego Emanuele Carlini Salvatore Trani	raffaele.perego@isti.cnr.it emanuele.carlini@isti.cnr.it salvatore.trani@isti.cnr.it	Extreme Federated Learning: geographically distributed and heterogeneous edge devices for human-centric AI	The PhD position focuses on the design, implementation, and evaluation of novel data-driven human-centered federated AI approaches for geographically distributed and heterogeneous computational resources such as edge computing environments. The research explores highly distributed and decentralized federated AI solutions for edge computing environments, considering the specific characteristics of edge devices (e.g., limited computing capacity, network connectivity, geographical position, etc.) and their interaction with both other edge devices and the users. In this context, research focuses on i) how to exploit local knowledge of an edge device to solve complex tasks by exchanging information with nearby devices; ii) new forms of human-AI interactions, enabling the implicit privacy awareness of decentralized systems and the transparency of the AI system.
17	CNR	1	FOE CNR	CNR-ISTI	Paolo Cignoni		AI for assisted 3D design and optimization in Computational Architecture	AI for assisted 3D design and optimization in Computational Architecture: Human-in-the-Loop strategies and 3D Geometric Deep Learning to leverage domain knowledge for the design and creation of advanced, efficient and resilient architectural structures
18	CNR	1	FOE CNR	CNR-IIT	Andrea Passarella		Human-centric AI: data-driven joint optimisation of decisions taken collaboratively by humans and their AI personalised agents	The thesis will focus on Human-centric AI, where humans and AI interact according to complex patterns. There are many examples of such contexts. For instance, "personal AI modules" trained and/or running on users' devices will collaborate with each other, possibly in a decentralized fashion, to augment local knowledge, and will exploit knowledge of their local users to optimise the resulting tasks. Moreover, AI agents will collaborate with humans according to complex targets, and one key challenge would be to govern such a complex ecosystem delegating decisions and tasks across users and AI agents. The candidate will design advanced algorithms to optimise human-centric AI in this spectrum of use cases, analyse behaviours emerging from these complex interactions, and evaluate the behaviour of the resulting human-centric AI algorithms.
19	CNR	1	FOE CNR	CNR-IGSG	Marina Pietrangelo		Semantic tools and technologies for processing legal information for transparent AI systems in compliance with fundamental human rights	
20	CNR	1	FOE CNR	CNR-INO	Alessandro Zavatta		Artificial Intelligence for Quantum Communication	
21	CNR	1	FOE CNR	CNR-ILC	Felice Dell'Orletta		Human in Neural Language Models	Human in Neural Language Models
22	Università di Trento	1	Unitrento	FOE CNR	Luca Turchet		Tuning of music information retrieval models via evolutionary computing techniques.	The PhD will focus on the application of evolutionary computing methods for the optimization of machine learning models in different music information retrieval tasks. The successful candidate will design, implement and evaluate advanced techniques merging the domains of music information retrieval and evolutionary computation, in areas such as classification of genres, emotions, audio effects, and type of instrument in large datasets of musical signals. Both offline and real-time scenarios will be investigated.

23	Università di Trento	1	DM 351		Andrea Passerini		Towards hybrid human-machine learning and decision making.	The project will focus on the development of hybrid strategies combining human decision-makers and machine learning algorithms to improve the performance of the joint human-machine system. This challenging goal requires an interdisciplinary perspective, combining aspects of explainable AI, interactive machine learning, human-computer interaction, human decision-making and cognitive science. A relevant case study will be the development of hybrid strategies for effective public policy making.
