

# **International Workshop on Embodied Intelligence (EI 2023)**

IOP Conference Series: Materials Science and Engineering  
Volume 1321

Cambridge, United Kingdom  
22-24 March 2023

ISBN: 979-8-3313-1144-5  
ISSN: 1757-8981

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571

**Some format issues inherent in the e-media version may also appear in this print version.**

This work is licensed under a Creative Commons Attribution 3.0 International Licence.  
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact the Institute of Physics  
at the address below.

Institute of Physics  
Dirac House, Temple Back  
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481  
Fax: 44 1 17 920 0979

[techtracking@iop.org](mailto:techtracking@iop.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

Preface	
Peer Review Statement	
Intelligence as Computation .....	1
<i>Oliver Brock</i>	
Habit-Inspired Methods for Embodied Intelligence .....	30
<i>Nicolas Kuske, Florian Roehrbein</i>	
Can the Prescience of Blade Runner Engender a Deeper Understanding of Our Relationship with AI Technology? .....	39
<i>Alexander G. Ross, Fr Hists</i>	
Embodiment, Socially Intelligent Behaviour and Proactive Robots.....	57
<i>Chapa Sirithunge, Thilina Dulantha Lalitharatne, Fumiya Iida</i>	
Embodied Intelligence in Additive Manufacturing .....	74
<i>Jie Xu, Yue Xie, Fumiya Iida</i>	
Emotional Alignment for Human-Robot Cooperation in Musical Tasks.....	83
<i>Huijiang Wang, Fumiya Iida</i>	
Sustaining Evolution for Shallow Embodied Intelligence.....	91
<i>W. B. Langdon, Daniel Hulme</i>	
An Information-Theoretic Perspective on Acting Agents.....	105
<i>Carlotta Langer, Nihat Ay</i>	
Inherent Behavioral Stochasticity in Soft Robots: Analysis and Control Strategies.....	124
<i>Muhammad Sunny Nazeer, Syeda Shadab Zehra Zaidi, Matteo Cianchetti, Egidio Falotico</i>	
Embodied Intelligence in Transportation Systems: Road Network Computing .....	134
<i>Kai-Fung Chu, Fan Ye, Fumiya Iida</i>	
Teaching Morphological Computation: A Case Study Using Paper Structures .....	147
<i>Yi-Shiun Wu, Josie Hughes</i>	
Evaluation of the Stochasticity in the Collective Bernoulli-Ball System as a Physical Reservoir Computer.....	160
<i>Fan Ye, Arsen Abdulali, Fumiya Iida</i>	
Continual Developmental Neurosimulation Using Embodied Computational Agents .....	173
<i>B Alicea, R Chakrabarty, S Dvoretzkii, Av Gopiiswaminathan, A Lim, J Parent</i>	
Object Construction Via the Action-Perception Helix, Bayesian Inference and Metaphorisation.....	203
<i>Amaranta Valdés-Zorrilla, Juan-Carlos Letelier, Jorge Soto-Andrade</i>	
Multiple Musical Skills Framework for Robotic Musicianship .....	227
<i>Lawrence Schofield, Chapa Sirithunge, Arsen Abdulali, Fumiya Iida</i>	
Experience-Based Learning and Adaptive Behavior for Improved Situation-Awareness of a Social Robot .....	241
<i>Chapa Sirithunge, A. G. Buddhika P. Jayasekara, D. P. Chandima</i>	

Variable Value Alignment by Design; Averting Risks with Robot Religion..... 254  
*Jeffrey White*

**Author Index**