Cathay March 2024

www.cathayradio.org

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Mission: The Cathay Amateur Radio Club is basically an active social club of Ham Radio Operators and their spouses. We support local community requests for HAM emergency communications. Several of us are trained in CPR/ First Aid and are involved with community disaster preparedness.

Monday Night Net Time: 9 PM Local Time/PST, As of 8/21/2023 we are switching over from using Repeater: WB6TCS to **Nick Carsion's Repeater: WA6GEL UHF 444.80000 Mhz, Offset +5Mhz, CTCCS/Tone PL 179.9 Hz on Monument Peak, Milpitas.**

If you cannot reach the fore-mentioned machine, please use WA6GEL UHF 4448.8 Mhz Offset +5Mhz, CTCCS/Tone PL173.8 which is on Mt. San Bruno.

The CARC Monday night net is the best way to find out the latest club news. All check-in are welcome.

Message from the President: George Chong, *W6BUR*

Hello CARC Members and Friends;

Happy Chinese New Year! I hope you all had a very pleasant holidays with family members and friends.

Many thanks to Nick Cassarino for the use of repeater – WA6GEL for our CARC Monday Night Net.

Additional folks are needed to help out with conducting the CARC radio net on Monday nights. Please contact Ed Fong (edison_fong@hotmail.com) if you are interested.

I wish to thank our CARC members that set aside their valuable time to participate in our Monday night's nets.

Silent Key

In Memory of Michael K Wong (WA6BPN)

December 9, 1943 – November 30, 2023.

Michael Wong at just 10 days shy of his 80th birthday, unexpectedly passed away from a heart attack.

Michael was born and raised in the heart of Chinatown, San Francisco CA.

He attended San Francisco local public schools which included Galileo High School and was selected as a member of the school district city wide orchestra. At the young age of 18, he got his HAM radio license.

Drawn to his devotion for his country, in 1964 he enlisted in the US Navy just at the very beginning of the Vietnam War. He served 4 years in the military and was awarded four service medals. He also served 5 years in the Naval Reserves. After his honorable discharge from military service, he worked for United Airlines SFO as a maintenance electrician for 47+ years.

In 2017 after his retirement, Michael renewed his passion for HAM radio and joined both the Cathay Amateur Radio Club (CARC) and the South Bay Amateur Radio Association (SBAR). He was a regular on the CARC Monday net and he would attend CARC sponsored events.

Michael was well respected and liked among the CARC members, he will be great missed by all that knew him.

His burial was given full military honors in December 2023.

Michael Wong seated 1st row 2nd from the left - Attending CARC Tech Session.
Host Ed Fong (WB6IQN) in blue shirt is seated next to Michael Wong.
(Credit: Howard Louie - N6MNV)

A Celebration of Life for Michael Wong will be held at the First Chinese Baptist Church, 15 Waverly Place, San Francisco, CA on Saturday March 16, 2024 at 11 am. After the memorial, a luncheon will follow on the 4th Floor of the church.

If you wish to attend, I need to receive your RSVP by March 7, 2024 for the luncheon head count. My email contact information: Vera Lee Hamano < j.hamano@yahoo.com>

We are planning to have the event live-streamed see links:

- YouTube
  https://www.youtube.com/watch?v=vwU3ooW63eo

- Zoom
  https://ministrelife.zoom.us/j/97829964043?pwd=ZFpOYjdTUEdoVk45azhHU0NpV3VUdz09
  Meeting ID: 978 2996 4043
  Passcode: 3624139

Introduction Tech Article:

Sustained controlled nuclear fusion has been the holy grail of physicists around the world as it offers almost unlimited clean energy.

Nuclear fusion is a reaction in which hydrogen atoms are fused together to produce helium and the release of enormous energy in the form of heat (some 25 million °F) and other products. Nuclear fusion is what occurs every moment in our Sun and other stars throughout the entire universe.

An important breakthrough in one of the many daunting technical hurdles toward the elusive controlled nuclear fusion has been devised. To learn more about this monumental achievement please read the Tech Section portion of this newsletter.