24	Scuola Superiore S. Anna	1	S. Anna	FOE CNR	Francesca Chiaromonte		AI, statistics and simulation techniques for big data-driven research in economics, management, the law and engineering.	Sviluppo di metodi statistici, computazionali, di simulazione, machine learning e intelligenza artificiale, per l' integrazione e l'analisi di enormi quantita' di dati, e l'applicazione di tali metodi in vari campi della ricerca economica (e.g., crescita, innovazione tecnologica, impatti socioeconomici del cambiamento climatico), manageriale (e.g., economia circolare, gestione della innovazione, management sanitario), giuridica (e.g., profili regolatori, di data protection, di governo dei dati e di proprietà intellettuale nell'ambito dell'intelligenza artificiale) e/o ingegneristica/informatica (e.g., infrastrutture scalabili e adattive per big-data processing)"
25	Scuola Superiore S. Anna	1	S. Anna	S. Anna	Francesca Chiaromonte		AI, statistics and simulation techniques for big data-driven research in economics, management, the law and engineering.	Sviluppo di metodi statistici, computazionali, di simulazione, machine learning e intelligenza artificiale, per l' integrazione e l'analisi di enormi quantita' di dati, e l'applicazione di tali metodi in vari campi della ricerca economica (e.g., crescita, innovazione tecnologica, impatti socioeconomici del cambiamento climatico), manageriale (e.g., economia circolare, gestione della innovazione, management sanitario), giuridica (e.g., profili regolatori, di data protection, di governo dei dati e di proprietà intellettuale nell'ambito dell'intelligenza artificiale) e/o ingegneristica/informatica (e.g., infrastrutture scalabili e adattive per big-data processing)"
26	Scuola Normale Superiore	1	Scuola Normale	FOE CNR	Fosca Giannotti		AI for Science and Mathematical Foundations of ML	The focus will be on the possible cross-fertilisations of AI research with contributions from hard and life sciences, either at the level of fundamental methods or in terms of concrete and challenging use cases in areas such as finance and life sciences that feed new and fundamental solutions
27	Scuola Normale Superiore	1	DM 351		Fosca Giannotti		Explainable AI for synergistic human-AI collaboration	The focus lies at the intersection of the topics of Explainable AI and Human-in-the-loop: intelligent machines and humans, which collaborate synergistically towards a common goal, interact and thus are able to understand each other and co-evolve. Such an objective necessitates revisiting machine learning techniques, which must be transparent and thus explainable, but also capable of deferring their decisions and reacting to further user requests. The thesis may also involve experiments involving human decision-makers in one or two application contexts that the ERC XAI project is building.
28	Università di Firenze	1	UniFirenze	FOE CNR	Paolo Nesi		Methods and models of AI / Explainable AI for decision support systems	The development of new AI methods for implementing decision support systems exploiting XAI/AI will be extremely useful to provide detailed and contextualized information about the rationales behind the suggested decisions. Rationales can be grounded on causality, key performance indicators and/or other concepts depending on the decision domain. Decision domains would be: health, mobility, energy, people behaviour, justice, etc. The solutions will oriented to provide decision support to operators/decision-makers as well as to final users/consumers, which can be also involved in the loop.
29	Università di Firenze	1	DM 351		Andrew David Bagdanov		Deep Reinforcement Learning for Embodied AI in Complex 3D Navigation Environments	Reinforcement Learning is benefiting from the ongoing Deep Learning renaissance and advanced techniques have been proposed in recent years to address the need for reliable, safe, and sample-efficient techniques for training agents to act and interact in complex environments. In this three-year PhD research project we will look at fundamental issues related to embodied AI systems in open-world navigation scenarios. Techniques that will be applied include, but are not limited to, Inverse and Offline Reinforcement Learning, Online and Offline Continual Learning, Few-shot Imitation Learning, and Open Set Visual Recognition. Applications to be considered are diverse and include open-world navigation, natural language goal specification, visual anomaly and novelty detection, video game AI, and automated video game playtesting.
30	Università di Firenze	1	DM 351		Michela Baccini		Methods for exposure assessment and index construction in environmental epidemiology	Description: The use of AI techniques in environmental epidemiology is becoming widespread, in particular for exposure assessment purposes. The study of the characteristics of natural and built spaces and their relationship with the health status of the population are of special interest, as well as the definition of indexes able to describe how people live a certain area, like for example walkability and playability indexes. The index construction relies on the combination of information from different sources at a fine geographical level, and requires the adoption of machine learning techniques. Validation is a fundamental step within this procedure.
