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ADVANCED RESEARCH WORKSHOP

AI-Powered Monitoring Systems, Regional Data Sharing, and Models for Early Warning in Critical Services and Infrastructure

14–19 September 2026

Yerevan State University · Yerevan, Armenia



Programme

Co-Directors

Prof. Francesco Lamonaca · Università della Calabria, Italy

Dr. Grigor Babayan · CenTRiS Foundation, Armenia

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About the workshop

Critical services and infrastructure across the South Caucasus and neighbouring regions face converging pressures: ageing physical assets, seismic and climate-driven hazards, and the growing dependence of energy, water, transport and emergency response on digital systems. This Advanced Research Workshop brings together researchers, engineers and practitioners from NATO member states and eligible NATO partner countries to examine how artificial intelligence can strengthen monitoring, cross-border data sharing and early warning, and to formulate practical recommendations for policy and further study.

01 **AI-powered monitoring**

Advanced sensing, digital twins and IoT for real-time structural health and anomaly detection across energy, water and transport networks.

02 **Regional data sharing**

Secure, sovereignty-respecting frameworks and privacy-enhancing technologies for trusted cross-border exchange.

03 **Early warning models**

Predictive models for multi-hazard and cascading-failure scenarios, shifting response from reactive to anticipatory.

Format and outcomes

Four days of sessions comprising 36 presentations by 36 speakers from fourteen countries, structured round tables and a concluding recommendations session. Around a third of the programme is given to discussion, syndicate work and the drafting of conclusions. The proceedings are to be published in the NATO Science for Peace and Security Series, Sub-Series D, in perpetual open access.

Practical information

Venue	Yerevan State University, 1 Alek Manukyan Street, Yerevan 0025, Armenia.
Access hours	The conference hall is available 09:00–17:30 on each session day.
Registration desk	Open 16:00–19:00 on Monday 14 September, 09:30–10:15 on Tuesday 15 September and 09:15–09:30 on the other session days.
Badges	Please wear your badge at all times in the venue and on the closing excursion.
Attendance record	A daily attendance sheet is signed at the desk each morning and afternoon. This is a NATO reporting requirement.
Online participation	Seven presentations are delivered online. Speakers joining remotely are asked to connect fifteen minutes before their session.
Meals	Coffee breaks and lunches are provided on all session days. Dinner arrangements are shown in the programme.
Closing excursion	Departure from the venue at 16:30 on Friday 18 September for Geghard Monastery and Garni Temple, followed by the farewell dinner in Garni village.
Publication	Speakers are asked to submit manuscripts for the NATO Science for Peace and Security Series volume to the Co-Directors.

Monday 14 September

Arrivals

From 12:00	Arrivals, airport transfers, hotel check-in
16:00–19:00	Registration desk open
19:30	Informal welcome gathering

Tuesday 15 September

Day 1 · Opening and Pillar 01

09:30–10:15	Registration and coffee
10:15–10:30	Participants take their seats
10:30–11:00	Opening ceremony <i>Co-Directors; Prof. Hovhannes Hovhannisyan, Rector of Yerevan State University; Ms. Tatev Aslanyan, Deputy Minister of High-Tech Industry and Artificial Intelligence; H.E. Mr. Alessandro Ferranti, Ambassador of Italy, with Lt. Col. Andrea Cilento, Carabinieri; H.E. Mr. George Sharvashidze, Ambassador of Georgia; H.E. Mrs. Kirsti Narinen, Ambassador of Finland; Mr. Valerii Lobach, Chargé d’Affaires of Ukraine; Mr. Aaron Coe, Embassy of Canada; Ms. Meline Yeghoyan, Embassy of the Republic of Poland; Mr. Nerses Yeritsyan, Chairman of the Information Systems Agency; Prof. Gianluigi Greco, Rector of the University of Calabria [online].</i>
11:00–11:30	Opening keynote — The New Security Frontier <i>Prof. F. Lamonaca and Dr. G. Babayan</i>
11:30–11:45	Coffee

Session 1.1 — Sensing foundations for critical infrastructure

chair: Prof. Kharchenko

11:45–12:10	AI-powered distributed sensing and instrumentation for critical infrastructure monitoring [online] <i>Prof. P. Daponte · University of Sannio, Italy</i>
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12:10–12:35 Advanced sensing for structural health monitoring of bridges, dams and pipelines
Prof. F. Lamonaca · Università della Calabria, Italy

