On Tuesday, December 13, at 12:00 pm (EST) the Department of Fire Protection Engineering at the University of Maryland will host its ninth annual competition to predict the burning behavior (heat release rate, HRR) of a Christmas tree. This is a friendly competition designed to bring together members of the fire safety science community that hopefully provides an opportunity to explore and develop collaborations in the future. The event also serves to share a positive fire safety message, mainly: "If you have a natural Christmas Tree this season, please keep it well-watered."

We would like to invite you to join us this year by submitting predictions to this year's competition. Over the last few years, on average, we received predictions from ~35 unique institutions across ~15 countries (including 10+ different states in the US). Video of the 2020 Christmas Tree Burn can be viewed here: https://youtu.be/zHeDZOo1SrU. The 2022 event will be livestreamed here: https://umd.zoom.us/j/7239055335; details regarding how to watch the event will be provided to all participants who submit a prediction.

For the first time in many years (after dominance by the University of Queensland) the 2021 competition had a new winner: Korea University. In second place (so very close behind) was Ghent University. Teams of at least 3 individuals from the same University or Research Institution are needed for a chance to win best team prediction. The first and second place teams of this competition earn our coveted golden and silver pinecones (see Fig. 1 below).

Come take a break with us for a moment when we can come together as a community just for fun (and to share an important fire safety message). Good luck!

Please let me know if you have any questions,
Isaac

First place (golden pinecone)
Korea University

Second place (silver pinecone)
Ghent University

Figure 1. Winners of the 2021 Christmas Tree Fire HRR Prediction Competition

Submitting Predictions

Visit https://pages.nist.gov/christmas_tree_fire_safety/ to use a custom-made app that allows you to 'build' (and submit) your own fire by adjusting four parameters:

- Fire Growth Rate
- Peak Heat Release Rate (Peak HRR)
- Duration of Steady Burning
- Fire Decay

In this app, after you click submit, an email will be generated that contains the parameters defining your HRR curve. Please remember to add your name, email, and lab affiliation if you wish to receive credit (and to hear future updates/receive the event livestream link) and to CLICK SEND so that the submission actually comes our way.

Competition information

Just as last year, this year's competition will be organized and scored to contextualize model predictions vs. experimental uncertainty. In short, this means that tests will be repeated in triplicate and your predictions will be scored with respect to the average and standard deviations (with explicit considerations for measurement uncertainty) of experimentally measured burning behavior (i.e., peak HRR, time to peak HRR, total energy release, and duration for which calculated HRR exceeds 50% and 80% of the peak value).

This year's competition trees are Balsam Firs, each approximately 191 cm +/- 2 cm tall (as shown in Fig. 2). Tree masses (obtained on November 26, 2022) measured between 10.9 kg and 11.1 kg. Listed variability represents the range of measured values (height & weight) of each of the three competition trees. The trees will be held in laboratory storage (relative humidity = 50 %; temperature = 18 °C) without water for 17 days prior to burning.

Figure 2. The three competition trees for 2022 (Balsam Firs, each ~1.91 m tall)

For ignition, a 6 cm diameter pan filled with 40 mL of heptane will be placed below the lowest branches of the tree, approximately 15 cm away from the outermost edge of the tree. Ignition (time, t = 0 s) will be defined as the earliest time at which measured HRR exceeds 50 kW. Note: this procedure moves the ignition source farther away from the center of the tree as compared to previous competitions (i.e., 2020 and earlier). Experimental results and the best predicted HRR curves from the 2021 Competition are shown in Fig. 3.

Christmas tree mass loss rate will be measured continuously at 1 Hz using a Mettler Toledo mass balance with a 0.1 g precision. If possible, cone calorimeter measurements will be performed to determine a representative heat of combustion, ΔH_c, for each tree. If not, a constant value will be assumed – $\Delta H_c = 17.7$ kJ/g [Mell et al. 2009] – to convert this to HRR.

