# Annotated Table of Contents

## Welcome to AI Matters 10(1)

Ziyu Yao, co-editor

Full article: [http://doi.acm.org/10.1145/3655032.3655033](http://doi.acm.org/10.1145/3655032.3655033)

Welcome and Summary

## Conference Reports

Louise A. Dennis

Full article: [http://doi.acm.org/10.1145/3655032.3655034](http://doi.acm.org/10.1145/3655032.3655034)

Conference Reports

## 2025 EAAI Mentored Undergraduate Research Challenge: Playing Word Association Games

Richard G. Freedman

Full article: [http://doi.acm.org/10.1145/3655032.3655035](http://doi.acm.org/10.1145/3655032.3655035)

Education


David S. Rogers

Full article: [http://doi.acm.org/10.1145/3655032.3655036](http://doi.acm.org/10.1145/3655032.3655036)

Book Announcement

### Links

SIGAI website: [http://sigai.acm.org/](http://sigai.acm.org/)

Newsletter: [https://sigai.acm.org/main/ai-matters/](https://sigai.acm.org/main/ai-matters/)

Blog: [https://sigai.acm.org/main/blog/](https://sigai.acm.org/main/blog/)

Twitter: [http://twitter.com/acm_sigai/](http://twitter.com/acm_sigai/)

Edition DOI: 10.1145/3655032

### Join SIGAI

Students $11, others $25

For details, see [http://sigai.acm.org/](http://sigai.acm.org/)

Benefits: regular, student

Also consider joining ACM. Our mailing list is open to all.

### Notice to Contributing Authors to SIG Newsletters

By submitting your article for distribution in this Special Interest Group publication, you hereby grant to ACM the following non-exclusive, perpetual, worldwide rights:

- to publish in print on condition of acceptance by the editor
- to digitize and post your article in the electronic version of this publication
- to include the article in the ACM Digital Library and in any Digital Library related services
- to allow users to make a personal copy of the article for noncommercial, educational or research purposes

However, as a contributing author, you retain copyright to your article and ACM will refer requests for republication directly to you.
Submit to AI Matters!

We’re accepting articles and announce-ments now for the next issue. Details on the submission process are available at https://sigai.acm.org/main/ai-matters/.

AI Matters Editorial Board

Ziyu Yao, Co-Editor, George Mason University
Anuj Karpatne, Co-Editor, Virginia Tech
Sanmay Das, George Mason University
Nicholas Mattei, Tulane University
Alexei Efros, Univ. of CA Berkeley
Susan L. Epstein, The City Univ. of NY
Yolanda Gil, ISI/Univ. of Southern California
Doug Lange, U.S. Navy
Kiri Wagstaff, JPL/Caltech
Xiaojin (Jerry) Zhu, Univ. of WI Madison

Column Editors

Louise A. Dennis, University of Manchester
Dilini Samarasinghe, University of New South Wales
Dongkuan Xu, North Carolina State University

Editor Emerita

Kiri Wagstaff, JPL/Caltech (founding Editor-In-Chief)
Eric Eaton, University of Pennsylvania
Amy McGovern, University of Oklahoma
Iolanda Leite, KTH

Contact us: aimatters@sigai.acm.org
Welcome to the first issue of the AI Matters Newsletter in 2024! This issue will start with a conference report by Dr. Louise A. Dennis. This report particularly summarizes the awarded papers and keynote speeches at HRI 2023, AAMAS 2023, ICAIL 2023, and more! Dr. Richard G. Freedman from Smart Information FlowTechnologies (SIFT) will then present us an exciting, upcoming challenge – the 2025 EAAI Mentored Undergraduate Research Challenge: Playing Word Association Games. Finally, this issue will end with a book review written by Dr. David S. Rogers at the American Military University. In this review article, Dr. Rogers introduced us a new book, titled “Understanding Large Language Models: Learning Their Underlying Concepts and Technologies”, recently written by Thimira Amaratunga and published by Apress.

Submit to AI Matters!
Thanks for reading! Don’t forget to send your ideas and future submissions to AI Matters! We’re accepting articles and announcements now for the next issue. Details on the submission process are available at https://sigai.acm.org/main/ai-matters/.

Ziyu Yao is an editor of AI Matters. She is an Assistant Professor in the Department of Computer Science at George Mason University. Her research interests lie in natural language processing (NLP) and artificial intelligence (AI), particularly building natural language interfaces that can reliably assist humans in knowledge acquisition and task completion. She also works in NLP/AI for other disciplines such as software engineering, education, and health informatics.
This section is compiled from reports of recent events sponsored or run in cooperation with ACM SIGAI. In general these reports were written and submitted by the conference organisers.

18th Annual ACM/IEEE International Conference on Human Robot Interaction (HRI 2023)

Stockholm, Sweden 03/13/2023 - 03/16/2023
https://humanrobotinteraction.org

The 18th ACM/IEEE International Conference on Human-Robot Interaction (HRI 2023) took place in Stockholm, Sweden, on March 13-16 2023. The conference had a hybrid format.

HRI is the annual conference for basic and applied human-robot interaction (HRI) research. Researchers from across the world present their best work at HRI to exchange ideas about the theory, technology, data, and science furthering the state-of-the-art in the field.

The intended audience included researchers, students, and developers in the fields of Human-Robot Interaction, Artificial Intelligence, Interaction Design, and Robotics. We had attendees from universities, government labs, and private industry. 730 participants attended this year’s conference (543 in person; 187 online).

The conference theme for HRI 2023 was “HRI for all” and focused on key HRI theories, methods, designs, studies, and technical advances that aim to understand and promote inclusion and diversity in HRI. We encouraged the community to consider ways to both make the field a more inclusive place for those who may not feel included, as well as to encourage inclusion within our research methods and practices.

This year’s conference received 250 full paper submissions from countries all over the world, including from Europe, Asia-Pacific, South-East Asia, the Americas, Middle East, Oceania, and South America. As a result of the review process, the program committee selected 63 of the submissions (25.2%) for presentation as full papers at the conference. As the conference is jointly sponsored by IEEE and ACM, papers are archived in both the ACM Digital Library and the IEEE Xplore.

The conference proceedings can be found at HRI ’23: Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction and HRI ’23: Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction

Along with the full papers, the conference program and proceedings included Late-Breaking Reports (LBRs), Videos, Demos, Alt.HRI, and a Student Design Competition (SDC) section. Additionally, we had 17 workshops this year, including HRI Pioneers, which promotes and highlights the work of early-career researchers in the field.

We had three excellent keynote speakers, including Drs. Chieko Asakawa (IBM and Carnegie Mellon University; title of talk: Interaction Techniques with a Navigation Robot for the Visually Impaired), Ericka Johnson (Linköping University; title of talk: Robotics Research and Teaching with a Feminist Lens), and Andrea Thomaz (Diligent Robotics; title of talk: Robots in Real Life: Putting HRI to Work).

A number of papers received awards at HRI 2023:

**Best LBR** Introducing Children and Young People with Sight Loss to Social Robots: A Preliminary Workshop. Isobel Voysey, Carl Bettosi, Emilyann Nault, Shenando Stals, Lynne Baillie

**Best Video** Demonstrating TRAinAR: an Augmented Reality Tool that Helps Humans Teach Robots. Andre Cleaver, Jivko Sinapov

**Best Demo** I’m a Robot, Hear Me Speak! Emma Hughson, Paige Tuttosi, Akihiro Matsufuji, Chuxuan Zhang, Angelica Lim

**Best Design in Physical Robot Category.** Making Music More Inclusive with Hospi-
AAMAS 2023
London, UK 05/29/2023 - 06/02/2023
https://aamas2023.soton.ac.uk

The 2023 edition of AAMAS, the International Conference on Autonomous Agents and Multi-Agent Systems, took place from the 29th of May until June 2nd 2023 (https://aamas2023.soton.ac.uk). This year the conference took place in-person in the ExCel conference center in London (UK), after three years of virtual conferences due to COVID. The conference attracted a record number of 993 registered participants (823 to the main conference, some with workshop/tutorials; others are workshop/tutorial/competitions only). As every year, the conference featured an exciting program of contributed talks in 6 parallel sessions, keynotes addresses, tutorials, affiliated workshops, a doctoral consortium, demos, blue sky ideas, and diversity and inclusion activities. Additionally, this was the first AAMAS to offer a competition track.

