



Nona Talks 2025

Colorado University, Boulder

Boulder, CO

June 27-28, 2025

<https://www.nonasoftware.com/nonataalks25>

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Executive Summary

This report provides background on the Nona Research Foundation and a summary of the presentations and discussions at the NonaTalks 2025 conference in Boulder, CO from June 27th to 28th. Note that some content has been AI-generated based on notes taken during the conference, and this report is not intended as an official record of all event proceedings.

NonaTalks 2025 successfully brought together synthetic biology stakeholders from academia and industry to showcase progress in open-source software development and identify future challenges. The event featured presentations from three student teams who developed innovative tools over six months: the winning Circuit Smiths team created GeneForge, an AI-powered server for design automation; the Base Bears developed Trunkline, a machine learning pipeline for predictive modeling; and the SBOL Pioneers built SBOL2Build, a DNA assembly package connecting design and build workflows. Industry presentations from organizations including MITRE, BIO-ISAC, Lattice Automation, and Asimov highlighted current needs in biosecurity, automation, and AI integration.

The conference's structured breakout sessions also revealed key challenges, opportunities for AI, and biosecurity needs in synthetic biology. Survey results showed overall high participant satisfaction with unanimous interest in attending future events. The Nona Research Foundation plans to make NonaWorks 2025 a virtual event to broaden participation and will launch a new platform for community members to request software support & hosting services via the Nona site.

If you have any additional questions or comments, please contact us at info@nonasoftware.org.

We want to express our thanks for the contributions of: Gonzalo Vidal Pena, Carolus Vitalis, University of Colorado Boulder Administration, All of our industry presenters, Alex Barutis (Nona), Chris Krenz (Nona), Woo Han (Nona)



University of Colorado
Boulder

Nona Research Foundation

Nona Research Foundation, Inc. was created to broaden participation, increase access, and advance innovation in the design, distribution, documentation, maintenance, and use of open-source software and tools in the fields of synthetic biology and bio-design automation.

Nona's goals include the following:

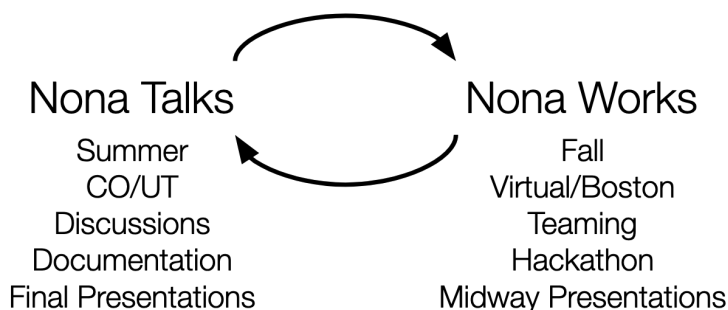
- Serve as a clearinghouse of knowledge.
- Accelerate creation of powerful open-source tools.
- Bring together academic and research groups to design software and carry out research.
- Ensure broad distribution to make advances widely available and useful to participants around the country.



Additional information can be found at <https://www.nonasoftware.com/>. Contact us at info@nonasoftware.org with questions.

Nona Events

NonaTalks and NonaWorks are complementary, annual events hosted by Nona. Each event informs and is informed by the other event. NonaWorks occurs in the Fall—usually in Boston, though this year will be virtual—and NonaTalks occurs in the Summer.



NonaWorks

This hackathon-style event is designed to bring together a diverse group of individuals passionate about innovation and problem-solving in the field of bio software development. Participants have the opportunity to meet researchers working on cutting-edge algorithms, industry professionals in the biotechnology space, and other like-minded individuals. Throughout the event, experts hold office hours to provide guidance, and workshops equip participants with essential skills for developing bio software. Volunteers are available to offer support as participants engage in project development. This event culminates in a Demo Day where teams showcase their innovative projects to the audience. After the event, teams continue to develop their projects further over the course of the next several months in preparation for NonaTalks.

NonaTalks

This event marks the grand finale of the NonaWorks journey, bringing together innovators, experts, and enthusiasts for a compelling showcase of progress and potential in open-source synthetic biology software. This event features the highly anticipated final presentations from NonaWorks competitors, offering a glimpse into the groundbreaking projects developed throughout the program. From innovative software tools to creative design approaches, these presentations highlight the ingenuity and hard work of participants pushing the boundaries of synthetic biology.

