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Artificial Intelligence in Medicine

18th International Conference on Artificial Intelligence in Medicine, AIME 2020
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Preface

The European Society for Artificial Intelligence in Medicine (AIME) was established in 1986 following a very successful workshop held in Pavia, Italy, the year before. The principal aims of AIME are to foster fundamental and applied research in the application of artificial intelligence (AI) techniques to medical care and medical research, and to provide a forum at biennial conferences for discussing any progress made. Hence, the main activity of the society thus far is the organization of a series of biennial conferences, held in Marseilles, France (1987), London, UK (1989), Maastricht, The Netherlands (1991), Munich, Germany (1993), Pavia, Italy (1995), Grenoble, France (1997), Aalborg, Denmark (1999), Cascais, Portugal (2001), Protaras, Cyprus (2003), Aberdeen, UK (2005), Amsterdam, The Netherlands (2007), Verona, Italy (2009), Bled, Slovenia (2011), Murcia, Spain (2013), Pavia, Italy (2015), Vienna, Austria (2017), and Poznan, Poland (2019).

In the last decade, there were discussions within the AIME society to make the AIME conference truly international (initially it was a European conference) and host it in North America, but those plans could not be realized. For the first time in the conference's history, it was supposed to be hosted in North America in 2020. This event came with real excitement and was a huge step for the conference and the community. However, due to the global COVID-19 pandemic, the decision was made to forgo an in-person meeting for a virtual one. This volume contains the proceedings of AIME 2020, the International Conference on Artificial Intelligence in Medicine, hosted virtually by the University of Minnesota in Minneapolis, USA, August 25–28, 2020.

The AIME 2020 goals were to present and consolidate the international state of the art of AI in biomedical research from the perspectives of theory, methodology, systems, and applications. The conference included two invited keynotes, full and short papers, tutorials, a COVID-19 themed workshop, a plenary session panel, and a doctoral consortium.

In the conference announcement, authors were invited to submit original contributions regarding the development of theory, methods, systems, and applications for solving problems in the biomedical field, including AI approaches in biomedical informatics, molecular medicine, and health-care organizational aspects. Authors of papers addressing theory were requested to describe the properties of novel AI models potentially useful for solving biomedical problems. Authors of papers addressing theory and methods were asked to describe the development or the extension of AI methods, to address the assumptions and limitations of the proposed techniques, and to discuss their novelty with respect to the state of the art. Authors of papers addressing systems and applications were asked to describe the development, implementation, or evaluation of new AI-inspired tools and systems in the biomedical field. They were asked to link their work to underlying theory, and either analyze the potential benefits to solve biomedical problems or present empirical evidence of benefits in clinical

practice. All authors were asked to highlight the value their work created for the patient, provider, and institution through its clinical relevance.

AIME 2020 received 103 submissions across all types of paper categories. Submissions came from 28 countries, including submissions from Europe, North and South America, Asia, Australia, and Africa. All papers were carefully peer reviewed by experts from the Program Committee, with the support of additional reviewers, and by members of the Senior Program Committee Committee – a new review layer introduced in AIME 2020. Each submission was reviewed in most cases by three reviewers, and all papers by at least two reviewers. The reviewers judged the overall quality of the submitted papers, together with their relevance to the AIME conference, originality, impact, technical correctness, methodology, scholarship, and quality of presentation. In addition, the reviewers provided detailed written comments on each paper, and stated their confidence in the subject area. One Senior Program Committee member was assigned to each paper and they wrote a meta-review and provided a recommendation to the scientific chair.

A small committee consisting of the AIME 2020 scientific chair, Dr. Nitesh Chwala, and the conference co-chairs, Dr. Martin Michalowski and Dr. Robert Moskovitch, made the final decisions regarding the AIME 2020 scientific program. This process began with virtual meetings starting in June 2020. As a result, 34 long papers (an acceptance rate of 33%) and 9 short papers were accepted. Each long paper was presented in a 20-minute oral presentation during the conference. Each regular short paper was presented in a 5-minute presentation and by a poster. The papers were organized according to their topics in the following main themes: (1) Deep Learning; (2) Natural Language Processing; (3) Predictive Modeling; (4) Image Processing; (5) Unsupervised Learning; (6) Temporal Data Analysis; (7) Clinical Practice Guidelines; (8) Information Retrieval; and (9) Bioinformatics.

AIME 2020 had the privilege of hosting two invited keynote speakers: Dr. Edward H. Shortliffe, Chair Emeritus and Adjunct Professor in the Department of Biomedical Informatics at Columbia University, USA, giving the keynote entitled “AI Today: Are We Forgetting Our Roots?,” and Dr. Vimla L. Patel, Senior Research Scientist and Director for the Center for Cognitive Studies in Medicine and Public Health at The New York Academy of Science, USA, describing “Human Cognition: A Guide to the Evolution of AI in Medicine.” AIME 2020 also hosted an invited panel during the main conference that focused on the effects of the global pandemic on AI in medicine research and implementation. Panelists were academic and industry experts from the USA, Canada, China, the UK, and Israel.

The doctoral consortium received six PhD proposals that were peer reviewed. AIME 2020 provided an opportunity for these PhD students to present their research goals, proposed methods, and preliminary results. A scientific panel consisting of experienced researchers in the field provided constructive feedback to the students in an informal atmosphere. The doctoral consortium was chaired by Dr. Mary Regina Boland.

One workshop was organized before the AIME 2020 main conference. This workshop focused on the challenges and problems data science and AI can address related to the global pandemic, and relevant deployments and experiences in gearing AI to cope with COVID-19. The workshop was chaired by Dr. Martin Michalowski and Dr. Robert Moskovitch, with invited extended abstracts presented by experts in the

public and private sectors from around the globe. The work from this workshop will be extended and presented in a special journal issue devoted to the topic.

In addition to the workshops, three interactive half-day tutorials were presented prior to the AIME 2020 main conference: (1) Methods and Applications of Natural Language Processing in Medicine (Rui Zhang, University of Minnesota, USA); (2) Large Scale Ensembled NLP Systems with Docker and Kubernetes (Raymond Finzel, University of Minnesota, USA), (3) The Overview Effect: Clinical Medicine and Healthcare Concepts for the Data Scientist (Anthony Chang, Children's Hospital of Orange County, USA).

We would like to thank everyone who contributed to AIME 2020. First of all, we would like to thank the authors of the papers submitted and the members of the Program Committee together with the additional reviewers. Thank you to the Senior Program Committee for writing meta-reviews and to members of the Senior Advisory Committee for providing guidance during conference organization. Thanks are also due to the invited speakers and panelists, as well as to the organizers of the tutorials and doctoral consortium panel. Many thanks go to the Local Organizing Committee, who helped plan this conference and transition it to a virtual one. The free EasyChair conference system (<http://www.easychair.org/>) was an important tool supporting us in the management of submissions, reviews, selection of accepted papers, and preparation of the overall material for the final proceedings. We would like to thank Springer and the *Artificial Intelligence Journal* (AIJ) for sponsoring the conference and the Association for the Advancement of Artificial Intelligence (AAAI) for establishing a cooperative agreement with AIME 2020. Finally, we thank the Springer team for helping us in the final preparation of this LNAI book.

July 2020

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