AAMAS is the largest and most influential conference in the area of agents and multi-agent systems. The aim of the conference is to bring together researchers and practitioners in all areas of agent technology and to provide a single, high-profile, internationally renowned forum for research in the theory and practice of autonomous agents and multiagent systems. AAMAS is the flagship conference of the non-profit International Foundation for Autonomous Agents and Multiagent Systems (IFAAMAS). The conference featured three keynote speakers.

- Karl Tuyls (DeepMind) “Multiagent learning: from fundamentals to foundation models”
- Yejin Choi (School of Computer Science & Engineering at the University of Washington) “Common Sense: The Dark Matter of Language and Intelligence”
- Iain Couzin (University of Konstanz) “Geometric Principles of Individual and Collective Decision-Making”

In addition, one award winner presented a keynote talk at the conference:

- ACM/SIGAI Autonomous Agents Award: Edith Elkind (University of Oxford) “Proportionality in Multiwinner Voting: The Power of Local Search”

Also, the winner of the IFAAMAS Victor Lesser Distinguished Dissertation Award gave a talk as part of the conference program:
Several other awards were given:

**Best paper winner** Trust Region Bounds for Decentralized PPO Under Non-stationarity. Mingfei Sun, Sam Devlin, Jacob Beck, Katja Hofmann and Shimon Whiteson

**Best paper runners-up** Voting by Axioms. Marie Christin Schmidtlein and Ulle Endriss

**Best student paper winner** A Map of Diverse Synthetic Stable Roommates Instances. Niclas Boehmer, Klaus Heeger and Stanislaw Szufa


**Best Demo Award** Demonstrating Performance Benefits of Human-Swarm Teaming. William Hunt, Jack Ryan, Ayodeji Abioye, Sarvapali D. Ramchurn and Mohammad D. Soorati

The proceedings can be found at: [https://dl.acm.org/doi/proceedings/10.5555/3545946](https://dl.acm.org/doi/proceedings/10.5555/3545946)

**ICAIL'23: Nineteenth International Conference on Artificial Intelligence and Law**

_Braga, Portugal, 06/19/2023 - 06/23/2023_  

ICAIL'23: Nineteenth Conference on Artificial Intelligence and Law was organized at the University of Minho Law School, Braga, Portugal and took place on 19-23 June 2023. The conference was organized under the auspices of International Association for Artificial Intelligence and Law (iaail.org) as in-cooperation event with ACM-SIGAI and the AAAI. The main purpose of the ICAIL conferences is to promote research on the broadly understood field of AI and Law, which encompasses, among others, the development of formal and computational models of legal reasoning, representation of legal knowledge and normative systems, application of machine learning models to support and automatize legal tasks and to reflect on ethical and legal considerations concerning applications of AI in legal practice. The target audience of the conference are academics (computer scientists, lawyers, argumentation scholars), but also legal practitioners, representatives of computer science industry, judges, policymakers and researchers involved in access to justice topics.

The 2023 edition of the conference was the first hybrid one, enabling both in-person and online attendance. The main conference was accompanied by 14 thematic workshops and the Doctoral Consortium. Overall, it attracted 294 registrants (196 in-person). There were two keynote speakers: Dr. Natalie Byrom (The Legal Education Foundation, UK), who delivered a talk titled “Increasing Access to Justice: The role of AI techniques” and Prof. Daniel Ho from Stanford Law School, who presented a lecture titled “From Prototypes to Systems: The Need for Institutional Engagement for Responsible AI and Law”. Moreover, Prof. Floris Bex from Utrecht University, acting in his capacity as the IAAIL President, delivered an address titled “AI, Law and Beyond - Transdisciplinary Research for the Future of AI & Law”.

As always, best paper awards winners were selected by the committees appointed by the Program Chair, Matthias Grabmair. The awarded contributions are as follows. Best Paper Award – in honor of Carole Hafner was awarded to David D. Lewis, Lenora Gray and Mark Noel (Redgrave Data) for their paper entitled “Confidence Sequences for Evaluating One-Phase Technology-Assisted Review”. Quinten Steenhuis, Bryce Willey, David Colarusso (Suffolk University) were awarded Peter Jackson Best Innovative Application Paper Award, for the paper “Beyond Readability with RateMyPDF: A Combined Rule-based and Machine Learning Approach to Improving Court Forms”. The Doctoral Consortium Best Paper Award was given to Claire Barale (University of Edinburgh) for her paper "Empowering Refugee Claimants and their Lawyers: Using Machine Learning to Examine Decision-Making in Refugee Law". Finally, the Best Student Paper Award (in honor of Don Berman) was given to Daphne Odekerken, Floris Bex, Henry Prakken (Utrecht University) who co-authored the paper "Justification, stability and relevance for case-based reasoning with incomplete focus cases".
The conference proceedings, edited by the Program Chair Matthias Grabmair, are already available at the ACM Digital Library: https://dl.acm.org/doi/proceedings/10.1145/3594536

13th International Conference on Simulation and Modeling Methodologies, Technologies and Applications
Rome, Italy, 06/12/2023-06/14/2023
https://simultech.scitevents.org

SIMULTECH 2023 was held in Rome, Italy, from July 12 to 14, 2023. It was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC).

SIMULTECH 2023 was also organized in cooperation with the ACM Special Interest Group on Artificial Intelligence, Institute of Engineering and Management, Society for the Study of Artificial Intelligence and Simulation of Behaviour, European Council for Modeling and Simulation, Federation of Asia Simulation Societies, and the Japan Society for Simulation Technology.

SIMULTECH received 67 paper submissions from 28 countries. To evaluate each submission, a double-blind paper review was performed by the Program Committee. After a stringent selection process, 22.39% of the papers were published and presented as full papers, i.e., completed work (12 pages/25’ oral presentation).

In addition to the presentation sessions, SIMULTECH 2023 included outstanding keynote lectures, which are relevant to today’s lines of research and technical innovation. These talks were presented by internationally distinguished researchers, namely:

- Murat Gunal, Fenerbahce University, Industrial Engineering Department, Turkey: Simulation Methods for Improving Healthcare Services: How to Choose the Right Method and to Model a System Right
- Fabio Bruno, University of Calabria, Italy: Simulating Robots Activities and Humans Experiences in Underwater Environment
- Paolo Bellavista, Alma Mater Studiorum, Università di Bologna, Italy: Distributed and Hybrid Digital Twins for Low Latency Applications: The Pros of Exploiting Edge Cloud Computing and the Challenges for Simulation

Additionally, a "Best Paper Award", "Best Student Paper Award" and "Best Poster Award" were conferred during the conference. More information can be found at: https://simultech.scitevents.org/PreviousAwards.aspx

2023 5th International Conference on Artificial Intelligence and Computer Science (AICS 2023)
Wuhan, China, 06/26/2023-06/28/2023
https://www.aicsconf.cn

2023 5th International Conference on Artificial Intelligence and Computer Science (AICS 2023) was held at Zmax Carrey International Hotel and lasted from 9:00 to 18:00 on Jul. 26th, 2023. AICS2023 looked for significant contributions to all major fields of AI technology, computer science and communication science. The aim of the conference was to bring professionals, researchers, engineers, and students of the related fields together to share their latest research results, exploring new areas of research and development. Most of the presenters were doctors, professors from universities from China and abroad, and part of them were engineers in high-tech companies like China Mobile. And the number of audiences is 80. Keynote speakers are listed followed:

**Speaker I:** Prof. Hamid Reza Karimi, Politecnico di Milano, Italy **Title:** Deep Fault Diagnosis and Explainability for Rotary Machines

**Speaker II:** Prof. Huiyu Zhou, University of Leicester, UK **Title:** Learning Uncertainty in Image Understanding

**Speaker III:** Prof. Anand Nayyar, Duy Tan University, Vietnam **Title:** Industry 4.0 and Cyber-Physical Systems

**Speaker IV:** Prof. Hoshang Kolivand, Liverpool John Moores University, UK **Title:** AI in Tomorrow of Augmented and Virtual Reality

**Speaker V:** Prof. Xunwei Zhou, Beijing Union University, China **Title:** On Mutually Inverse Implication

Author Dongzi Xu won the best oral presentation **(Title:** Analysis of Artificial Intelligence Medical Device Standards network:**
Based on Social Network Analysis and TOP-SIS Method).