In addition to the final demos, NonaTalks hosts keynote speakers who bring valuable insights into software tools, vendor solutions, and design feedback tailored to synthetic biology programs. These discussions provide attendees with practical knowledge and industry perspectives, fostering a deeper understanding of the evolving bioengineering landscape.

NonaTalks 2025 Goals

- Bring together stakeholders in synthetic biology from industry and academia
- See progress on the Nona Works 2024 team projects
- Hear from industry partners about their own projects and needs
- Facilitate conversation on challenges and opportunities in synthetic biology
- Identify the key topics and questions for Nona Works 2025
- Improve, promote, and disseminate useful synthetic biology tools

NonaTalks 2025 Event Details

[NonaTalks 2025](#) was a 2-day event held on June 27th and 28th at the Williams Village Center in the University of Colorado Boulder. The event was attended by a few dozen participants, both in person and virtually.

June 27th Schedule

- 12:00 - 1:00: Registration
- 1:00 - 2:00: Welcome and Overview - Douglas Densmore, Chris Krenz
- 2:00 - 3:00: Breakout Session 1 - Key Challenges
- 3:00 - 3:30: Coffee Break
- 3:30 - 4:30: Breakout Session 2 - Opportunities for AI
- 4:30 - 5:00: Industry Presentation - Lattice, Mitre
- 5:00 - 5:15: SynBioSuite - Gonzalo Vidal Pena
- 5:15 - 5:30: Summary Comments
- 6:00: Dinner - Dark Horse Tavern

June 28th Schedule

- 8:00 - 9:00: Continental Breakfast
- 9:00 - 10:00: Project Presentations
- 10:00 - 11:00: Breakout Session 3 - Biosecurity Needs
- 11:00 - 11:30: Industry Presentation - Asimov, bioisac
- 11:30 - 12:00: Project Award Session
- 12:00 - 1:00: Lunch and Networking
- 1:00 - 1:30: Final Wrap Up

Industry Presentations

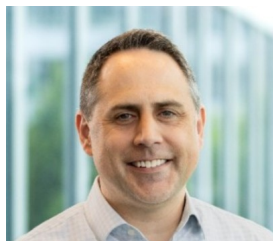
Industry presentations were given by several guest speakers. Some details on each speaker, their organization/project, and key points from their presentations are presented below.

BIO-ISAC - Whitney Bowman-Zatzkin



- Whitney Bowman-Zatzkin is Co-Founder and Director of BIO-ISAC.
- The Bioeconomy Information Sharing and Analysis Center is a nonprofit organization dedicated to advancing cybersecurity resilience within the life sciences, biotech, and broader bioeconomy sectors.
- Whitney spoke about challenges she is seeing in biosecurity and what are the immediate areas that could be addressed by open source software.

Mitre - Dr. Steven Fairchild



- Dr. Steven Fairchild is a Principal Engineer at The MITRE Corporation.
- MITRE has been involved in projects including the BioNET effort and BioMADE's BABEL project.
- Steve spoke to the general challenges MITRE sees in engineering biology.

Lattice Automation - Chris Krenz



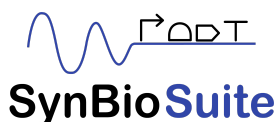
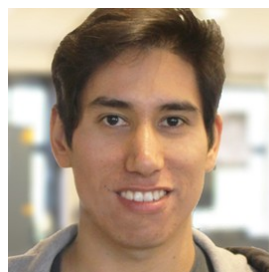
- Chris Krenz is a Software Engineer at Lattice Automation.
- Lattice develops software solutions to fundamentally change the way that biological designs are conceived, designed, and managed.
- Chris spoke on the open source software development at Lattice as well as its new “Interop” platform, which seamlessly connects various synthetic biology tools and services, as well as integrating tools like Anthropic’s MCP for leveraging LLM agency in synbio workflows.

