

A²ID — 1st International Workshop on Augmented Artificial Intelligence: a Symbiotic Approach to Enhance Decision-Making

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Abstract

The workshop “Augmented Artificial Intelligence: a Symbiotic Approach to enhance Decision-Making” (A²ID) aims to explore the human-AI collaboration in contexts in which the decision-making process can be supported and augmented, emphasizing a human-centered approach to design and develop Artificial Intelligence (AI) systems and fostering human-AI symbiosis. The goal is to create systems that work symbiotically with humans by employing Human-Computer Interaction (HCI)’s guidelines and best practices in designing and developing AI systems. Symbiotic Artificial Intelligence (SAI), which is a specialization of Human-Centered AI (HCAI), aims to achieve this objective by supporting humans rather than replacing them, while enhancing their skills. AI can represent a great resource. However, challenges such as biases in training data, over-reliance on AI, and lack of interpretability still persist, raising concerns about trust, fairness, and ethical compliance of AI systems. This workshop addresses these issues by promoting the same multidisciplinary perspective that characterizes the creation of SAI systems, integrating HCI, AI, Ethics and Laws, Software Engineering (SE) and End-User Development (EUD). Through discussions and knowledge exchange, participants will investigate the components of human-AI interaction that characterize the symbiotic relationship between the two parties in decision-making scenarios (for example, in the medical domain).

Keywords

Human-Centered AI, Human-AI Symbiosis, AI for Decision-Making, Adaptable AI, Augmented Intelligence

1. Introduction

Artificial Intelligence (AI) finds its application in numerous fields and domains, ranging from medicine to education, providing substantial support to humans. Although AI can process large amounts of data and make complex elaborations, users who interact with AI-based systems must be aware of both their advantages and risks to make informed use and contribute to the well-being of society [1].

As AI is becoming ubiquitous, it is imperative to provide end-users with clear, appropriate, and effective interaction mechanisms that allow them to communicate properly with the software they are using [2, 3, 4]. To this end, a human-centered approach to designing new solutions becomes necessary. Human-Centered Design (HCD), in fact, allows to consider users’ needs and preferences as fundamental requirements, translating into an adaptable, reliable, and pleasant interaction experience [5, 6, 7]. Finally, users should be empowered to adapt AI systems to their specific needs without being AI experts, as demonstrated through user studies [8, 9].

Symbiotic Artificial Intelligence (SAI), which is a specialization of Human-Centred Artificial Intelligence (HCAI) [10], aims at achieving this goal by supporting humans, instead of replacing them while

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augmenting and enhancing their skills [11]. Building SAI systems requires a multidisciplinary approach that integrates five disciplines (Figure 1): Human-Computer Interaction, Artificial Intelligence, End-User Development, Law and Ethics, and Software Engineering [4].

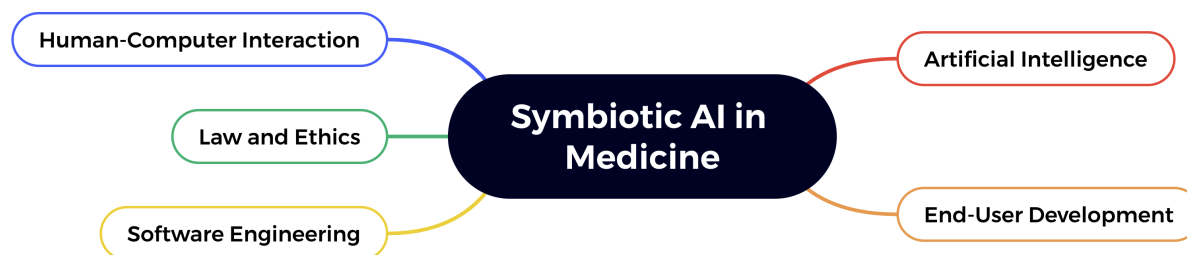


Figure 1: The five disciplines that characterize Symbiotic Artificial Intelligence (SAI)

The five disciplines contribute to the creation of SAI from different standpoints. Human-Computer Interaction (HCI) permits guiding the creation of interactive solutions that are usable, intuitive, and accessible [5], not just focusing on the accuracy of the model, whereas the discipline of AI excels, building architectures that satisfy performance requirements [12]. End-User Development (EUD), instead, enables end-users to customize AI systems to better fit their needs, making them adaptable [7]. The role of Software Engineering (SE) is also central as it allows standardization of practices to build robust systems and guarantee correct execution of processes through agile methodologies, which project management helps implement [13]. Similarly, Law and Ethics ensure adherence to ethical principles, safeguarding humans [14]. Although apparently separate fields, these five disciplines are intertwined through different contact points.

Currently, the traditional approach of creating AI systems heavily focuses on achieving high-performing models. In this new era of AI, designers and developers are making an effort to create solutions that generate intelligible outputs and interpretable models, offering explanations and transparency mechanisms that can reduce the level of opacity of models when possible [15, 10]. The motivation behind this is that users need to be able to understand the processes that lead to outputs in order to make informed decisions or solve problems that may affect other people [16]. This approach can foster trust, ensuring fairness and compliant use, especially in safety-critical domains, such as medicine [17].