AICS2023 proceedings was published by Proceedings of SPIE-The International Society for Optical Engineering (ISSN 0277-786X; eISSN: 1996-756X), all published papers can be found through https://www.spiedigitallibrary.org/conference-proceedings-of-SPIE/12803

2023 3rd Guangdong-Hong Kong-Macao Greater Bay Area Artificial Intelligence and Big Data Forum

Guangdong, China, 09/22/2023-09/24/2023
http://www.ic-aibdf.org

The 2023 3rd Guangdong-Hong Kong-Macao Greater Bay Area Artificial Intelligence and Big Data Forum (AIBDF 2023) took place in Guangzhou from September 22 to 23, drawing approximately 500 scholars and experts from around the world. With the rapid rise of the digital economy, artificial intelligence and big data have emerged as pivotal drivers of global economic and social development. This trend has brought together individuals from the realms of research, engineering, and industry to collectively propel innovation and application within the digital economy. The forum focused on modern logistics practices within the context of the digital supply chain, meeting the practical demands of the Greater Bay Area's digital economic innovation and development, and addressing forefront issues in future economic and social development. The conference provided a platform for experts, scholars, engineering professionals, and research personnel in the fields of artificial intelligence and big data to share research outcomes and cutting-edge technology, explore academic trends, broaden research perspectives, strengthen academic research and discussion, and foster collaborative efforts for the industrialization of academic achievements. Notably, we were honored to have distinguished experts in the field of artificial intelligence and big data as keynote speakers. Firstly, Academician Junlong Chen, a Fellow of the European Academy of Sciences, Dean of the College of Computer Science and Engineering at South China University of Technology, and a Fellow of IEEE, AAAS, and IAPR, delivered a presentation on “The Concept of Building the Ministry of Education’s Center for Health Intelligent Perception and Digital Parallel Artificial Intelligence Engineering Research,” providing a valuable opportunity to gain deep insights into the research on health intelligent perception and digital parallel studies. Secondly, we had Prof. Kaisun WU, a Fellow of IEEE and the Associate Vice-President of The Hong Kong University of Science and Technology (Guangzhou), to deliver a presentation titled “Ubiquitous Sensing – Unraveling the Secrets of Contactless and Contact-Based Sensing Technologies”. It revealed the secrets behind ubiquitous sensing technologies and showcased the cutting-edge developments in sensing technology. Additionally, other remarkable presentations were given by Prof. Youhua Chen from City University of Hong Kong (Topic: “Application of Machine Learning in Inventory Models: Insights for New Product and Multi-Product Decision Making”); Prof. Wenhu Zhou from South China University of Technology (Topics: “Research on Regional Medical Resource Allocation Under the Policy of Direct Settlement for Medical Treatment in Different Places”), Prof. Wenming Zuo from South China University of Technology (Topic: “Theoretical Research and Practical Exploration of Industrial Internet”); and General Manager Weimin Liu from SF Medical Supply Chain Co., Ltd. (Topic: “Accelerating Medical Digital Transformation to Build a ‘Healthy Bay Area’ for the Speeding up of Medical Smart Supply Chains). Attendees actively engaged in discussions, exchanged ideas on relevant topics, and shared their unique experiences regarding development trends and research directions. For the papers submitted to this event, a rigorous review process was conducted to ensure the publication of only high-quality research papers. Finally, we would like to extend our special thanks to all the guest speakers, technical committee members, authors, reviewers, attendees, conference partners, and all the members who supported this academic event. It is their support and participation that contribute to such a remarkable academic event.

AI-ML Systems 2023
Bengaluru, India, 10/25/2023-10/28/2023
www.aimlsystems.org
AIMLSystems is a new conference targeting the research in the intersection of Systems Engineering and Artificial Intelligence and Machine Learning techniques.

Through this conference, we plan to examine how immense strides in AI/ML techniques are made possible through advances in the computational systems and how the use of AI/ML can help in the data-driven explorations of the design space of the computational systems. We also investigate how new breeds of AI/ML systems enable new forms of socio-techno-economic systems and they in turn generate new requirements for research in AI/ML techniques.

**AIMLSystems 2023 Statistics**

- Total number of Participants: 269
- Total number of Virtual attendees: 2
- Total number of paid registrations: 163
- Total number of Papers in the Research Track: 22
- Total number of Papers in the Industry Track: 13
- Total number of Demos & Exhibits: 24
- Total number of Workshops: 2
- Total number of Tutorials: 1

**Keynote Speakers**

1. Prof. Christopher Matthew De Sa, Cornell University, USA
2. Prof. Svetha Venkatesh, Deakin University, Australia
3. Prof. Milind Tambe, Google Research & Harvard University, USA
4. Prof. Sanghamitra Bandyopadhyay, Indian Statistical Institute, India

**Awards**

**Best Paper Award in Research Track**

TinyML-Driven On-Device Personalized Human Activity Recognition and Auto-Deployment to Smart Bands. Bidyut Saha (Indian Institute of Technology Kharagpur); Riya Samanta (Indian Institute of Technology, Kharagpur); Soumya Kanti Ghosh (Indian Institute of Technology Kharagpur, India); Ram Babu Roy (Indian Institute of Technology Kharagpur)

**Best Paper Award in Industry Track**

Adapting Open-Source LLMs for Contract Drafting and Analyzing Multi-Role vs. Single-Role Behavior of ChatGPT for Synthetic Data Generation. Jaykumar Kasundra (Thomson Reuters); Shreyans Dhankhar (Thomson Reuters)

**Honorable Mention in Research Track**

LiBERTy: A Novel Model for Natural Language Understanding. Onkar Susladkar (IIT Roorkee); Gayatri s Deshmukh (Vishwakarma Institute of Information Technology); Sparsh Mittal (IIT Roorkee); Sai Chandra Teja R (Independent Researcher); Rekha Singhal (TCS)

**Best Demo - Product**

SWAra ROOPantaran (SWAROOP): A Tool for Transcription, Translation and Speech Synthesis. Amresh Kumar (CABS, DRDO); Dhipu T M (CABS, DRDO); Rajesh R (CABS, DRDO)

**Best Demo - Research**

From Wrist to World: Harnessing Wearable IMU Sensors and TinyML to Enable Smart Environment Interactions. Bidyut Saha (Indian Institute of Technology Kharagpur); Riya Samanta (Indian Institute of Technology, Kharagpur); Soumya Kanti Ghosh (Indian Institute of Technology Kharagpur, India); Ram Babu Roy (Indian Institute of Technology Kharagpur)

**Equity and Access in Algorithms, Mechanisms and Optimization (EAAMO ‘23)**

_Boston, USA, 10/30/2023-11/01/2023_  
[https://eaamo.org/](https://eaamo.org/)

The ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization (EAAMO ’23) took place October 30 - November 1, 2023 at Boston University in Boston, MA, USA. This was the third iteration of the EAAMO conference series, after the EAAMO’22 first in-person conference at George Mason University, USA, and the virtual launch at EAAMO’21.

The conference program highlighted contributions along the research-to-practice pipeline aimed at improving access to opportunity for historically underserved and disadvantaged communities.
communities, as well as mitigating harms concerning inequitable and unsafe outcomes with grounding in the social sciences and humanistic studies.