Asimov - Andy Zinsser



- Andy Zinsser is Technical Lead Manager at Asimov.
- Asimov engineers biology for applications in human health and therapeutics. In particular, focusing on cell line development products and solutions.
- Kernel is Asimov’s flagship software product. Kernel is a suite of software and models that connects design work with lab operations.
- Andy spoke about open source software development in the synthetic biology community.

SynBioSuite - Gonzalo Vidal



- Gonzalo Vidal is a Postdoctoral Researcher in Synthetic Biology and Software Engineering at the University of Colorado Boulder.
- Gonzalo spoke about the current state of the SynBioSuite software and how to use it for making synthetic biology workflows automated and programmatic.

Team Project Presentations

Base Bears Team



Jared Croyle

Bioinformatics and Data Engineering Research Apprentice at UC, Berkeley

Trunkline: SynBio ML Pipeline

- Trunkline is a functional end-to-end machine learning pipeline designed to make predictive modeling accessible to synthetic biologists with minimal coding experience.
- It automates data cleaning, model training (across multiple frameworks), and interpretation of outputs via SHAP - all wrapped into a clean HTML report.
- While the current use case focuses on protein production predictions, the framework is modular and can extend to other ML tasks in synthetic biology.

Circuit Smiths Team



Jordan Graves

MS Student of Biotechnology, Harvard Ext. School
Voythos CTO, Elastin COO



Chunxiao Liao

Graduate Researcher, Ph.D.
University of Colorado Boulder

GeneForge: Agentic AI Server for Design Automation

- This project explores the potential of using AI agents for synthetic biology workflows, equipping agents with synbio tools, validating workflows, and learning preferences.
- GeneForge reduces the number of manual steps for common workflows; provides a foundation for integrating agents and tools; and presents an opportunity for preference optimization and reinforcement learning to improve and align agents.

SBOL Pioneers Team



Ryan Greer

Undergraduate Researcher
Genetic Logic Lab, CU Boulder



Kerem Gurkan

Undergraduate Researcher
Genetic Logic Lab, CU Boulder

SBOL2Build: SBOL DNA Assembly Python Package

- Focuses on connecting software in the Design and Build stages together.
- Takes data-rich plasmids designed in SBOLCanvas with parts from SynBioHub, and creates an in-depth representation of the golden-gate transformation to the final product.
- With the output of SBOL2Build, an ‘assembly plan’, the team is developing connectors that take in assembly plans to generate OpenTrons robot protocols with PUDU and LapOp by-hand protocols.

Voting and Awards

After the project presentations, all conference participants were sent a brief survey to rate each of the presentations. The results were tallied, and the grand prize winner was announced.

Grand Prize Winner: The Circuit Smiths

Group Discussions

On both days of the events, participants separate into groups of 3-5 people to discuss the topics below. A scribe was elected in each group to take notes during the discussion, and notes were then sent to Nona staff for consolidation and AI summarization (using Claude Sonnet) presented below (raw notes from the group discussions can be made available upon request).

Breakout Session 1: Key Challenges in Synthetic Biology

Discussion Prompts:

- 15 minutes - brainstorm key challenges in synthetic biology
- 15 minutes - associate these challenges with potential software solutions
- 15 minutes - rank these combined challenges and software in terms of:
 - Potential Impact - how many people could use it, economic/societal benefits, etc.
 - Most difficult - how hard is this to solve, how hard is data to get
 - Lowest hanging fruit - which are we closest to being able to do
- 15 minutes - propose 3 potential Nona Works programming projects around these topics - focus on those that could be successful in a 6 month period.

Key Points from Discussions:

- Portability & Host Context: Genetic designs struggle to transfer between different organisms/environments due to host-specific behaviors.
- Data & Design Complexity: Lack of failure data and tools to simplify complex genetic circuits into robust, practical designs.
- Scale-Up & Automation: High-throughput experimentation tools need better automation and integration with existing datasets.
- Environmental Context: Designers must manually research environmental conditions rather than tools auto-suggesting optimal parameters.
- Biosecurity & AI Limitations: Need methods to distinguish engineered vs. natural designs; AI lacks access to failure data to debug.

