IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Workshop on Artificial Intelligence for Accelerating Fusion and Plasma Science

IAEA Headquarters, Vienna, Austria

28 November – 1 December 2023

Ref. No.: EVT2205764

Information Sheet

Introduction

Over the past decade, artificial intelligence (AI) has evolved rapidly, becoming increasingly sophisticated and capable of solving ever more complex problems. AI is deployed in sectors as diverse as manufacturing, transportation, finance, education and healthcare. AI methods are used in data analysis, theoretical modelling and experiment design, helping to accelerate fundamental science and advancing technological innovation. A particular area that benefits from the application of AI is fusion and plasma science discovery. With its ability to solve large and complex problems, AI can aid experiments and scientific discovery through modelling and simulations. These applications of AI are included in a five-year IAEA coordinated research project aimed at accelerating fusion research and development. The results of this workshop will feed into the coordinated research project.

Objectives

The purpose of the event is to provide a platform for researchers, developers, practitioners, entrepreneurs and policymakers to discuss artificial intelligence applications to accelerate fusion and plasma science; and to identify representative examples and related data to be shared through international collaboration, ideally leading to coordination or joint work within the coordinated research project on the subject.

Target Audience

The event aims to bring together a multi-stakeholder and inter-disciplinary audience of researchers, developers, practitioners, entrepreneurs and policymakers in artificial intelligence, fusion and plasma science, to discuss applications, connect and build collaboration.

Working Language(s)

The working language of the event will be English. All communication and papers must be sent to the IAEA in English. No simultaneous interpretation will be provided.

Structure and Tracks

The programme will mainly consist of sessions dedicated to invited oral talks and poster presentations and discussions. A Programme Committee made up of a representative international membership will be responsible for selecting the invited oral and poster presentations and arranging the technical and discussion sessions, as well as for the overall scientific content of the event. The programme will feature the following topical sessions:

1. **Physics/Engineering**

This session focuses on the current applications of AI to physics and engineering applications. Speakers will discuss the current state-of-art for these technologies in fusion science and other fields. Discussions will include successes of these technologies as well as current limitations and research opportunities. This session will bring into focus how AI is currently being used and spur important discussions between disciplines to cross-pollinate ideas into the fusion science space and highlight challenges for AI researchers to tackle.

2. **AI**

This session is dedicated to discussing machine learning research both broadly and specifically relevant to fusion and plasma science. Examples of topics include advanced AI techniques for time-series prediction, self-supervised/unsupervised training on large datasets, and reinforcement learning for control and scenario design. Additionally, AI techniques to enhance simulation, for general, fast surrogate creation in digital twin applications, and Bayesian inference to compare to experiment

3. **Enabling Infrastructure**

High Performance Computing (HPC) and cloud technologies offer nowadays a platform to accelerate the design and the simulation of multiphysics and multiscale systems through massive parallel computing, allowing the processing of huge amounts of multidimensional data and to solve complex problems at extremely high speed. HPC and AI offer the opportunity of advancing human knowledge and produce significant transformations, as successfully shown in fields such as sequence DNA, self-driving cars, automate stock trading, and digital twins accurately modelling complex systems. This session has the objective of bringing together experts in the field to discuss how to accelerate fusion and plasma science leveraging HPC and AI resources.

4. Special Track

This session dedicated to discussing lessons learned and best practices from AI applications in fields outside fusion and plasma science. This multidisciplinary session will bring together experts from renowned institutes from particle physics, civil space programs, and/or United Nations agencies. The scope is to engage in collaborative discussions on how to accelerate scientific research leveraging AI, while preserving open science, and FAIR principles

Participation and Registration

All persons wishing to participate in the event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

In order to be designated by an IAEA Member State, participants are requested to send the **Participation Form (Form A)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) for onward transmission to the IAEA by **30 June 2023**. Participants who are members of an organization invited to attend are requested to send the **Participation Form (Form A)** through their organization to the IAEA by the above deadline.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters.

Participants are hereby informed that the personal data they submit will be processed in line with the Agency's Personal Data and Privacy Policy and is collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required. The IAEA may also use the contact details of Applicants to inform them of the IAEA's scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA's mandate. Further information can be found in the Data Processing Notice concerning IAEA InTouch+ platform.

Abstracts and Presentations

The IAEA encourages participants to give presentations on the work of their respective institutions that falls under the topics listed on the IAEA-INDICO website.

Participants who wish to give presentations are requested to submit an abstract of not more than 500 words through IAEA-INDICO by **30 June 2023**. Abstracts may contain figures and graphics. Instructions on how to upload the abstracts will be available on the IAEA-INDICO website.