We extend our heartfelt gratitude to our generous sponsors for their support and commitment to EAAMO’23. The conference is legally and financially sponsored by ACM Special Interest Groups on Artificial Intelligence (ACM SIGAI) and on Economics and Computation (ACM SIGecom) for sponsoring the conference for the third year in a row. In addition, our special thanks go to the University of California, Berkeley, the Boston University, the Rafik B. Hariri Institute for Computing and Computational Science & Engineering, the Artificial Intelligence Journal, the Schmidt Futures Foundation, the Public Interest Technology University Network (PIT-UN), the U.S. Consular Services - and in particular the U.S. Embassy in CDMX - and the Government of Mexico. Their support has been essential in allocating funds to under-represented groups for participating in the conference. Our funders’ support has been used for travel grants for students, registration fee waivers, and speaker honoraria, which has contributed to a diverse and multidisciplinary program. We received over 170 submissions for publication, the largest number so far in the three years since the inception of the conference series. Authors from over 20 countries across the globe, spanning various fields such as research, policymaking, and expertise, all shared a common dedication to enhancing equity and addressing issues in diverse application areas like education, labor, environment, healthcare, algorithmic fairness, and digital platforms. The conference, due to its interdisciplinary nature, attracted a large and diverse group of participants with backgrounds in computer science, operations research, economics, public policy, and the humanities. Many papers showcased a fusion of methodologies and insights from multiple domains, highlighting the conference’s holistic approach. All submitted papers underwent rigorous peer review by experts selected from relevant fields closely aligned with the conference’s themes. We extend our gratitude to 80 reviewers and 20 area chairs who ensured the quality of accepted papers. Out of all submissions, 88 submissions were accepted as oral or poster presentations in the main conference program.

From the accepted papers, 30 were accepted in the second volume of the archival track of the conference: the 2023 Proceedings of EAAMO ’23: Equity and Access in Algorithms, Mechanisms, and Optimization the 2023 Proceedings of EAAMO ’23: Equity and Access in Algorithms, Mechanisms, and Optimization, published by the ACM. The conference awarded the following categories of papers: Best Paper, Best Student Paper, New Horizons, and track awards.

Each of the four days of the conference featured either keynote talks or panel discussions alongside thematically related sessions. Our keynote talks addressed key themes for the conference: digital and data markets, algorithms for societal allocation, sustainability, and past and present inequality. The thematically-related multi-disciplinary sessions for contributed talks represented the wide range of topics and application domains of interest to the conference goals, the combination of novel and diverse methodologies as well as the strong connections of many papers to policy design:

- Allocating Resources: This session focused on the equitable distribution of resources and examined innovative strategies to ensure that historically marginalized communities have fair access to essential assets and opportunities.
- Labor & Money: This session focused on labor market dynamics, financial inclusion, and the impact of algorithmic decision-making on income disparities and wealth distribution.
- Power & Participation: This session explored the role of power dynamics in algorithmic systems and ways to enhance the participation of marginalized communities in decision-making processes.
- Mechanisms for Correction: This session delved into mechanisms and strategies for identifying and rectifying algorithmic biases and unintended consequences, emphasizing the importance of accountability and transparency.
- Respecting Preferences: This session covered topics from mechanism design and algorithms for eliciting and accounting for indi-
individual preferences, both in a static and dynamic sense in allocating outcomes or opportunities.

- Demographics & Representation: This session scrutinized the importance of accurate demographic representation in data and algorithms, with a focus on fairness metrics, implementation, and pipeline issues in fair algorithmic design, with a focus on machine learning.

- Strategic Solutions: The conference concluded with a session on strategic solutions, including interventions for mitigating gaps in access to opportunities, such as fair voting and gerrymandering, testing and education, and social networks dynamics.

The conference had more than 200 in-person participants from 12 countries as well as 90 virtual participants from over 21 countries. The conference program consisted of a single-track program including three keynote talks, one panel discussion, an invited tutorial, contributed talks, and poster presentations across various fields, in addition to a doctoral consortium as well as several networking and mentoring opportunities. The virtual modality of the conference was hosted on the Zoom. The conference succeeded in bridging research and practice by intentionally bringing together researchers, policymakers, and practitioners in various government and non-government organizations, community organizations, and industry. To this end, the conference had a “Research” submission track and a “Policy and Practice” submission track. The conference provided an international forum for presenting research papers, problem pitches, survey and position papers, new datasets, and software demonstrations towards the goal of bridging research and practice. Our keynote speakers spanned practice and research disciplines from Computational Social Science, Social Work, and Computing and Data Sciences. The conference also featured a panel discussion on “Exploring Academia-Adjacent Partnerships for Change in Mexico” featuring experts in public policy, government, and academia, both from Mexico and the United States.

We were fortunate to benefit from a variety of keynote speakers, all joined thematically by related research on marginalized populations. Our keynote speakers included:

- Ridhi Kashyap (Professor of Demography and Computational Social Science at the University of Oxford) Title: The digital revolution and gender inequality
- Yeukai Chideya (Clinical Social Worker and Founder of Ruremekedzo Project) Title: Restoring the Dignity of People in Crisis: A Role for Technology
- Mayank Varia (Associate Professor in the Faculty of Computing & Data Sciences at Boston University) Title: Cryptographically Protected Data Science for All

EAAMO ’23 Awards

- Best Student Paper Award: “30 Million Canvas Records Reveal Widespread Sequential Bias and System-design Induced Surname Initial Disparity in Grading” authored by Jiaxin Pei, Zhihan Wang, and Jun Li.
- New Horizons Award: “Common Voice and Accent Choice” authored by Kathy Reid and Elizabeth T. Williams.
- AI Track Paper Award: “Setting the Right Expectations: Algorithmic Recourse Over Time” authored by Joao Fonesca, Andrew Bell, Carlo Abrate, Francesco Bonchi, and Julia Stoyanovich.

Website & Web Content: Conference-related content will be stored on the eaamo@org domain, at this link. The success of EAAMO ’23 conference relied on the contributions of many individuals and organizations. We thank all authors who submitted work to the conference and we are grateful for their high quality submissions. We are grateful to our sponsors, whose support has been used for travel grants
for students coming from the Global South, registration fee waivers, and speaker honoraria, which has contributed to a diverse and multi-disciplinary program. Finally, no conference will succeed without the strong support of its participants. We would like to thank all the authors and attendees for participating in the conference.

15th International Joint Conference on Computational Intelligence

Rome, Italy, 11/13/2023-11/15/2023
https://ijcci.scitevents.org

IJCCI 2023 was held in Rome, Italy, from November 13 to 15, 2023. It was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC). IJCCI 2023 was also organized in cooperation with the ACM Special Interest Group on Artificial Intelligence, International Neural Network Society, World Federation on Soft Computing, Società Italiana di Reti Neurroniche and European Society for Fuzzy Logic and Technology.

IJCCI received 69 paper submissions from 26 countries. To evaluate each submission, a double-blind paper review was performed by the Program Committee. After a stringent selection process, 31.88% of the papers were published and presented as full papers, i.e. completed work (12 pages/25’ oral presentation).

In addition to the presentation sessions, IJCCI 2023 included outstanding keynote lectures, which are relevant to today’s lines of research and technical innovation. These talks were presented by internationally distinguished researchers, namely:

- Hani Hagras, University of Essex, United Kingdom: Towards True Explainable Artificial Intelligence for Real-World Applications
- Anastasios Tefas, Aristotle University of Thessaloniki, Greece: Deep Learning for Active Robotic Perception
- Sanaz Mostaghim, Otto-von-Guericke-Universität Magdeburg, Germany: Next Generation of Multi-Objective Evolutionary Optimization and Decision-Making Algorithms
- Nikolaus Hansen, Inria & Ecole Polytechnique & Institut Polytechnique de Paris, France: Assessment and Evaluation of Empirical and Scientific Data

Additionally, a Best Paper Award, Best Student Paper Award and a Best Poster Award were conferred during the conference. More information can be found at: https://ijcci.scitevents.org/PreviousAwards.aspx

15th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management

Rome, Italy, 11/13/2023-11/15/2023
https://ic3k.scitevents.org

IC3K 2023 was held in Rome, Italy, from November 13 to 15, 2023. It was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC). IC3K 2023 was also organized in cooperation with the ACM Special Interest Group on Artificial Intelligence.