Breakout Session 2: Opportunities for AI in Synthetic Biology

Discussion Prompts:

- 10 minutes - Write 2-3 prompts for AI that attempt to engineer a genetic system
- 10 minutes - Examine the results of the prompts and identify:
 - Useful/Correct information; Not useful/Incorrect information; Other
- 10 minutes - refine the prompts to improve the responses
- 5 minutes - examine the new responses
- 25 minutes - Discuss why you got what you got. Can this improve? Will AI be able to handle these in the future? Some other topics for discussion:
 - Where is AI currently being used in SynBio? (e.g., sequence design, modeling, automation) What's working well?
 - What are the current limitations of AI in SynBio? What technical, biological, or data barriers exist?
 - What could be the next frontier? How might large language models, reinforcement learning, or AI-driven labs shape SynBio in the next 5–10 years?
 - What ethical or societal concerns should we address early? Who benefits, who might be left out, and how do we ensure responsible use?

Key Points from Discussions:

- **Model Reliability:** AI models vary widely in self-awareness, with some overconfident and others appropriately cautious.
- **Data Bottlenecks:** Limited training data in specialized areas leads to AI guessing rather than reasoning through solutions.
- **Biological Speed Limits:** While AI-robot integration shows promise, slow biological processes remain a fundamental constraint.
- **Biosecurity Risks:** Need for guardrails to prevent AI from creating dangerous biological agents while maintaining benefits.
- **Equity Concerns:** AI advantages may disproportionately benefit wealthy countries and institutions with better access.

Key points from Breakout Session 3: Biosecurity Needs in Synthetic Biology

Discussion Prompts:

- 15 minutes - Break into two subgroups within your larger group. Each group should come up with a biosecurity threat that arises from accidental circumstances.
- 15 minutes - Give the other group your scenario. Each group should then brainstorm computational solutions to this scenario.
 - Take notes on the scenario, your solution, and any discussion points that arise.
- 15 minutes - Each group should now create a biosecurity threat that arises from malicious circumstances.
- 15 minutes - Give the other group your scenario. Each group should then brainstorm computational solutions to this scenario.
 - Take notes on the scenario, your solution, and any discussion points that arise.

Key Points from Discussions:

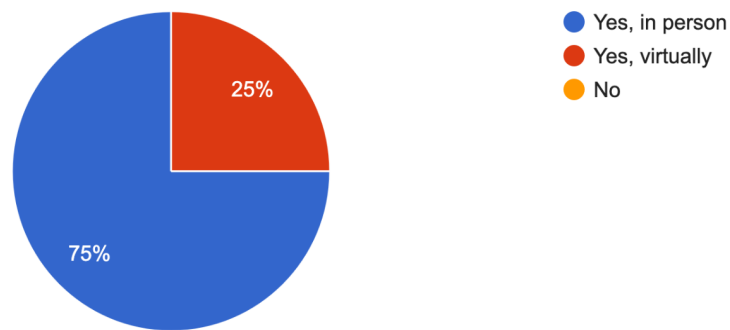
- Accidental Contamination: Environmental contamination from the unintentional release of pathogens.
 - Proposed solution: Auto-screening for abnormal sequence evolution patterns.
- Hidden Toxic Designs: Malicious actors creating toxic proteins from small, undetectable segments assembled in vivo.
 - Proposed solution: Improved small-sequence detection algorithms.
- Data Corruption: Intentional tampering with databases of sequence/annotations.
 - Proposed solution: Audit trails, distributed validation, and multi-algorithm detection systems.
- Agricultural Biowarfare: Engineered organisms targeting crops or livestock through resistant pathogens.
 - Proposed solution: Diversified crop protection and biosensor networks.
- Novel Threats: Unknown toxic sequences not on standard blacklists and accidental human genome modifications
 - Proposed solution: Predictive screening and kill-switch mechanisms.

Survey Results

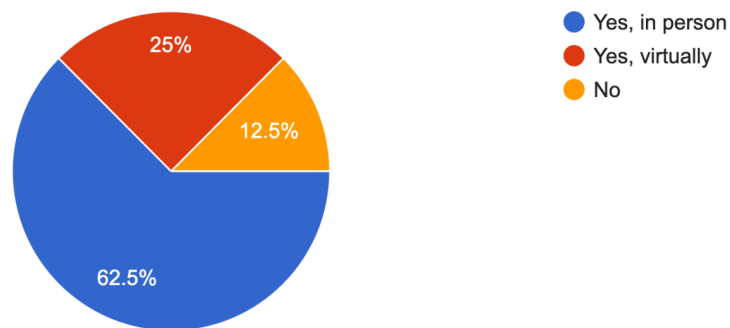
Following NonaTalks 2025, Nona sent out a survey to participants to better understand their experience and improve future events.