CARC Final News Wrap Up

Chat sub s'em to all you CARC members!   - George W6BUR.

Public Service Announcements

HAM CRAM / HAM Licensing

For upcoming HAM Licensing locations please refer to:
http://www.arrl.org/find-an-amateur-radio-license-exam-session

Auxiliary Communications Service (ACS)

The Auxiliary Communications Service (ACS) is a unit of trained professionals who supply communications support to the agencies of the City and County of San Francisco, particularly during major events/incidents. ACS goals are the support of gathering and distribution of information necessary to respond to and recover from a disaster.

The ACS Net begins at 1930 hours (7:30 p.m. PT) local time each Thursday evening, on the WA6GG repeater at 442.050 MHz, positive offset, tone 127.3 Hz. The purpose of this net is to practice Net Control skills, practice checking in with deployment status in a formal net, and to share information regarding upcoming ACS events. Guests are welcome to check in. ACS members perform Net Control duty on a regular basis. On the second Thursday of each month, the net is conducted in simplex mode on the output frequency of the WA6GG repeater, 442.050 MHz no offset, tone 127.3 Hz.

ACS holds its General Meetings on the third Tuesday of each month from 1900 hours to 2100 hours local time. Currently meetings are exclusively conducted over Zoom during the COVID-19 pandemic, ACS looks forward to meeting in person again as soon as possible.

Upcoming meeting dates in 2024 are:

- March19, 2024

- April 16, 2024
- May 21, 2024

Location of in person future ACS meetings are yet to be determined as the regular location is under reconstruction. All interested persons are welcome to attend. For further information contact Corey Siegel KJ6LDJ <kj6ldj@gmail.com>.

For more information, please attend an ACS meeting, check in on the ACS radio net, or call 415-558-2717.

Free Disaster Preparedness Classes In San Francisco – NERT Taught by San Francisco Fire Department (SFFD).

https://sf-fire.org/nert/nert-calendar-meetings-trainings-events

NERT is hosting three session with Stop the Bleed organization for interested NERT graduates.

This highly anticipated class conducted by www.stopthebleed.org is available to NERT graduates. You may join **one** of three scheduled sessions on March 15th or 16th.

A bleeding injury can happen anywhere. Life-threatening bleeding can happen in people injured in serious accidents or disasters. Instead of being a witness, you can become an immediate responder because you know how to STOP THE BLEED®.

You'll learn three quick techniques to help save a life before someone bleeds out:
- How to use your hands to apply pressure to a wound;
- How to pack a wound to control bleeding; and
- How to correctly apply a tourniquet. These three techniques will empower you to assist in an emergency and potentially save a life.

Registration:
Friday, March 15, 9:00 am - 1:00 pm

Saturday, March 16, 8:00 am - 1:00 pm (Optional: Join NERT Advisory Board office hours from 8:00 am - 9:00 am)

Saturday, March 16, 2:00-6:00 pm

For more information about Stop the Bleed, see the attached flyer. You can visit their website on www.stopthebleed.org.

+ Recertifications
TBD

***SFFD DOT** is the Fire Department Division of Training. All participants walking, biking or driving **enter through the driveway gate on 19th St.** between Folsom and Shotwell. Parking is allowed along the back toward the cinderblock wall.

Visit ***www.sfgov.org/sffdnert*** to learn more about the training, other locations, and register on line.   Upcoming Special NERT Events.

San Francisco Police Department: Auxiliary Law Enforcement Response Team (ALERT)

The Auxiliary Law Enforcement Response Team (ALERT) is a citizen disaster preparedness program designed. The ALERT program is for volunteers 16 years of age or older, who live, work, or attend high school in San Francisco.

Graduates of the San Francisco Police Activities League (P.A.L) Law Enforcement Cadet Academy are also eligible to join.

ALERT volunteers will no longer need to complete the Fire Department's Neighborhood Emergency Response Team (NERT) (www.sfgov.org/sfnert) training and then graduate into two 8 hour Police Department course specifically designed for ALERT team members.