12:35–13:00 Building health monitoring solutions [online]
Dr. K. Shiwaku · OYO Corporation, Japan

13:00–14:00 Lunch and group photograph

Session 1.2 — Grids, networks and wireless sensing

chair: Prof. Arslan

14:00–14:25 Low-cost AI-powered distributed sensors for power quality event detection and early warning in smart grids [online]
Prof. D. L. Carnì · Università della Calabria, Italy

14:25–14:50 Fibre sensing for infrastructure monitoring using AI
Prof. R. Kvatadze · GRENA, Georgia

14:50–15:15 Foundation models for wireless sensing
Dr. H. Khachatryan · YerevaNN, Armenia

15:15–15:35 Coffee

Session 1.3 — Assurance and cyber-physical resilience

chair: Prof. Paladi

15:35–16:00 From early warning to assured action: cybersecurity assessment and security-informed safety for resilient cyber-physical systems
Dr. O. Illiasenko · Leeds Beckett University, United Kingdom

16:00–16:25 Securing device identity in cyber-physical systems for resilient infrastructure monitoring
Dr. C. Felicetti · Università della Calabria, Italy

16:25–17:15 Moderated discussion — what AI-powered monitoring must deliver operationally
Prof. A. N. Arslan, Pillar 01 rapporteur

17:15–17:30 Day close

19:00 Opening reception

Wednesday 16 September

Day 2 · Pillar 01 continued, Pillar 02 and hybrid threats

09:15–09:30 Registration and coffee

Session 2.1 — Aerial, unmanned and satellite sensing

chair: Prof. Lamonaca

09:30–09:55 AI-powered heterogeneous unmanned systems for critical services: models, dependability assurance and implementation

Prof. V. Kharchenko · KhAI, Ukraine

09:55–10:20 A multiple-node power network simulation

Prof. Y. Mamasakhlisov · Armenia

10:20–10:45 From UAV-acquired data to predictive models: computational modelling of environmental factors and infrastructure monitoring

Prof. F. Paladi · Moldova State University

10:45–11:10 From Space to Decisions: AI-Driven Earth Observation for Monitoring, Early Warning, and Resilient Critical Infrastructure

Prof. A. N. Arslan · Kvarken Space Center, University of Vaasa, Finland

11:10–11:35 Large-scale seismic vulnerability assessment methods: advanced numerical methods and artificial intelligence [online]

F. S. Liguori, F. Morrone, G. Capparelli and A. Madeo · Università della Calabria, Italy

11:35–11:55 Coffee

Session 2.2 — Governance and trust frameworks (Pillar 02)

chair: Dr. Babayan

11:55–12:25 Keynote: From innovation to implementation — building governance frameworks for AI in critical sectors

Mr. P. Upmann · AIGN, Germany

12:25–12:50 Trusted sensing, trusted sharing, trusted warning: AI for the resilience of critical rail infrastructure

Eng. A. Lugarà · Italy

12:50–14:00 Lunch

Session 2.3 — Hybrid threats, trust and the information layer*chair: Dr. Gajewski*

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- 14:00–14:25** Critical infrastructure vulnerabilities in Armenia: hybrid threats, emerging risks and building national resilience
Dr. G. Melikyan · INFORS Armenia
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- 14:25–14:50** AI-powered multimodal sensor fusion for 3D mapping, object detection and anomaly detection [online]
Prof. J. Aelterman · Ghent University – imec, Belgium
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- 14:50–15:15** The missing hazard: information attacks as cascade amplifiers in multi-hazard early warning
Mr. S. Martirosyan · CenTRiS Foundation, Armenia
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- 15:15–15:35** Coffee
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- 15:35–16:00** Population as critical infrastructure: mass account compromise as a national cascading-failure vector
Mr. S. Martirosyan · CenTRiS Foundation, Armenia
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- 16:00–16:25** A call to action: forging international partnerships for a resilient future
Col. A. Hayrapetyan · 112 Operational Management Centre, Mol, Armenia
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Session 2.4 — Hydrogeological risk and damage assessment*chair: Prof. Lamonaca*

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- 16:25–16:50** AI-Powered Real-Time Decision Support for Hydro-Hydraulic Risk Management [online]
Prof. G. Capparelli and Prof. D. Biondi · Università della Calabria — CAMILab, Italy
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- 16:50–17:15** Leveraging satellite imagery and computer vision for rapid disaster damage assessment
Dr. A. Vitale · Università della Calabria, Italy
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- 17:15–17:30** Day close
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- 19:30** Dinner
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Thursday 17 September