A summary of the results follows.

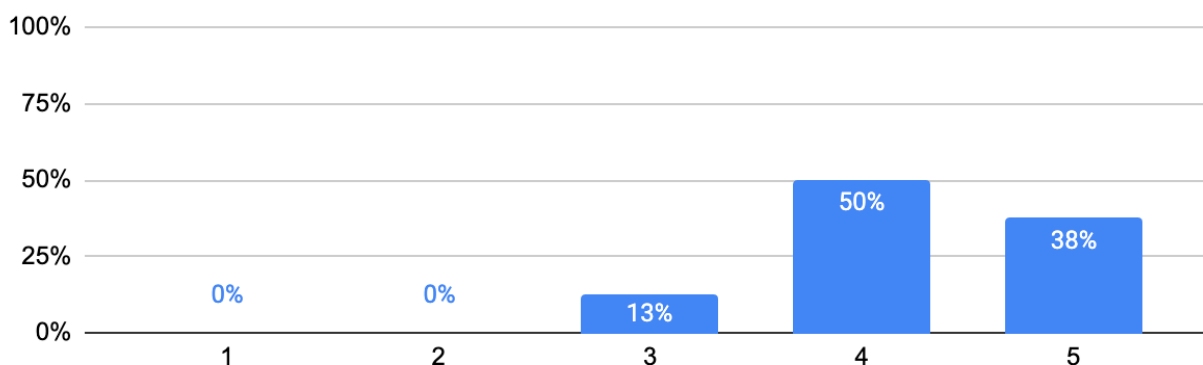
Did you attend (at least most of) the first day of the event?



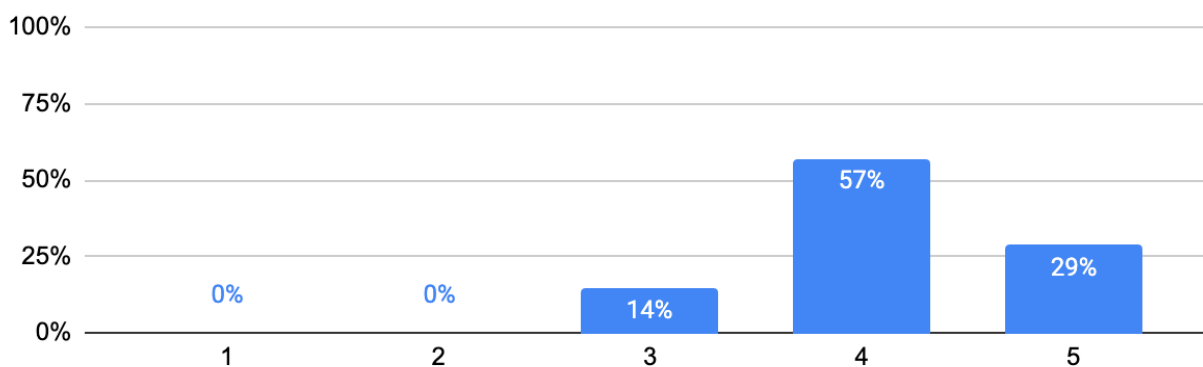
Did you attend (at least most of) the second day of the event?



