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poziva vas na radionicu:

UMJETNA INTELIGENCIJA U OCEANOGRAFIJI: IZAZOVI I PERSPEKTIVE

koja će se održati **u utorak, 6. listopada 2026. od 10 do 13 sati**
u dvorani Knjižnice Hrvatske akademije znanosti i umjetnosti,
Trg Josipa Jurja Strossmayera 14, Zagreb.

Uvodna predavanja:

dr. sc. Matjaž Ličer (Slovenian Environment Agency, Group for Meteorological, Hydrological and Oceanographic Modelling, Ljubljana, Slovenia; National Institute of Biology, Marine Biology Station, Piran, Slovenia)

dr. sc. Iva Međugorac (Geofizički odsjek Prirodoslovno-matematičkog fakulteta Sveučilišta u Zagrebu)

Moderator rasprave:

dr. sc. Jadranka Šepić (Prirodoslovno matematički fakultet Sveučilišta u Splitu)

Dr. sc. Gordana Beg Paklar, v.r.,
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Radionica Hrvatskog povjerenstva za geodeziju i geofiziku
(Razred za prirodne znanosti, Hrvatska akademija znanosti i umjetnosti)

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Zahvaljujući napretku tehnologije i ogromnoj količini dostupnih digitalnih podataka, alati umjetne inteligencije prodiru danas u sve sfere naših života, ulaze u naš svakodnevni život, u industriju, promet, medicinu, obrazovanje, dio su mnogih znanstvenih istraživanja pa se tako sve više koriste i u oceanografiji. O tome kako se modeli umjetne inteligencije primjenjuju u fizičkoj oceanografiji, koje su njihove dobre i loše strane pokazat će nam kroz primjere svojih istraživanja dr. sc. Matjaž Ličer i dr. sc. Iva Međugorac.

Nakon uvodnih predavanja slijedit će rasprava koju će moderirat dr. sc Jadranka Šepić (PMF, Split) i u kojoj će moći sudjelovati svi sudionici radionice.

Kratki životopisi predavača i sažeci predavanja:

Dr. sc. Matjaž Ličer is a physical oceanographer, based in Ljubljana, Slovenia. He holds a PhD in physics from the University of Ljubljana and a PhD in philosophy from the Postgraduate School of Scientific Research Centre of Slovenian Academy of Sciences and Arts. He is the head of numerical ocean modeling at the Slovenian Environment Agency (ARSO), a researcher at the Marine Biology Station of the National Institute of Biology, and an assistant professor for Physical Oceanography at the University of Ljubljana's Faculty of Mathematics and Physics. He is an associate editor of the scientific journal *Ocean Science* (Copernicus Publications), a co-chair of the Mediterranean Oceanographic Network for the Global Ocean Observing System (MonGOOS), and an Ocean Sciences division science officer for Coastal Ocean, Regional and Marginal Seas at the European Geosciences Union (EGU).

Positive and negative aspects of artificial intelligence in oceanography and science in general

Since its inception, modern science has understood itself as a low-parametric representation of nature. Artificial intelligence is not bound by this formal constraint. It uses an exorbitant amount of trainable parameters and is consequently often described as an unexplainable "black box". This talk will discuss positive aspects of AI as an universal functional approximator and related epistemological trade-offs. Several recent oceanographic machine learning applications will be discussed, ranging from sea level and surface gravity wave modeling to satellite L3 data reconstructions using transformer or diffusion-based generative algorithms. These algorithms have the benefit of reducing numerical costs of specific tasks by several orders of magnitude without

compromising performance. However, negative aspects of machine learning collateral phenomena exist as well. To name just one concrete example, recent OpenAI conduct with respect to proof of finite time blow-up of solutions to the Navier-Stokes equations have profoundly stirred global mathematical community. Careful pondering about how to proceed with the usage of these tools - individually and as a scientific and educational community - is very much needed.

Dr. sc. Iva Međugorac is an oceanographer who graduated from the Faculty of Science, University of Zagreb, in 2008 and obtained her PhD in 2018. Her research focuses on extreme sea levels in the Adriatic across a range of timescales and their atmospheric drivers. Over the past two years, she has been developing deep-learning models for high-frequency sea-level extremes in the Mediterranean. She has participated in several national (CARE, MAUD, ADAM-ADRIA, CroClimExtremes) and international (DAMOCLES, SMASH, AI-ODIN) research projects. She completed her postdoctoral training in Nova Gorica and Ljubljana, Slovenia, within the SMASH project as an MSCA fellowship recipient, and also spent a research period at POL in the United Kingdom. As part of her professional activities, she manages the Bakar tide-gauge station and has participated in 11 research cruises in the Adriatic. She is the author or co-author of 12 scientific papers and one professional paper.

Deep-learning prediction of high-frequency sea-level oscillations in the Adriatic Sea

The eastern Adriatic coast is a hotspot of meteorologically induced high-frequency sea level oscillations (HFOs) with periods shorter than 1 hour. Their most extreme manifestation, meteorological tsunamis (meteotsunamis), can reach several meters at some locations and are generated by specific meteorological conditions acting over limited spatial scales. Although the physical mechanisms driving extreme HFOs are well understood, hydrodynamic forecasting systems remain unreliable and computationally demanding. To address these limitations, we are developing convolutional neural network models to predict HFOs at two Adriatic sites, Bakar and Ploče. The models combine past sea level measurements with atmospheric predictors from reanalysis. Although not meteotsunami-prone, both sites provide long 1-min sea level records, available since 2003, enabling model training and potential transfer to more exposed locations with shorter records (e.g., Vela Luka, Mali Lošinj, Stari Grad). The models successfully reproduce observed HFO variability but perform better under typical conditions than during extremes, which remain systematically underestimated. Model skill varies between locations, reflecting differences in the predictability of local sea level responses. Higher resolution atmospheric forcing does not improve predictions, while predictors that improve average performance do not necessarily improve the representation of extremes. These results demonstrate the potential of deep learning for predicting HFOs in the Adriatic, while highlighting persistent challenges in forecasting rare, high amplitude events.