As an example, AI-based systems are often used to improve diagnostic precision, to design personalized treatment plans, and to support drug discovery [18]. Physicians also benefit from real-time monitoring and predictive analytics, which improve patient outcomes and reduce healthcare costs [19, 18]. However, there are challenges (e.g., biases in training data) that can lead to inequities in care and increase the potential for over-reliance on AI at the expense of human judgment [20]. The integration of AI into high-stakes decision making scenarios, like those in the medical domain, has the potential to complement human expertise rather than replace it, fostering human-AI symbiosis [8].

2. Objectives

This workshop has the objective to explore, through discussion and exchange of views, the role of human-AI interaction in domains where humans can make decisions with the help of AI-based systems, in order to gain a better perspective of SAI and its potentials in critical scenarios, taking into account the five disciplines that shape its creation, as shown in Figure 1.

Feeding this interdisciplinary approach and navigating the factors that foster collaboration between humans and AI, the benefits of using this technology in multiple and diverse contexts, such as medicine and healthcare, can be explored, ensuring that the appropriate interaction mechanisms allow humans to communicate properly with these systems. As SAI development requires a HCD process [4], this

workshop aims at investigating the main factors that influence the creation of SAI systems, identifying the main tasks for which they can be useful and their requirements.

More specifically, exploring potentially already-existing AI systems can be beneficial to the community to extract the guidelines and patterns that characterize human-AI interaction to foster a positive user experience. For example, in medicine, end-users can be medical professionals (e.g., therapists, physicians, etc.) and patients whose ages, skills, and abilities range on a very wide spectrum. Thus, designing AI systems aimed at their support must be carefully carried out, considering their mental models, needs, and contexts of use. Collecting and discussing multiple design solutions and ideas can be beneficial in exploring this field in a productive way oriented to supporting and improving the activities of all parties involved.

The discussions that begin with the presentations of each contribution can help to grasp the main requirements of these systems in terms of interaction paradigms, AI algorithms, and EUD techniques. When it comes to AI systems, the integration of customization and, in general, of EUD can be challenging: although it can bring advantages in establishing a stronger collaboration between the two parties, the performance of the system must not be undermined [9].

The expected outcome concerns a collection of insights that can guide the future definition of design patterns, evaluation techniques, and guidelines that can be applied to creating SAI systems that can be used during the decision-making process.

3. Workshop Structure

The intended workshop duration is half-day with the following structure:

- **Introduction** (15 mins): workshop objectives and motivations, and introduction of the organizers and participants. It is an ice-breaking activity in which participants briefly present themselves and indicate their research interests and expertise.
- **Presentation of submitted articles** (2 hours 30 min): Participants present their work through an oral presentation. Each paper's presentation will last 10 minutes plus 5 minutes of questions. Participants have to take note of aspects they like and aspects that need to be improved for each presented work.
- **Panel Discussion** (30 mins): the participants discuss the aspects that emerged from the presentations. To make the activity more interactive, each participant shared their own observations, leveraging the notes taken during presentations. Participants' observation will be the starting point for the discussion, and interactive activities like card sorting will allow for stimulating discussion.
- **Closing** (15 mins): the organizers summarize the aspects that emerged during the workshop and gather participant's feedback. Post-workshop plans will be presented.

To ensure the effectiveness and ease of discussion management, the target audience size is approximately 20 individuals. A more detailed program will be available on the workshop website: <https://a2id.di.uniba.it>.

4. Target Audience

This first edition of the workshop aims to attract researchers and practitioners from various backgrounds and communities, such as designers and users of AI-powered systems, regardless of the specific techniques adopted. We expect the main contributions to be from HCI and AI communities. However, leveraging the multidisciplinary nature of SAI and HCAI, we also consider the pertinent contributions and participation of researchers and practitioners from different domains, such as psychology, philosophy, ethics, etc. We also appreciate contributions stemming from the final application domains (like medicine), which decision-making processes AI try to support.

5. Call for Contributions

A²ID has the objective to gain insights into the employment of SAI in activities that require humans to make decisions with its support. Participants are invited to submit contributions that revolve around the following topics focusing on the human-AI relationship:

- Novel interaction mechanisms to support professionals through AI.
- Case studies investigating the relationship between humans and AI in critical contexts (e.g., industry, medicine).
- Re-Engineering of already-existing AI systems for problem-solving and decision-making.
- Application of HCD and development techniques to AI-powered software to support humans in making decisions.
- Evaluation methods and quality verification techniques for the creation or employment of AI-based systems.
- Application of EUD methods and techniques to AI-based solutions that can help humans in making decisions.
- Considerations of legal and ethical issues concerning the use of AI systems in contexts in which human responsibility and accountability play a crucial role.
- Investigation concerning the role of trustworthiness in AI to support decision-making (e.g., AI systems used by professionals or patients for diagnostic/therapeutic support).

Final versions of the accepted papers will be submitted for publication in the CEUR Workshop Proceedings (<http://ceur-ws.org/>) indexed by Scopus, as part of the IS-EUD 2025 Adjunct Proceedings. Any additional workshop results will be published on the website.