IC3K received 166 paper submissions from 44 countries. To evaluate each submission, a double-blind paper review was performed by the Program Committee. After a stringent selection process, 19.28% of the papers were published and presented as full papers, i.e. completed work (12 pages/25’ oral presentation).

In addition to the presentation sessions, IC3K 2023 included outstanding keynote lectures, which are relevant to today’s lines of research and technical innovation. These talks were presented by internationally distinguished researchers, namely:

- Tony Bagnall, University of Southampton, United Kingdom: Time Series Machine Learning
- Domenico Lembo, Sapienza Università di Roma, Italy: Combining Entity Resolution and Query Answering in Ontologies
- Luís Paulo Reis, University of Porto, Portugal: Deep Reinforcement Learning for Creating Advanced Humanoid Robotic Soccer Skills
- Yannis Manolopoulos, Open University of Cyprus, Cyprus: Recommendation Systems in Scholarly Publishing
Additionally, a Best Paper Award, a Best Student Paper Award and a Best Poster Award were conferred during the conference. More information can be found at: https://ic3k.scitevents.org/PreviousAwards.aspx

20th International Conference on Informatics in Control, Automation and Robotics

Rome, Italy, 11/13/2023-11/15/2023
https://icinco.scitevents.org

ICINCO 2023 was held in Rome, Italy, from November 13 to 15, 2023. It was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC), and technically co-sponsored by the International Federation of Automatic Control.

ICINCO 2023 was also organized in cooperation with the ACM Special Interest Group on Artificial Intelligence, Association for the Advancement of Artificial Intelligence and International Neural Network Society.

ICINCO received 180 paper submissions from 47 countries. To evaluate each submission, a double-blind paper review was performed by the Program Committee. After a stringent selection process, 20% of the papers were published and presented as full papers, i.e. completed work (12 pages/25’ oral presentation). In addition to the presentation sessions, ICINCO 2023 included outstanding keynote lectures, which are relevant to today’s lines of research and technical innovation. These talks were presented by internationally distinguished researchers, namely:

- Luís Paulo Reis, University of Porto, Portugal: Deep Reinforcement Learning for Creating Advanced Humanoid Robotic Soccer Skills
- Anuradha Annaswamy, MIT, United States: Lessons from Adaptive Control: Towards Real-Time Machine Learning
- Sergio M. Savaresi, Politecnico di Milano, Italy: Autonomous Driving: The Hidden Enabling Technology for a Sustainable Mobility Model

2024 4th International Conference on Artificial Intelligence and Computer Engineering

Online, 11/17/2023-11/19/2023
http://event-icaice.org/

2023 4th International Conference on Artificial Intelligence and Computer Engineering (ICAICE 2023) has been held successfully online on Nov. 17-19, 2023. The idea of the conference is for scientists, scholars, engineers, and students from all over the world to present ongoing research activities related to artificial intelligence and computational engineering, strengthening existing partnerships and fostering new collaborations. ICAICE2023 attracted nearly 150 scholars in related fields to participate online.

Keynote Speakers:

- Prof. Zhu Han, ECE Department and CS Department, University of Houston, USA Speech Title: Mean Field Games Guided Machine Learning in Distributed Systems
- Prof. Zhe Wang, East China University of Science and Technology, China Speech Title: Research on Few-shot Image Generation
- Prof. Xiaolong Xu, Nanjing University of Information Science and Technology, China Speech Title: Big Data-Driven Innovation in Edge Intelligence Services
- Prof. Jingming Xia, Nanjing University of Information Science and Technology, China Speech Title: Catalyzing Meteorological Insights: Exploring the Role of Artificial Intelligence in Atmospheric Science

ICAICE 2023 conference proceedings will be published in ACM International Conference Proceedings Series (ISBN: 979-8-4007-0883-1). The proceedings are currently undergoing typesetting and proofreading, and they will be submitted to ACM for publication very soon.
2023 International Conference on Mathematics and Machine Learning (ICMML 2023)
Nanjing, China 11/24/2023-11/26/2023
https://www.icmml.com/index.html
Keynote Speakers:
1. Prof. Xudong Jiang, Nanyang Technological University, Singapore (Fellow IEEE)
2. Prof. Nikola (Nik) K. Kasabov, Auckland University of Technology, New Zealand (Life Fellow IEEE)
3. Prof. Zhihua Zhou, Nanjing University, China (Fellow ACM, AAAI, AAAS, IEEE)
ICMML 2023 was held in Nanjing, China during November 24-26, 2023. More than 100 scholars attended this conference. The ICMML 2023 conference proceedings will be published in ICPS.

7th ACM Computer Science in Cars Symposium
Darmstadt, Germany 12/09/2023
https://acm-cscs.org/
The 7th ACM Computer Science in Cars Symposium (CSCS) took place on December 5, 2023, at Darmstadt University of Applied Sciences (h_da) in Germany. The conference served as a central meeting point, bringing together experts and enthusiasts to explore the central topics artificial intelligence (AI) and security for vehicles.

The agenda began with a warm welcome at the premises of h_da by Prof. Dr. Nicole Saenger, Vice President for Research at h_da, together with Björn Brücher as General Chair and Prof. Dr. Christoph Krauß as Program Chair. Three keynotes, nine full papers, and three extended abstracts formed the backbone of the conference program, showcasing the latest advances, research results, and innovative approaches in the field of AI and automotive security. Attendees had the opportunity to delve into various topics, gaining insights into the challenges and opportunities of these dynamic fields. At the end of the symposium, attendees voted for the (unofficial) best paper and best extended abstract.

A highlight of the symposium was the exceptional line-up of keynotes delivered by industry and research leaders. Martin Arend (BMW Group, Germany) provided insights into automotive security management systems and Hassan Mohd (Continental Automotive, Germany) discussed cybersecurity regulations impacting Europe. The AI keynote was delivered by Prof. Jan Peters, Ph.D. (Technical University of Darmstadt, Germany), who provided attendees with insights into lessons learned from robot reinforcement learning.

The symposium attracted nearly 50 participants, fostering a collaborative environment conducive to knowledge exchange and networking. Scientists, researchers, and practitioners engaged in insightful discussions, solidifying connections within the vibrant community dedicated to advancing the frontiers of AI and automotive security.

The conference’s success was a testament to the collaborative efforts of its organizers. The general organization was in the hands of Björn Brücher (Intel Germany) as General Chair. The carefully crafted program was a collaborative effort of Program Chair Prof. Dr. Christoph Krauß (h_da), Co-Chairs Prof. Dr. Mario Fritz (CISPA Helmholtz Center for Information Security, Germany), Prof. Dr. Hans-Joachim Hof (Technical University of Ingolstadt, Germany), and Prof. Dr. Oliver Wasenmüller (Mannheim University of Applied Sciences, Germany) with the support of 20 reviewers from academia and industry. Special recognition goes to the Web Chairs and Local Organization Chairs, whose dedication was instrumental to the success of the event: Dominik Bayerl (Technical University of Ingolstadt, Germany), Timm Lauser (h_da), Lukas Kaupp (h_da), Jana Brücher (Munich University of Applied Sciences, Germany), and Dr. Oliver Grau (Intel Germany).

The proceedings of the symposium have been published in the ACM Digital Library as “CSCS ’23: Proceedings of the 7th ACM Computer Science in Cars Symposium”. This collection captures the depth and breadth of insights shared during this collaborative exploration of AI and security in the automotive domain.

2023 International Conference on Information Education and Artificial Intelligence (ICIEAI 2023)
Xiamen (online), China, 12/22/2023-12/24/2023
2023 International Conference on Information Education and Artificial Intelligence (ICIEAI 2023) was held in Xiamen(online), China on December 22-24, 2023. The conference focused on information-based education, artificial intelligence and other research fields, and invited experts and scholars to introduce research on how artificial intelligence in education can help society meet its needs of providing inclusive and fair high-quality education and promoting lifelong learning for all. The conference focused on how AI shapes and can shape education in all walks of life, how to advance the science and engineering of AI-assisted interactive learning systems, and how to promote widespread adoption.

This conference provided an authoritative international exchange platform for researchers in related fields, promoted good academic exchanges among scholars in related fields, and promoted the development and application of theories and technologies in this field in universities and enterprises.