ALERT members will work closely with full-time and/or Reserve Police Officers in the event they are deployed after a disaster. The Basic ALERT volunteer will have no law enforcement powers other than those available to all citizens.

SFPD ALERT Training (New Members)

The next SFPD ALERT training class has been scheduled for: TBD

*Class date indicated are only for new members

IMPORTANT- All participants must complete the background interview process in order to be eligible to attend the ALERT training class.

Eligible ALERT participants may register fora training class by contacting the ALERT Program Coordinator, marina.chacon@sfgov.org, or by telephone at 415-401-4615.

SFPD ALERT Practice/Training Drill

All active/trained ALERT members are asked to join us for our next training drill, via scheduled for on TBD

For more information on the San Francisco Police Department ALERT Program, email us at sfpdalert@sfgov.org, or call Lt. Marina Chacon (SFPD Ret.), SFPD ALERT Program Coordinator, at (415) 401-4615.

For additional information on the web please refer to: https://sfgov.org/policecommission/alert

Tech Article

Engineers use AI to wrangle fusion power for the grid

https://www.pppl.gov/news/2024/engineers-use-ai-wrangle-fusion-power-grid

The researchers stand in the Andlinger Center (left to right: Azarakhsh Jalalvand, Egemen Kolemen, Ricardo Shousha). (Credit: Adena Stevens)

By Colton Poore Date: February 21, 2024

In the blink of an eye, the unruly, superheated plasma that drives a fusion reaction can lose its stability and escape the strong magnetic fields confining it within the donut-shaped fusion reactor. These getaways frequently spell the end of the reaction, posing a core challenge to developing fusion as a non-polluting, virtually limitless energy source.

But a Princeton-led team composed of engineers, physicists, and data scientists from the University and the U.S. Department of Energy's Princeton Plasma Physics Laboratory (PPPL) have harnessed the power of artificial intelligence to predict — and then avoid — the formation of a specific plasma problem in real time.

In experiments at the DIII-D National Fusion Facility in San Diego, the researchers demonstrated their model, trained only on past experimental data, could forecast potential plasma instabilities known as tearing mode instabilities up to 300 milliseconds in advance. While that leaves no more than enough time for a slow blink in humans, it was plenty of time for the AI controller to change certain operating parameters to avoid what would have developed into a tear within the plasma's magnetic field lines, upsetting its equilibrium and opening the door for a reaction-ending escape.

"By learning from past experiments, rather than incorporating information from physics-based models, the AI could develop a final control policy that supported a stable, high-powered plasma regime in real time, at a real reactor," said research leader **Egemen Kolemen**, associate professor of **mechanical and aerospace** engineering and the Andlinger Center for Energy and the Environment, as well as staff research physicist at PPPL.

The research opens the door for more dynamic control of a fusion reaction than current approaches, and it provides a foundation for using artificial intelligence to solve a broad range of plasma instabilities, which have long been obstacles to achieving a sustained fusion reaction. The team published **their** findings in *Nature* on February 22.

"Previous studies have generally focused on either suppressing or mitigating the effects of these tearing instabilities after they occur in the plasma," said first author **Jaemin Seo**, an assistant professor of physics at Chung-Ang University in South Korea who performed much of the work while a postdoctoral researcher in Kolemen's group. "But our approach allows us to predict and avoid those instabilities before they ever appear."

Superheated plasma swirling in a donut-shaped device

Fusion takes place when two atoms — usually light atoms like hydrogen — come together to form one heavier atom, releasing a large amount of energy in the process. The process powers the Sun, and, by extension, makes life on Earth possible.