31	IMT Lucca	1	DM 351		Diego Garlaschelli	diego.garlaschelli@imtlucca.it	Complex networks for societal challenges	Many of the challenges in modern society require the understanding and management of the complexity of physical, biological, social, economic, financial and technological networks. The Theory of Complex Systems and the Science of Networks are modern approaches to the study of complex systems characterized by a large number of heterogeneous interacting components that are interconnected in irregular architectures. Recent financial, economic and health crises have shown how the highly irregular and inhomogeneous structure of real networks of interaction (among banks, firms or people) deeply complicates the management (and even more so the prediction) of stress and disease propagation in modern economies and societies. This project aims at the empirical analysis, the mathematical modelling, the theoretical understanding and the development of novel AI methodologies for the study of complex networks, as well as their application to problems of societal relevance. See http://www.networks.imtlucca.it for more details.
32	Università di Modena e Reggio Emilia	1	Unimore	Unimore	Rita Cucchiara	rita.cucchiara@unimore.it	Computer vision for semi surpervised action	Human behavior understanding in video requires new models and neural representation to understand human presence, human-enviornment interaction, learning with partial data (up to zero-shot learning) and provide explainable solutions too. New approaches exploit new visual transformers and spatio-temporal autoencoders for representation learning in multimodal generative netowks. This will be the main topic of the Phd Journey Possible applications will be mobility video understanding and fake video detection. It will done in collaboration with ELLIS and ELSA EU project
33	Università di Modena e Reggio Emilia	1	Unimore	Unimore	Costantino Grana	costantino.grana@unimore.it	Machine learning for medical imaging	Medical imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, and whole slide imaging (WSI) are at the heart of clinical diagnostics. In recent years, artificial intelligence techniques, and especially deep learning, have already pushed the state-of-the-art in many tasks including 3D medical image segmentation. Automatically obtained segmentations can be further used as input for disease classification, quantification, or for the extraction of functional information. Such downstream applications require efficient methods that operate on 3D shapes. In this position, you will develop machine learning techniques to bridge the gap between 3D model extraction from medical images and downstream applications. The methods developed in this PhD will be used to tackle real-world clinical problems, and specifically combination of WSI and clinical data for nephrology, and 3D modeling of maxillofacial structures.

34	Università di Modena e Reggio Emilia	1	DM 351		Franco Zambonelli and Marco Lippi		Distributed Causal Reasoning in Multiagent Systems with Neuro-Symbolic Approaches	Understanding causal relationships is a necessary step for agents that are learning to act and adapt to face evolving situations both at the individual and at the collective level. This tasks involves both perception and reasoning skills, and it thus represents an ideal scenario to apply neuro-symbolic techniques for individual agents and for their coordination. The developed techniques will be tested in various scenarios of smart environments.
35	Università di Siena	1	UniSiena	UniSiena	Stefano Melacci	mela@diism.unisi.it	Lifelong Machine Learning	The research will be focussed on problems where a machine is exposed to a continuous stream of information, and it is expected to learn in a lifelong manner, progressively improving its skills. The study is aimed at re-thinking the foundational aspects of machine learning "over time", and also at developing agents that benefit from a small number of interactions with humans or other machines. Most of the emphasis will be given to the case of Computer Vision, where the the input stream consists of video data. Neuro-symbolic integration will be evaluated as a tool for increasing the memorization, reasoning, and explanation capabilities of agents that learn over time.