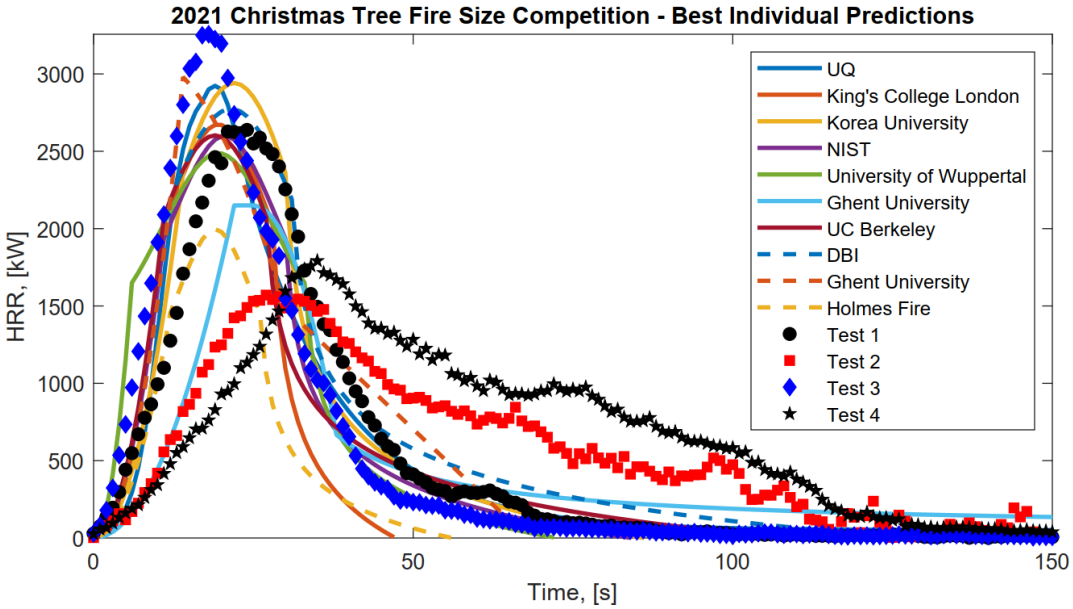

Figure 3. Results from the 2021 Christmas Tree HRR Prediction Competition

Additional information

Rules, scoring guidelines, and some reference materials can be found online at: https://fpe.umd.edu/burn-competition

As seen in Fig. 4, on average, larger teams (i.e., more participants per team) did as well or better than smaller teams. If there's ever a member of your team who's hesitant to submit a prediction, share this plot and tell them not to worry.

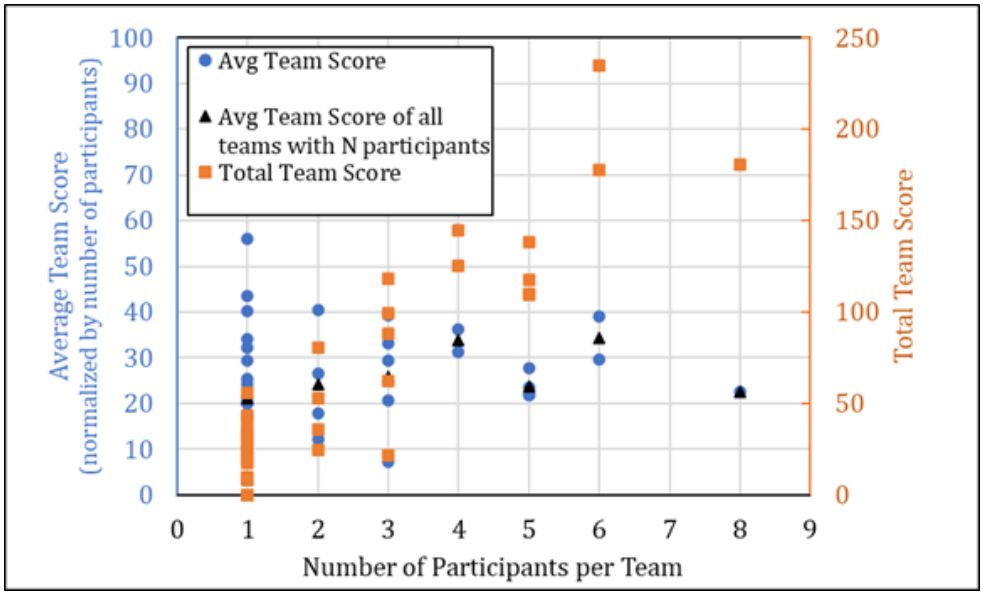

Figure 4. Team score vs. number of participants per team