Submissions must contain the author's name, email address, country, organization and topic. Authors are encouraged to flag their proposals as an oral or poster presentation. However, the Programme Committee will evaluate all submissions and decide on the final presentation format.

Authors will be notified of the acceptance of their proposed presentations by **30 July 2023**.

Expenditures and Grants

No registration fee is charged to participants.

The IAEA is generally not in a position to bear the travel and other costs of participants in the event. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Upon specific request, such assistance may be offered to normally one participant per country, provided that, in the IAEA's view, the participant will make an important contribution to the event.

The application for financial support should be made using the **Grant Application Form (Form C),** which has to be stamped, signed and submitted by the competent national authority to the IAEA together with the **Participation Form (Form A)** by **30 June 2023**.

Venue

The event will be held at the Vienna International Centre (VIC), where the IAEA's Headquarters are located. Participants must make their own travel and accommodation arrangements.

General information on the VIC and other practical details, such as a list of hotels offering a reduced rate for IAEA participants, are listed on the following IAEA web page:

www.iaea.org/events.

Participants are advised to arrive at Checkpoint 1/Gate 1 of the VIC one hour before the start of the event on the first day in order to allow for timely registration. Participants will need to present an official photo identification document in order to be admitted to the VIC premises.

Visas

Participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria at least four weeks before they travel to Austria. Since Austria is a Schengen State, persons requiring a visa will have to apply for a Schengen visa. In States where Austria has no diplomatic mission, visas can be obtained from the consular authority of a Schengen Partner State representing Austria in the country in question.

Key Dates

30 June 2023	Deadline for submission of abstracts for contributed posters through IAEA-INDICO at https://conferences.iaea.org/event/335/
30 June 2023	Deadline for submission of Participation Form (Form A) and Grant Application Form (Form C) (if applicable) through the official channels
30 July 2023	Notification of acceptance of abstracts and of assigned awards
28 November 2023	Event begins
1 December 2023	Event ends

Programme Committee

Cristina Rea (Chair)	United States of America
Michael Churchill	United States of America
Marcin Jakubowski	Germany
Ryan McClarren	United States of America
Hideo Nagatomo	Japan
Alessandro Pau	Switzerland
Fuyuan Wu	China
Zongyu Yang	China

IAEA Contacts

Scientific Secretary:

Mr Matteo Barbarino
Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 26386

Fax: +43 1 26007
Email: M.Barbarino@iaea.org

Administrative Secretary:

Ms Ivana Andrejic–Dukic
Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 25119
Fax: +43 1 26007
Email: I.Andrejic-Dukic@iaea.org

Subsequent correspondence on scientific matters should be sent to the Scientific Secretary/Secretaries and correspondence on other matters related to the event to the Administrative Secretary.

Event Web Page

Participants are encouraged to visit these web pages regularly to check for new or updated information regarding the meeting:

IAEA-INDICO: https://conferences.iaea.org/event/335/

IAEA
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Form A

EVT2205764

Participation Form

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To be completed by the participant and sent to the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA, or National Atomic Energy Authority) of his/her country for subsequent transmission to the International Atomic Energy Agency (IAEA) either by email to: Official.Mail@iaea.org or by fax to: +43 1 26007 (no hard copies needed). Please also send a copy by email to the Scientific Secretary M.Barbarino@iaea.org and to the Administrative Secretary I.Andrejic-Dukic@iaea.org.

Participants who are members of an invited organization can submit this form to their organization for subsequent transmission to the IAEA.

Deadline for receipt by IAEA through official channels: 30 June 2023

Family name(s): (same as in passport)	First name(s): (same as in passport)	Mr/Ms
Institution:		
Full address:		
Tel. (Fax):		
Email:		
Nationality:	Representing following Member State/non-Member State/entity or invited organization:	
If/as applicable:		
Do you intend to submit a paper?	Yes	No
Would you prefer to present your paper as a poster?	Yes	No
Title:		

Participants are hereby informed that the personal data they submit will be processed in line with the Agency's Personal Data and Privacy Policy and is collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required. The IAEA may also use the contact details of Applicants to inform them of the IAEA's scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA's mandate.

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Form C

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Grant Application Form

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Family name(s): (same as in passport)	First name(s): (same as in passport)	Mr/Ms:
Mailing address:	Tel.:	
	Fax:	
	Email:	
Date of birth (yyyy/mm/dd):	Nationality:	

1. Education (post-secondary):

Name and place of institution	Field of study	Diploma or Degree	Years attended from	to

2. Recent employment record (starting with your present post):

Name and place of employer/ organization	Title of your position	Type of work	Years attended from	to

3. Description of work performed over the last three years:

4. Institute's/Member State's programme in field of event:

Date: **Signature of applicant: _____**

Date: **Name, signature and stamp of Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority _____**