36	Dipartimento di Informatica UniPi	1	Dip. Informatica	Dip. Informatica	Dino Pedreschi	dino.pedreschi@unipi.it	"Science and technology of interpretable machine learning and explanation of AI-assisted decision making: eXplainable AI for synergistic human-machine co-evolution"	
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N.	Università ed EPR ASSOCIATI	N. Borse	50%	50%	Referente scientifico		Titolo	Tema
37	Orientale di Napoli	1	Orientale di Napoli	FFO Pisa	Johanna Monti	jmonti@unior.it	Semantic Enhancement of advanced conversational agents.	**Semantic enhancement of advanced conversational agents.** The goal is to improve the linguistic representativeness, precision, robustness and efficiency of conversational agents by developing linguistic patterns for the Italian language. The project deals with the analysis and processing of Multiword Expressions (MWEs) to create linguistic resources to support the process of interpreting the inputs by advanced conversational agents. Despite recent advances, the state of the art regarding the representation and processing of MWEs is largely unsatisfactory. Current research focuses on both the creation of MWE dictionaries and their automatic recognition in texts. Only a few approaches address the link between MWEs and a comprehensive linguistic analysis of the text. These approaches confirm that adequate processing of MWEs improves both linguistic accuracy and robustness of Natural Language Processing systems. This unsatisfactory situation is mainly due to the lack of linguistic knowledge bases that encode the information regarding the MWEs, which could be inserted into linguistic analysis software. In Italian there are very few resources, but they are incomplete in terms of syntactic and semantic representation, and adequacy in relation to the development of advanced conversational agents.
38	Università di Sassari	1	UniSassari	UniSassari	Massimo Tistarelli	tista@uniss.it	Biologically-inspired AI models for visual perception and human-robot interaction	The Phd research program will be mainly focused on the design and development of efficient and robust vision modules to be applied in a number of visual tasks involving the recognition of people and actions, including human recognition for security purposes and human-robot interactions. One objective will be to investigate the role of engaging an active observation of people and objects during social interaction. The specific goal is to allow a humanoid robot to establish a non-verbal communication with humans, understanding and anticipating her/his needs to activate the necessary actions required to respond to a naturally expressed request. To achieve these research objectives, it will be necessary to create an overt attention system capable of interpreting multiple channels of mutual interaction in a social setting, including, but not restricted to, recognition of the participant's identity, age, familiarity and gender, understanding of the initiation and termination of communication triggered by mutual gaze, the identification of emotional state of the participant by means of audio-visual channels, including the understanding of "body language". In the development of the planned research specific modules will be necessary to: - actively scan of the environment through saccadic movements of the robot's eye-head system and the detection of points of interest (people and objects); - define strategies for shifting attention guided by the task, for example for the analysis of faces, bodies and objects; - analyse and fuse multisensory data (audio and video) for specific tasks such as the location of a human actor and the maintenance of attention;
39	Università dell'Aquila	1	UniAquila	UniAquila	Davide Di Ruscio		AI-based Systems for Software Engineering	This research aims to define and develop novel AI-based systems supporting different phases of software engineering ranging from requirement elicitation, software development, and evolution.
40	Università dell'Aquila	1	DM 351		Stefania Costantini		Beyond the Metaversum: a synergy of AI techniques to define the Hybrid Society encompassing humans and autonomous systems	The objective of this research is the definition of a novel notion of "Hybrid Society" (for short HS), different from and more general than what is found in current literature, and the realization of a prototype instance of the HS. Initial attempts exist for definition of concepts similar to HS, e.g., the "Metaversum" by Meta, previously Facebook, that lack the generality of the present proposal, and to which the principles an techniques developed in this research might be profitably applied. In the envisaged HS, humans and Autonomous Systems (AS) are coupled at multiple levels, based on shared agreed-upon principles and standards which must by definition enforce tight constraints on the behaviour of agents. Within the hybrid society, AS can usefully play the role of special actors, taking care of humans, and promoting interactions to human's benefit. This on the one hand on the purely utilitarian side, e.g., by adjusting the dosage of drugs or identifying the best specialist to treat some symptoms; on the other hand, in a wider perspective, by eliciting and promoting user's interests and social and affective needs, and helping to build new useful social connections; eventually, by steadily providing company, help and assistance. In our vision, each human user will be enhanced by a Personal Assistant Agent (PA) which will represent the user's entry point into the Hybrid Society. The PAs will be equipped with a detailed and anytime evolving knowledge of the user's needs, preferences, and expectations. Thanks to the PAs, users in the hybrid society will perceive themself to be in to some extent free of the limitations of body, health state, space and time. This is particularly important for people who are to in a certain degree impaired: they may wish to be taken care of, but also, often so strongly, they may wish to be enabled to transcend their contingent problems and limitations.