Keynote speakers and titles of their talks:

- Prof. Zehui Zhan, C-STEAM Education and Technology-supported Pedagogical Innovation
- Assoc. Prof. Haoliang Wang, New open online Teaching Mode and Its Application in Maritime Education
- Prof. Longkai Wu, International Comparative Analysis: Pioneering Educational Technology in Modern Education
- Prof. Yongjun Feng, A Pilot Research on the Selection and Evaluation of a New Round of “World first-class” Universities in the Context of Chinese-style Modernization
- Prof. Hui-Yu Zhou, Artificial intelligence and its applications in remote sensing

The proceedings can will be published by ICPS.
Abstract

The topic for EAAI 2025’s Mentored Undergraduate Research Challenge is Playing Word Association Games. What does that mean? Where are the applications? How can you get started? We break down the topic, discuss applications, and explore project ideas in this column.

Introduction

The EAAI Mentored Undergraduate Research Challenge invites undergraduate students to team up with research mentors and participate in an artificial intelligence (AI) research project from start to finish. For 2025, the specific challenge is for students to research and develop a bot that can play a word association game similar to Apples-to-Apples™ and a number of other board games. The recent innovations in large language models (LLMs) has created quite the buzz, but there has been a long history of research in AI for natural language understanding and information retrieval. Furthermore, games with a social component such as word association games introduce additional challenges that involve understanding other players beyond their strategies. How can computational systems use AI to think about others’ preferences and interests? How should a bot make decisions that align with its own artificial persona? These are just a few project ideas that relate to the challenge topic, but they are far from all the possibilities.

Not sure where to start? Do not worry, this column has you covered! We break down the buzzwords, clarify the concepts, and dig into the details so that you can identify your perfect research project for the challenge. After describing the word association game, we give a brief overview of related research areas that might be helpful for getting started. In particular, we go over some natural language and information retrieval methods to introduce possible starting approaches for making word associations. Then, we discuss some cognitive modeling efforts to get you thinking about how your bot can play appropriately with other people and/or bots. This column ends with more details about forming a team and registering for the 2025 EAAI Mentored Undergraduate Research Challenge. We look forward to seeing all the cool and creative projects you come up with for the challenge—happy researching!

What are Word Association Games?

Word association games typically involve players choosing a word that has some relation to a specified target word, phrase, image, etc. (we will use the term “target”). Improvisation activities and ice-breakers at events lack structure and simply challenge people to say whatever comes to mind that makes sense. However, a number of board games have added structure to this social activity in the form of cards containing words and targets. Players take turns in the role of judge selecting a card with a target (usually at random) and deciding a winner for the “best” associated word to the chosen target. The other players have a collection of cards with words in their hand, and each player must choose one of those cards to submit to the judge as their associated word for the target. In an attempt to keep submissions anonymous, the players submit their cards face-down and the judge shuffles the submissions so that they do not know who submitted each word card. The choice of “best” is in quotes because the player in the current judge role has no rules about how to select a winner for the turn, which means players submitting a card with a word on it need to consider what the judge would label a good choice.

Regardless of the role a player has each turn, they will select one word card from an array of word cards to be the “best” word association with the target card. For the players not in the judge role, their personal hand of word cards...
represent that array. All those players’ chosen word cards serve as the array for the player in the judge role; the judge does not interact with cards from their hand. The greatest difference between the roles is the criteria for selecting the “best” word card because the player in the judge role defines “best.” Each player not in the judge role needs to figure out what the judge will define as “best,” and the player in the judge role needs to apply their definition of “best.” If the players all know each other, then understanding each player’s definition of “best” for word associations might come easily from past experiences and familiarity with their personality—an inside joke might become the “best” word association even if the target card and word card typically have little to do with each other. When the players are less familiar with each other, then it is important to observe which word cards the player selects while they are judge—do the judge’s decisions imply any preferences, biases, or trends besides the association of the words? If you are the judge that turn, then what criteria do you apply when selecting the “best” word association for the target?

For teams who want to see their bots play together in this year’s challenge, we will use word cards and target cards that resemble the word association game Apples-to-Apples™ (Mattel, 2008). Our word cards will list one noun (no proper nouns) per card, and each target card will list one adjective. The list of available words and targets could vary between games similar to how different editions of a game will have its own unique cards, but we will provide a default list for teams who wish to have their bot play with other teams’ bots in case their word association selection method requires a precomputed ontology, knowledge base, or machine learning model. What do these have to do with making decisions about word associations? Keep reading onwards to find out!

**How Could AI Associate Words?**

Information retrieval studies how to generate and apply knowledge, and its applications are all around us from search engines (Croft, Metzler, & Strohman, 2009) to finding related works (Bela & Jörn, 2009). Natural language understanding studies how our textual content translates to concepts for the purposes of knowledge, communication, and more. If you are wondering how these relate to playing word association games, it comes down to handling the word association tasks more than playing the game itself. Say the target word is “sticky;” what sort of words go with sticky? How did you make those connections between the words? How could a machine choose those words and/or make similar connections?

One way to think about it is how frequently the words appear together because adjectives are usually near the nouns they describe: a sticky situation, some sticky glue, a tree branch with sticky sap, and so on. **N-grams** count how often certain words appear together out of all possible sequences of \( n \) words (Jurafsky & Martin, 2000). Despite how simple this sounds, text prediction for autocompletion has had success using \( n \)-grams (Yazdani, Safdari, Golkar, & Niakan Kalhori, 2019). You can also consider multiple values of \( n \), but keep in mind that words that are nearby do not always imply correlation. Negation terms such as ‘not’ might appear in your \( n \)-grams, but the context of negation does not count against those words being nearby.

Another thing to consider is whether the words share a common theme. A popular collection of methods for this during the 2000s and early 2010s was topic modeling (Blei, Ng, & Jordan, 2003), and more recent approaches consider variational autoencoders (Srivastava & Sutton, 2017). In general, these methods aim to group words that appear together frequently in related text documents or snippets. For example, one group might contain sticky alongside tape, glue, attach, and blob; another group might contain sticky alongside mud, sap, honey, goo, and guano. The former group could be about arts and crafts while the latter seems to focus on natural things from the great outdoors. We assume this from our experiences with the words and their definitions, but it is not guaranteed to be accurate because the machine lacks the definitions and themes of the source material. Topic models assume that the theme is missing information that justifies the identified group of words.

In fact, LLMs have much in common with these **latent semantic analysis** approaches...
(Landauer, 1998) given the patterns that these methods try to find both involve hidden variables. Like a known unknown, we define the hidden variables as “something is responsible for a correlation that we observe, but we do not quite know what that something is to directly observe it.” As humans designing these model structures, we might have a hunch from our experiences, like figuring out the topics describing each cluster of words above. However, the statistical methods and/or learned models lack the same context such that the most meaning these hidden variables have to machines are values whose assignment contribute to the improved conditional likelihood, utility function, etc. The people who wrote the original documents knew the context influencing what they wrote, but the learning algorithm only has access to the text output without the authors’ thought process and inspirational context. Thus, the machine invents its own patterns to mimic the observations regardless of the true process that generated the original (Shanahan, McDonell, & Reynolds, 2023)—this is why some call LLMs “parrots” (Bender, Gebru, McMillan-Major, & Shmitchell, 2021) rather than thinking for themselves (Wei et al., 2022).

Explicit semantic analysis aims to address the concern of no context by generating definitions. The earliest work of which the author is aware used the titles of Wikipedia articles as features, creating a vector measuring how frequently each word appears in the respective article (Gabrilovich & Markovitch, 2009). Even if the machine does not know what the titles’ words mean semantically, there is a correlation between grounded concepts that we can inspect and understand as people. If all the words in a sentence have a reasonable amount of presence in one of the Wikipedia articles, then we can associate what those words have in common through that feature name (Wikipedia article’s title) rather than with a mysterious random variable and its assigned values. Other examples include query facets (Kong & Allan, 2013) and Bayesian Case Models (Kim, Rudin, & Shah, 2014).

How Could AI Consider Others and Itself?