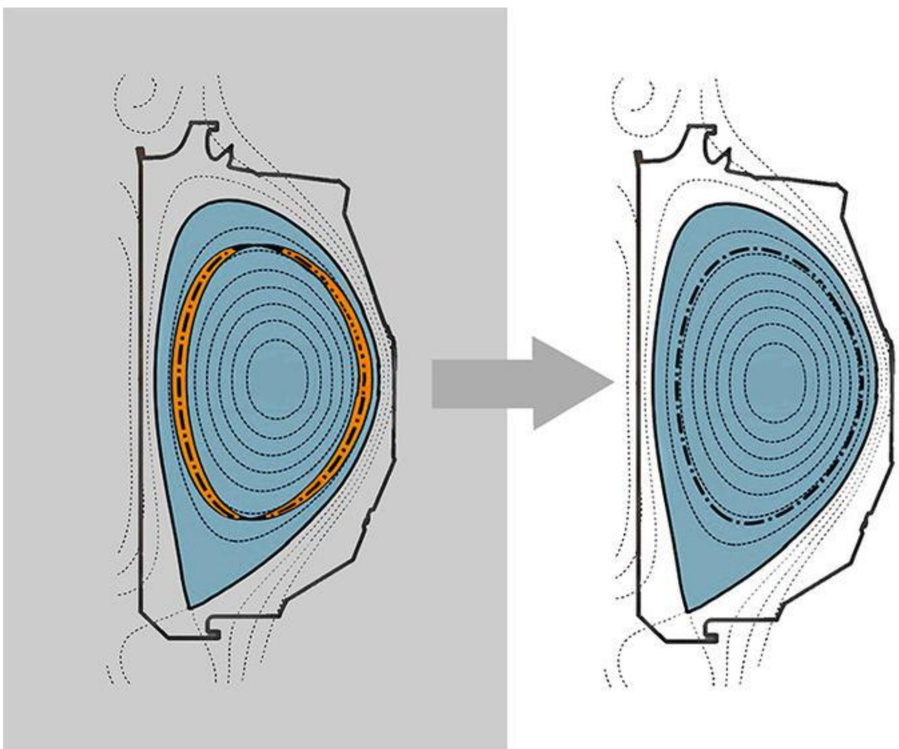
However, getting the two atoms to fuse is tricky, as it takes massive amounts of pressure and energy for the two atoms to overcome their mutual repulsion.

Fortunately for the Sun, its massive gravitational pull and extremely high pressures at its core allow fusion reactions to proceed. To replicate a similar process on the Earth, scientists instead use extremely hot plasma and extremely strong magnets.

In donut-shaped devices known as tokamaks — sometimes referred to as “stars in jars” — magnetic fields struggle to contain plasmas that reach above 100 million degrees Celsius, hotter than the center of the Sun.

While there are many types of plasma instabilities that can terminate the reaction, the Princeton team concentrated on solving tearing mode instabilities, a disturbance in which the magnetic field lines within a plasma actually break and create an opportunity for the plasma’s subsequent escape.

“Tearing mode instabilities are one of the major causes of plasma disruption, and they will become even more prominent as we try to run fusion reactions at the high powers required to produce enough energy,” said Seo. “They are an important challenge for us to solve.”



The researchers harnessed the power of AI to predict and avoid the formation of a tearing instability (left), which could quickly result in plasma disruption and the termination of the fusion reaction (Courtesy of the researchers).

Fusing artificial intelligence and plasma physics

Since tearing mode instabilities can form and derail a fusion reaction in milliseconds, the researchers turned to artificial intelligence for its ability to quickly process and act in response to new data.

But the process to develop an effective AI controller was not as simple as trying out a few things on a tokamak, where time is limited, and the stakes are high.

Co-author **Azarakhsh Jalalvand,** a research scholar in Kolemen's group, compared teaching an algorithm to run a fusion reaction in a tokamak to teaching someone how to fly a plane.

"You wouldn't teach someone by handing them a set of keys and telling them to try their best," Jalalvand said. "Instead, you'd have them practice on a very intricate flight simulator until they've learned enough to try out the real thing."

Like developing a flight simulator, the Princeton team used data from past experiments at the DIII-D tokamak to construct a deep neural network capable of predicting the likelihood of a future tearing instability based on real-time plasma characteristics.

They used that neural network to train a reinforcement learning algorithm. Like a pilot trainee, the reinforcement learning algorithm could try out different strategies for controlling plasma, learning through trial and error which strategies worked and which did not within the safety of a simulated environment.