41	Università di Bari	1	UniBari	UniBari	Nicole Novielli/Rosa Lanzilotti		Design and Assessment of Human-centred AI Systems	AI is usually conceived with a perspective on autonomy. In this project, we aim at working at the development of Human-centered AI systems, to support and facilitate human activities and augment human cognition. The work funded by this scholarship will be carried out at the Department of Computer Science, University of Bari, Italy. The main goal is to propose methods to design new interaction paradigms for Human-centred AI that can amplify, augment, and enhance human performance, in ways that make systems reliable, safe, and trustworthy.
42	Università Cattolica del Sacro Cuore	1	DM 351		Giuseppe Riva	giuseppe.riva@unicatt.it	Analisi critica degli aspetti psicologici e cognitivi dell'intelligenza artificiale (Critical analysis of psychological and cognitive aspects of Artificial Intelligence)	The work funded by this scholarshiio wll be carriied out at the Humane Technology Lab., Catholic University of Sacred Heart, Milan, Italy. The main goal is to carry out a critical analysis of psychological and cognitive aspects of Artificial Intelligence by exploring the biocognitive basis of Explanable AI and Social AI. Skills required are: i) a good knowledge of the theories and methods of cognitive psychology, and ii) basic skills in Machine Learning and Data Science. An expertise in iii) virtual reality development (UnityVR) will be considered a plus.
43	Università Cattolica del Sacro Cuore	1	DM 351		Antonella Marchetti	antonella.marchetti@unicatt.it	Analisi critica degli aspetti psicologici ed evolutivi della Robotica Sociale (Critical analysis of the psychological and developmental aspects of Social Robotics)	The work funded by this scholarship will be carried out at the Research Unit on Theory of Mind, Catholic University of Sacred Heart, Milan, Italy. Within a paradigm of hybrid interactions between humans and social robots, in which behavioral and emotional attunement are fundamental, psychological constructs and cognitive models of trust-based exchanges will be respectively operationalized and implemented. These constructs and models will be based on the link between trust dynamics and Theory of Mind, conceived as the ability to understand and attribute emotional and epistemic mental states to others. The cognitive models will be tested in real-life situations through the lifespan to tailor them to the specific users' needs and to the different contexts of application. This will enable human-centered hybrid interactions between humans and social robots. The candidates'evaluation will consider possible expertise in cognitive/psychological sciences, programming and the design of models of interaction between humans and artificial agents.
44	Università del Salento	1	DM 351		Adriano Barra		Artificial Intelligence for Society	Artificial Intelligence
45	INFN	1	INFN		Chiara Roda		AI-based solutions for data analysis in Physics	The work funded by this scholarship will be developed within the INFN (Istituto Nazionale di Fisica Nucleare). INFN was born about 70 years ago as the national center to develop research to understand the elementary structure of matter, a field that is normally addressed as Particle Physics. In these years, the INFN research focus has developed in many directions ranging, as and example, from gravitational wave observations with data collected at interferometers, Higgs boson studies with events produced at colliders up to several applications in the medical fields. In all these researches, and in many others carried out at INFN, the goal is to extract and understand the information collected from sensors of various types. This information can be sparse as in medical science or very close to what is called big-data as for detectors at colliders. In all cases, in the last years, the extraction of the information of interest through the application of Machine Learning (ML) algorithms has boosted the opening of new and promising roads for data analysis. INFN can serve as a rich data laboratory to challenge new ideas and algorithms in the many directions of ML, from the explainability of ML models to low-latency algorithms to be used for real data analysis.
46	Università di Messina	1	DM 351		Massimo Villari		Workflows Innovativi Cloud-Edge basati su Algoritmi di Machine Learning orientati alla PP. AA. (Innovative Cloud-Edge machine learning workflows for decision making in the public sector)	"Workflows Innovativi Cloud-Edge basati su Algoritmi di Machine Learning orientati alla PP. AA., propedeutici ad una maggiore efficacia, efficienza ed economicità dell'azione pubblica nel processo di Decision Making".
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