

HUMAN CENTERED COMPUTING: A COMPREHENSIVE REVIEW OF PRINCIPLES, TECHNOLOGIES AND EMERGING TRENDS IN INTERACTIVE SYSTEMS

Prahallad Das¹, Subhadip Das², Arindam Ghosh³, Sarasij Majee⁴, Aditi Karmakar⁵, Subrata Kumar Majumdar⁶ and Kousik Roy^{2*}

¹ Department of Computer Science and Engineering, Kalyani Government Engineering College Kalyani, Nadia, West Bengal, India. Pin-741235

² Department of Computer Science and Engineering, Bengal College of Engineering and Technology, Durgapur-713212, West Bengal

³ Assistant professor at Department of Computer science and Engineering, Academy of Technology (AOT), Adisaptagram- 712502, West Bengal

⁴ Department of Computer Science Engineering, Swami Vivekananda Institute of Science & Technology (SVIST), Dakshin Gobindapur, Sonarpur, Kolkata – 700145

⁵ Department of Computer Science Engineering, Kalinga Institute of Industrial Technology, Bhubaneswar, Odisha-751024

⁶ Department of Mechanical Engineering, Sanaka Educational Trust, Durgapur-713212, West Bengal

*Corresponding Author Email ID: Kousikroy002@gmail.com

ABSTRACT

Human Centered Computing is the discipline that researches interactive systems able to meet human needs, comfort and real world situations. The review amalgamates the most important principles, critical technologies and the trends that are just emerging and will continue to do so to the interactive environments of the present and the future. It does so by analyzing the role played by usability, transparency, trust, accessibility and personalization in the development of systems that foster meaningful human engagement. The conversation brings up the most significant tech areas such as the immersive environments, multimodal sensing, intelligent interfaces, the digital health applications and the human centered. These technologies are intended to design interfaces that come off as very natural and adaptive and responsive to the different user objectives. The review also considers the problems associated with the safeguarding of privacy, cognitive load, interoperability and continuous user involvement that are the leading issues of responsible development. In recent times, research has suggested a rising trend in several areas, such as human computer collaboration, participatory design methods, explainable AI systems and context aware interaction. The reinforcement of such diversifying trends indicates a complete upheaval of the computational ecosystems which would not just be responsive to users' intents but also perfectly aligned with the altered context. The review concludes by emphasizing the development of this field being dependent on the confluence of the technology breakthrough and a comprehensive grasp of the human aspect to build reliable and inclusive systems.

Keywords: *Human centered computing, human AI interaction, digital health, immersive technologies.*

1. INTRODUCTION

The emergence of smart and interactive systems that dramatically influence human life have made Human Centered Computing a very attractive research field. There is a gradual but unmistakable shift of AI, VR and robots from being simply hi-tech luxury items to being integrated into people's daily