In the earlier days of AI research, game-playing research considered traditional strategy games where everyone is an adversary competing to win through making “better” decisions. The adaptation of game theoretic methods from economics was a key approach because playing these types of games satisfied many of the assumptions underlying game theory, especially that everyone plays rationally to optimize their outcome given that everyone else is also optimizing their outcome (Tadelis, 2013). Most the research considered state representations, heuristics, algorithms, and shortcuts that could handle a computer’s limited resources when playing games live because these applications were not off-line studies of behavior; time limits and memory constraints matter (Russell & Wefald, 2003). More recent game playing research in AI for Poker (Moravčík et al., 2017) and Hanabi (Bard et al., 2020) add strategies that deal with the complexity of reasoning over partially observable information and nondeterminism not just on the game state, but also within the other players’ minds for their strategies and private knowledge about the game state.

The majority of these studied games favor computational power as sufficient criteria for scaling good performance. That is, increasing resources to make more calculations over less time often improves game-playing performance. Moravec’s paradox (Moravec, 1990) points out that computers can outperform people in such reasoning tasks because they are designed to compute things (what a surprise), but people are more competent than machines at many other tasks that do not have such formulaic solutions. This is why vision, signal processing, and natural language have been popular areas of study in AI with so much potential for discovery! We take our abilities for granted, but machines still struggle to do these tasks well even with the rapid performance improvements that came from deep learning (Waldrop, 2019). With this motivation, let’s consider why game theory might not help us as much with word association games.

The biggest issue is defining the outcomes of actions because they are not payoffs in the traditional sense. We cannot simply assign point
values to every card combination because the word association validity is one of two criteria in scoring. The changing judge introduces the other criteria because each judge has a personal evaluation for every word association, and their perspective likely differs from yours. This comes from many factors including cultural background (Kirby, Dowman, & Griffiths, 2007), life experiences, knowledge of vocabulary, and other qualitative factors. There is no universal quantitative measure for which words go better with certain targets. Someone might associate sticky with dog because of a childhood memory where their pet dog rolled in the mud and got leaves stuck to its fur, but another person might find no reason for a dog to be sticky without such a moment in their past. Worst case, a judge who wishes to be a troll and violate the players' expectations might select the card whose word is least associated with the target or even pick a card at random—yikes!

If we know the judge's personal evaluation of each word compared to the target word, then we can start to make some informed decisions. The optimal move is to play the card from your hand whose word has that judge's greatest score with respect to the target because the judge will perceive it to have the greatest value among your hand's options. Next, to break ties when hands have multiple cards that are each worth the greatest score for that judge, you might consider which of those words is more flexible in general. The expected value of a word's association with possible targets and possible judges implies whether that card is niche or likely usable for later rounds of play. In such a case when the immediate value is relatively equal, the long-term value might indicate a card to keep for later so that it is rational to play the more niche card that has the lesser expected payoffs for future situations. Of course, we could delve deeper into considering which cards were already played to know when you can safely play a less associated niche card because it would score enough to win without the competition, etc. However, the cards that other players have around the table are random with no obvious clues regarding the words against which your cards' words are competing. You also do not always know how familiar other players are with each other to have an advantage on knowing the current judge's personal evaluation of words compared to the target.

Regardless of whether your bot tries to do all these complex computations for playing a word association game, in which ways could the bot consider how much a particular judge evaluates the card values? Preference modeling (Rossi, Venable, & Walsh, 2011) and theory of mind (Langley, Cirstea, Cuzzolin, & Sahakian, 2022) each study how an agent thinks about what other agents do and want. There are many ways for one agent to represent what it believes is inside another agent's mind. When an agent like your bot observes another agent make a choice, then your bot can store information about that choice and what that choice implies. For example, if the player in the judge role chooses 'candy' for sticky, does your bot decide that the judge simply believes candy is a better match than the other words? Does this particular judge prefer sweets and confectionaries compared to the other cards' words' categories? Until there is more information, the bot can keep track of various hypotheses (Hutson, 2023). Bayesian updates on a prior distribution is one way to keep track of these hypotheses through accumulating the observations that support each one (McCann, 2020).

Flipping the tasks around, what should your bot choose to do when it plays the role of judge? While it might sound strange to design a personality with preferences for your bot because it is a computer program, this adds an important factor for a social game like this one. In fact, the chatbot Eugene Goostman (Aamoth, 2014) was the first of its kind to pass a formal Turing Test because the content Eugene generated aligned with the specified personality. How did choppy English sentences (this was before LLMs) pass as reasonable behavior? The developers made the bot's origin be from a country where English is not the native language, and they set the bot's age young enough to not have a chance of learning to speak English with fluent proficiency. Training the bot on content that aligns with the specified interests and preferences further cemented what it knew when engaging in conversations. When Brian Christian participated in the Turing Test as one of the humans convincing judges that he was not a chatbot, he realized these sort of properties,
from personality to genuine experiences, were what made him different from the machines (Christian, 2012). This is not advocacy for your word association game-playing bot to go compete in the Turing Test, but it does provide context for things you can consider that will make your bot unique when it is the judge—what do other bots and human players need to figure out about your bot in order to choose favorable cards from their hand? How will your bot communicate these trends based on the cards other players present for association with the target?

One Last Thing: Being Transparent!

Although we can throw together some code and use a few AI algorithms to create a bot that plays word association games, it is important to keep in mind that there are additional considerations. Even if the bot you create can make word associations and consider other people’s preferences, how do you know that it is playing the word association game well and consistently? Do you trust that your algorithms, data (if using machine learning-based methods), and knowledge representations are working consistently? If so, then why? Is it good enough that you believe it works because of the code or some extensive testing? Will that justification be good enough for other people?

Many of them will not be able to read or write code themselves, and simply claiming that our systems work is not the most comforting reassurance. In fact, biases in datasets (Mehrabi, Morstatter, Saxena, Lerman, & Galstyan, 2021), the risks of human error in programming, and malicious actors taking advantage of exploits in knowledge representation models (Microsoft, 2016; Ren, Zheng, Qin, & Liu, 2020) give users even fewer reasons to be comfortable with intelligent systems that act like black boxes. From our own perspective as AI researchers, if we do not fully understand what is going on, then can we guarantee consistent performance? If not, when will our bot fail through making a “wrong” decision? Everyone makes mistakes, but understanding our mistakes is what allows us to improve—our intelligent systems currently do not have such capabilities in most the traditional AI algorithms. While reinforcement learning can give out negative rewards to dissuade repeating the same bad decision in the future, this assumes the reward function is accurate and properly defined (Amodei et al., 2016; Griffith, Subramanian, Scholz, Isbell, & Thomaz, 2013). Overall, everyone has stakes in reliable AI systems, and we need a means of providing evidence that supports reliability.

Transparency is a growing area of interest in AI to provide that evidence, and it is a responsibility we should keep in mind as we develop intelligent systems that others will have to use in their everyday lives. Two of the more popular means of transparency include explainability (Gunning & Aha, 2019) and interpretability (Rudin, 2019). Explanations are more post-hoc such that the AI system provides a human-understandable justification for the decisions it makes; this answers questions such as “why did you do that?” Right or wrong, a justification gives people the opportunity to assess how the algorithms, data, and knowledge play a role in generating output. In contrast, interpretability is more pre-hoc such that the AI system’s information and processes are human-understandable for inspection before use; this answers questions such as “if this were to happen, what would you do?” Interpretable models and methods that are sufficiently summarized through text and/or visualizations enable people to explore the capabilities and edge cases of the system in advance of general use. Which of these approaches do you prefer for getting to know how your bot actually plays word association games?