5.1. Submission and Selection of Contributions

Potential participants are invited to submit a position paper addressing the topics and goals of the workshop. Participants may submit novel ideas, work-in-progress, or well-founded works.

Submissions should adhere to the single-column *CEUR-WS CEURAT* template, and should not exceed 6 pages in length (excluding references). Contributions will be managed through EasyChair. Each submission will be reviewed by at least 2 members of the Program Committee, who will assess the relevance of the submission to the workshop's topics, as well as the technical soundness and presentation quality. We aim to select around 10 contributions for presentation at the workshop.

To stimulate discussion during the workshop, the authors of accepted papers will be asked to read all accepted contributions, which will be made available online before the workshop day. Each accepted paper will be included in the workshop proceedings, and at least one author of each accepted contribution must attend the workshop to present their work.

6. Publicity Plans

To encourage people to attend the workshop, we will send out a call for papers to mailing lists in human-computer interaction and artificial intelligence communities. Social media accounts will be created to promote the workshop and reach as many researchers and practitioners as possible. All IS-EUD participants will be welcome to attend the workshop.

A website (<https://a2id.di.uniba.it>) has been published to report all the most important information about the workshop. It will, therefore, hold all the organizational details (e.g., call for contributions, workshop program, deadlines, etc.). The website will be the main source of useful information.

To attract more submissions, we plan to collaborate with an international journal to invite participants to submit an extended version of their manuscripts to be part of a special issue.

A. Committees

A.1. Program Committee

- **Nadeem Abbas** — Linnaeus University (Sweden)
- **Rahatul A. Ananto** — McGill University (Canada)
- **Chaudhry Muhammad Nadeem Faisal** — University of Bari (Italy)
- **Mafalda Ingenito** — Università di Salerno (Italy)
- **Robbert Jongeling** — Mälardalen University (Sweden)
- **Rosa Lanzilotti** — University of Bari (Italy)
- **Alessio Malizia** — University of Pisa (Italy)
- **Sven Mayer** — LMU Munich (Germany)
- **Chiara Natali** — Università degli Studi di Milano-Bicocca (Italy)
- **Teresa Onorati** — Universidad Carlos III de Madrid (Spain)
- **Francesca Pia Perillo** — University of Salerno (Italy)
- **Luciana Provenzano** — Mälardalen University (Sweden)
- **Steeven Villa Salazar** — LMU Munich (Germany)

A.2. Organizing Committee

All the organizers have a strong background both in human-computer interaction and artificial intelligence. The organizers' main research areas are, among others, Human-Centred Artificial Intelligence and Symbiotic Artificial Intelligence.

Miriana Calvano She is a second-year PhD Student in Computer Science at the University of Bari Aldo Moro. She is a member of the Information Visualization and Usability (IVU) and UX Laboratory. Her research interest concerns Symbiotic Artificial Intelligence (SAI), which results from the contamination of Human-Computer Interaction and Artificial Intelligence, and cybersecurity. She is a member of IFIP WG 13.11/12.14 “Human-Centred Intelligent Interactive Systems” and ACM SICH.

Antonio Curci He is a second-year PhD Student in Artificial Intelligence for Society at the University of Bari in co-affiliation with the University of Pisa. I am a member of the Information Visualization and Usability (IVU) Laboratory. My main interests are human-computer interaction, its relationship with artificial intelligence, along with the ramifications of project management, software engineering, and cybersecurity. He is a member of IFIP WG 13.11/12.14 “Human-Centred Intelligent Interactive Systems” and of ACM SICH.

Paloma Díaz She is full professor at Universidad Carlos III de Madrid (Escuela Politécnica Superior) and head of the DEI research group. She holds a Degree in Computer Science and Ph.D. in Computer Science from Universidad Politécnica de Madrid. Her research interests mainly focus on topics such as interaction design, ubiquitous computing and social computing and their practical application to different kinds of interactive systems including e-learning, digital culture, health, industry, civic engagement and crisis informatics.

Andrea Esposito He is a junior research fellow and Ph.D. student at the Department of Computer Science, University of Bari Aldo Moro, Italy. He is a member of the Interaction Visualisation Usability (IVU) and UX Laboratory. His interests lie in Human-Computer Interaction, eXplainable Artificial Intelligence, and Human-AI Interaction. He is committed to advancing the field of Human-Centred AI, working to improve the interaction between humans and AI systems. He is a member of IFIP WG 13.11/12.14 “Human-Centred Intelligent Interactive Systems,” as well as ACM SIGCHI and ACM SIGAI.

Alexander Repenning Dr. Alexander Repenning is the Chair of Computer Science Education at the Pädagogische Hochschule FHNW in Switzerland and a computer science professor at the University of Colorado. He directs the international Scalable Game Design Initiative. He is the godfather of block-based programming and the creator of AgentSheets, AgentCubes and RULER.game computational thinking tools. Repenning has advised organizations including the National Academy of Sciences, the European Commission, and the National Science Foundation on computer science education initiatives.

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Declaration on Generative AI

During the preparation of this work, the author(s) used Grammarly in order to: Grammar and spelling check. After using these tool(s)/service(s), the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication’s content.

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