Day 3 · Pillar 03 and technical visit

09:15–09:30 Registration and coffee

Session 3.1 — Hazard forecasting and early warning

chair: Dr. Karapetyan

09:30–10:00 Keynote: AI algorithms for faster and more reliable earthquake and tsunami early warning

Dr. Q. Bletery · IRD — Géoazur, France

10:00–10:25 Smartphone networks as early-warning infrastructure: detecting and alerting where seismic instrumentation is sparse

Prof. R. Allen · UC Berkeley, United States

10:25–10:50 Spatial analysis and early warning for flood and dam-break hazards to critical infrastructure: Armenia's operational experience

Lt. Col. T. Simonyan · 112 Operational Management Centre, Armenia

10:50–11:15 Artificial intelligence in geology: earthquake and geohazard assessment for critical infrastructure

Dr.Sci. K. Meliksetian · Institute of Geological Sciences SNCO, Armenia

11:15–11:35 Coffee

Session 3.2 — Water, climate and environmental risk

chair: Dr.Sci. Meliksetian

11:35–12:05 AI-based prediction of earthen dam failure

Prof. P. Baljyan and Dr. H. Karapetyan · Armenia

12:05–12:30 Armenia's new digital disaster risk management system: from risk assessment to forecasting and resilience

Mr. K. Atayan · Ministry of Internal Affairs, Armenia

12:30–13:20 Round table — toward a regional data-sharing framework for critical infrastructure

chairs: Mr. P. Upmann and Prof. R. Kvatadze

13:20–14:00 Lunch

14:00–17:00	Technical visit — YSU supercomputer facility and CRISP Lab
17:00 onwards	Optional Yerevan cultural programme, at participants' own arrangement
19:30	Dinner

Friday 18 September

Day 4 · Cascading failure, capacity building and conclusions

09:15–09:30	Registration and coffee
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Session 4.1 — Cross-sector resilience and cascading failure

chair: Dr. Tonoyan

09:30–10:00	Keynote: Digital health as critical infrastructure for early risk prediction and safer care <i>Dr. L. Tonoyan · University of Alberta, Canada</i>
10:00–10:25	Implementation of Vulnerability Monitoring and Management System in RENAM <i>Dr. P. Bogatencov and A. Cacean · RENAM Association, Republic of Moldova</i>
10:25–10:50	Indirect attacks on small modular reactors: societal vulnerabilities as security issues <i>Dr. J. Gajewski · National Centre for Nuclear Research, Poland</i>
10:50–11:15	Long-endurance fixed-wing UAS for wide-area infrastructure survey: platform design and operational experience [online] <i>Eng. A. Danici · DanAero, Republic of Moldova</i>
11:15–11:40	One AI backbone, three specialisations: applied advanced training in cybersecurity, aerial robotics and electrical engineering for the critical infrastructure workforce <i>Dr. G. Babayan · CenTRiS Foundation, Armenia</i>
11:40–12:05	Utilization of AI in monitoring and early warning in the treatment and reuse potential of municipal wastewater <i>Prof. P. Samaras · International Hellenic University, Greece</i>
12:05–12:30	Trustworthy AI for monitoring and early warning: from ethical principles to organisational risk management <i>Ms. M. Kaladjian · Salience Consulting, Armenia</i>

12:30–12:50 Coffee

Session 4.2 — Follow-up and publication

chair: Co-Directors

12:50–13:15 Publication plan: NATO Science for Peace and Security Series D, open access
Co-Directors

13:15–14:20 Lunch

14:20–15:30 Round table — drafting the workshop recommendations. Rapporteurs report back:
Prof. A. N. Arslan (Pillar 01), Col. A. Hayrapetyan (Pillar 02), Dr. L. Tonoyan (Pillar
03). Coffee served in the room
chairs: Co-Directors

15:30–16:15 Adoption of conclusions and recommendations · next steps · closing remarks
Co-Directors

16:15–16:30 Assemble at the buses

16:30 Departure — closing excursion: Geghard Monastery, then Garni Temple under
evening illumination

19:30 Farewell dinner — Garni village

Saturday 19 September

Departures

Departures and airport transfers

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Organised by the Center for Technology and Risk Studies (CentRIS)

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Proceedings

The conclusions and recommendations of this workshop will be published in the NATO Science for Peace and Security Series, Sub-Series D, in perpetual open access.



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