Transparency is by no means restricted to just explanations and interpretable models, though. One method that IBM’s Watson used while playing Jeopardy (Ferrucci et al., 2010) is a confidence score. The author of this column remembers being an undergraduate student just learning about AI research at this time, and Watson was a huge inspiration as it correctly answered questions consistently and faster than the human champions. Alongside its response, Watson listed the top three answers ranked with a confidence score (greater implies more confidence in that response). This mattered most on the Final Jeopardy challenge asking about a city in the United States because Watson replied “What is Toronto?,” which is a city in Canada (IBM, 2011). Although we do not know what infor-
mation Watson consulted nor how it used that information, we do know that Watson’s confidence in this response was absurdly low and just barely higher than the next-most-confident responses. Suddenly, we have a way to represent “I do not know” even if the AI system is not programmed to acknowledge that it is struggling to find the answer, and a person can accept “I do not know” as an indicator to ignore this particular output. This is more reassuring than thinking that Watson is confident in its incorrect response.

Other Project Considerations

In addition to the research challenges described above, there are a few alternative projects that teams may consider that align with this year’s challenge. Special thanks to those listed in the acknowledgments below for their thoughtful contributions on these. First, because LLMs are very popular right now, what roles can they play? Relying on prompt engineering for the bot’s decision making during gameplay is a rather dangerous practice given the lack of transparency behind how they work, bias in training documents (Acerbi & Stubbersfield, 2023; Kotek, Dockum, & Sun, 2023), and potential to hallucinate incorrect information or justifications (Smith, 2023; IBM, 2023). However, using them as a text generator can be a beneficial means of dataset creation or augmentation. If you need example sentences with ‘sticky’ in order to establish its n-grams, generate topic models, or retrieve some other information from natural language, then the LLM can produce those sentences based on the documents it received for training that included ‘sticky’ or related words. Whether the generated sentence is an accurate statement or not does not matter as much when you care about the combination of words in the sentence. Second, there are plenty of other word association games besides Apples-to-Apples. Most of them continue to use the described structure above of “choose a word from a list of options that best relates to a target, and then the judge decides which of those choices is the most related,” but they can have some nuances to the list of options, targets, and judges that lead to different games. If your team identifies an alternative word association game that introduces different challenges for developing a bot that can play it, then feel free to share your experiences on creating a bot to play that word association game!

Participating in the Challenge

The EAAI 2025 Mentored Undergraduate Research Challenge invites teams of students and mentors to work together on a research project involving playing word association games—the goal is to complete a feasible project and submit a paper about the research to EAAI 2025. As these projects can become ambitious, it is important that students focus on one idea of interest and think of a simple task within that idea. Mentors are expected to be involved as guides for the students to evaluate feasibility, provide tips and ideas, and teach the research pipeline from observation and ideation, to the scientific method, to presenting results in a full paper. To provide a starting point for teams, we plan to make available code for a game server and a simple bot client in several programming languages so that students can focus on the AI research even if they are not familiar with game-playing bots or a specific programming language. If you create a bot client in another programming language, we will be happy to include it for others who might consider that language as well. Such resources and up-to-date information about the challenge will be available at https://www.yetanotherfreedman.com/resources/challenge_p wag.html.

If you are interested in AI techniques that think about finding the best word matches based on the players around the table, then we encourage you to consider participating in this challenge. Please make sure to form a team that meets the following requirements:

- At least one undergraduate researcher who has not completed a post-secondary education degree. Students in community college are also eligible for this role. Students in this category are expected to play a significant role in the project.
- At least one mentor actively engaged in research who either received a Ph.D. or works in a position involving undergraduate/community college student mentorship. This can be a faculty member at an aca-
A postdoctoral fellow, or a researcher in industry who has experience training undergraduate students in research. Mentors in this category are expected to be involved with the students regularly to guide them along their journey.

• As long as the above two roles are satisfied, additional team members are allowed. Additional members may include graduate students as long as the undergraduate researchers are actively involved in the research process (ideas, experiment design, paper writing, etc.). Graduate students may also provide additional mentorship to the undergraduate students, but they cannot serve as a substitution for the mentor’s participation.

Once you form a team, please contact the author of this column with the names, e-mail addresses, and roles (mentor, undergraduate student, etc.) of all team members to register your team in the challenge.

There are no limits to team sizes or number of teams per institution. However, due to conference logistics, there will be a limit on the number of accepted papers for publication and presentation at EAAI 2025. All submitted manuscripts will undergo peer review for writing quality, evidence of quality research at the undergraduate level, and relevance to the topic of playing word association games. We look forward to seeing your exciting and creative research on this topic!

Acknowledgments

The author would like to thank Todd W. Neller for establishing the Mentored Undergraduate Research Challenge and all his efforts organizing past challenges; his time and guidance while preparing for the challenge since 2023 has been invaluable. The author also thanks Calin Anton, Justin Stevens, and Jason R. Wilson for their discussions and feedback on this year’s topic and challenge details.

References


What artificial intelligence teaches us about being alive. USA: Anchor Books.


AI MATTERS, VOLUME 10, ISSUE 1  MARCH 2024


Richard G. Freedman is a Researcher at SIFT. In his quest to understand how machines can more naturally interact and play with people, Freedman studies the intersection of artificial intelligence and human-computer/robot interaction. Freedman enjoys sharing opportunities that inspired him, introducing STEAM to K-12 and research to undergraduates.

David S. Rogers (American Military University; david.rogers90@mycampus.apus.edu)
DOI: 10.1145/3655032.3655036

Introduction


Review

This timely book explores Large Language Models (LLMs). It begins with the lineage of these artificial intelligence (AI) systems and natural language processing (NLP). It discusses LLM architectures, what makes LLMs unique, and the future of these models. Although this is not a programming book, it provides a foundation for understanding these powerful tools. If you are an LLM manager, designer, or architect, you should read this book.

Chapter 2 discusses trade-offs in varying LLMs. Good examples are bag-of-words versus Word2Vec, N-Grams versus neural language models, and gated-recurrent units versus long-short-term memory. These comparisons are beneficial from a practical perspective. The argument for recurrent neural networks—critical to GPT models—is both intuitive and descriptive. One thing that struck me about this book is the density of information. Amaratunga introduced many topics quickly, but fundamental understanding requires rereading and digesting material over time.

Chapter 3 addresses transformers. These are not gigantic robots. Instead, they are a method of maintaining neural network attention to a topic, enabling models to focus on relevant information. Three vectors are important: query, key, and value. These are fed to attention, SoftMax, and context functions. Amaratunga provides an excellent diagram of this architecture that includes the encoders and decoders. Finally, there are many Python code examples to get programmers on the right track.

Chapter 4 covers the differentiating factors between LLMs and transformers. At a fundamental level, these factors are the number of parameters and the size of the data set. That's a starting point, but you need massive computational power and fine-tuning. The result is a wide array of capabilities. This chapter analyzes trade-offs and optimal designs to advise organizations and LLM architects. Some things to consider are overfitting, interpretability, complexity, and engineering difficulty. This chapter is an excellent guide to LLM architecture and management.

Chapter 5 concludes the book, addressing popular LLMs. It begins with the Generative Pre-trained Transformer (GPT). OpenAI's GPT was successfully semi-supervised to overcome earlier LLM shortcomings. The advantage is that it takes fewer epochs to fine-tune the model. OpenAI was concerned about the misuse of their powerful tool and found little evidence that it was being misused as of late 2023. This chapter covers GPT deeply but does not address other models at the same level, such as BERT or PaLM.

Chapter 6 is reserved for threats, opportunities, and misconceptions. It describes AI in three categories: weak AI (all we have now), artificial general intelligence, and artificial super intelligence. There are societal risks associated with the higher levels of AI. However, ChatGPT seems to pose little threat to society. If you believe Kurzweil, the higher-level risks may be closer than expected. Amaratunga describes a vocabulary of misconceptions and identifies many opportunities.
Summary

I appreciated several aspects of this book and recommend it highly for designers and practitioners. Most of all, I liked the architectural models that explain the high-level structure of these solutions. I also enjoyed the coding examples; these would significantly help beginning LLM programmers. Still, I want more in-depth coverage of the underlying libraries and concepts. This book whetted my appetite for deeper study into LLMs.

Reviewed by Dr. David S. Rogers, American Public University System, david.rogers90@mycampus.apus.edu

Dr. David Rogers DBA, MS, MBA, MS, CBE Is a part-time faculty at the American Military University teaching science, technology, engineering, and math. He served in the U.S. Army and worked in the finance industry for 30 years.