"We don't teach the reinforcement learning model all of the complex physics of a fusion reaction," Jalalvand said. "We tell it what the goal is — to maintain a high-powered reaction — what to avoid — a tearing mode instability — and the knobs it can turn to achieve those outcomes. Over time, it learns the optimal pathway for achieving the goal of high power while avoiding the punishment of an instability."

While the model went through countless simulated fusion experiments, trying to find ways to maintain high power levels while avoiding instabilities, co-author **SangKyeun Kim** could observe and refine its actions.

"In the background, we can see the intentions of the model," said Kim, a staff research scientist at PPPL and former postdoctoral researcher in Kolemen's group. "Some of the changes that the model wants are too rapid, so we work to smooth and calm the model. As humans, we arbitrate between what the AI wants to do and what the tokamak can accommodate."

Once they were confident in the AI controller's abilities, they tested it during an actual fusion experiment at the D-III D tokamak, observing as the controller made real-time changes to certain tokamak parameters to avoid the onset of an instability. These parameters included changing the shape of the plasma and the strength of the beams inputting power into the reaction.

“Being able to predict instabilities ahead of time can make it easier to run these reactions than current approaches, which are more passive,” said Kim. “We no longer have to wait for the instabilities to occur and then take quick corrective action before the plasma becomes disrupted.”

Powering into the future

While the researchers said the work is a promising proof-of-concept demonstrating how artificial intelligence can effectively control fusion reactions, it is only one of many next steps already ongoing in Kolemen’s group to advance the field of fusion research.

The first step is to get more evidence of the AI controller in action at the DIII-D tokamak, and then expand the controller to function at other tokamaks.

“We have strong evidence that the controller works quite well at DIII-D, but we need more data to show that it can work in a number of different situations,” said first author Seo. “We want to work toward something more universal.”

A second line of research involves expanding the algorithm to handle many different control problems at the same time. While the current model uses a limited number of diagnostics to avoid one specific type of instability, the researchers could provide data on other types of instabilities and give access to more knobs for the AI controller to tune.

“You could imagine one large reward function that turns many different knobs to simultaneously control for several types of instabilities,” said co-author **Ricardo Shousha,** a postdoc at PPPL and former graduate student in Kolemen’s group who provided support for the experiments at DIII-D.

And on the route to developing better AI controllers for fusion reactions, researchers might also gain more understanding of the underlying physics. By studying the AI controller’s decisions as it attempts to contain the plasma, which can be radically different than what traditional approaches might prescribe, artificial intelligence may be not only a tool to control fusion reactions but also a teaching resource.

“Eventually, it may be more than just a one-way interaction of scientists developing and deploying these AI models,” said Kolemen. “By studying them in more detail, they may have certain things that they can teach us too.”

The paper, “Avoiding tokamak tearing instability with artificial intelligence,” was published February 22 in Nature. In addition to Kolemen, Seo, Jalalvand, Kim, and Shousha, co-authors include Rory Conlin, Joseph Abbate and Josiah Wai of Princeton University, as well as Keith Erickson of PPPL.

The work was supported by the U.S. Department of Energy’s Office of Fusion Energy Sciences, as well as the National Research Foundation of Korea (NRF). The authors also acknowledge the use of the DIII-D National Fusion Facility, a Department of Energy Office of Science user facility.

SOURCE: Andlinger Center for Energy and the Environment

NEWS CATEGORY: Artificial Intelligence   Fusion energy Intranet

PPPL is mastering the art of using plasma — the fourth state of matter — to solve some of the world's toughest science and technology challenges. Nestled on Princeton University's Forrestal Campus in Plainsboro, New Jersey, our research ignites innovation in a range of applications including fusion energy, nanoscale fabrication, quantum materials and devices, and sustainability science. The University manages the Laboratory for the U.S. Department of Energy's Office of Science, which is the nation's single largest supporter of basic research in the physical sciences. Feel the heat at https://energy.gov/science *and https://www.pppl.gov*.