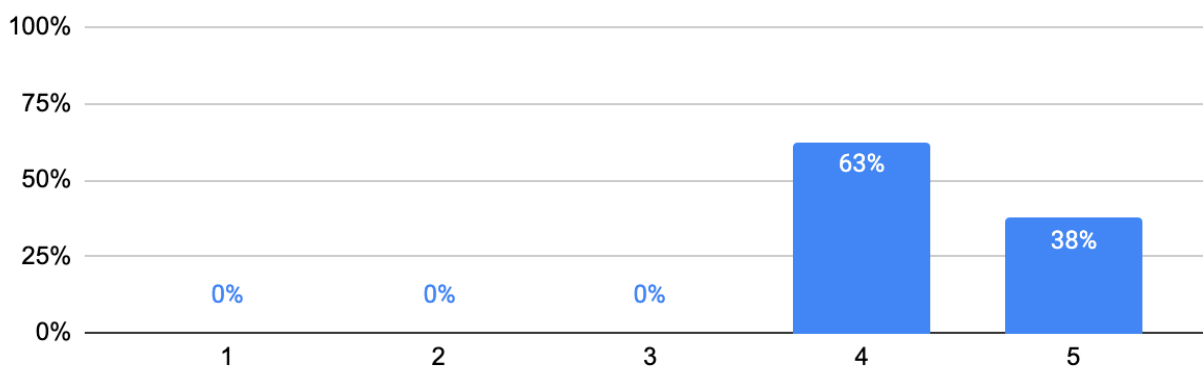
How would you rate your **overall experience** at NonaTalks 2025? (1: Poor; 5: Great)



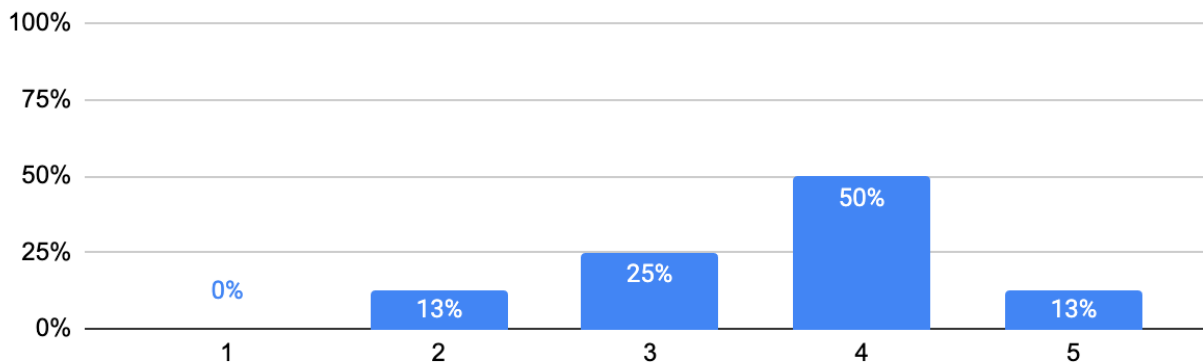
How useful were the **small group discussions** on Key Challenges, AI Challenges, and Biosecurity Challenges in synthetic biology? (1: Not useful; 5: Very useful)



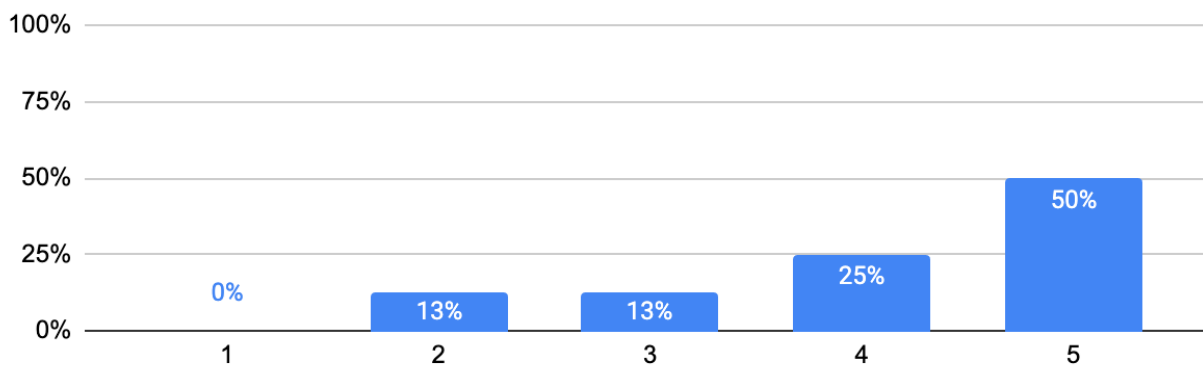
How useful were the **project presentations** by the Base Bears (Trunkline), Circuit Smiths (GeneForge), and SBOL Pioneers (SBOL2Build) overall? (1: Not useful; 5: Very useful)



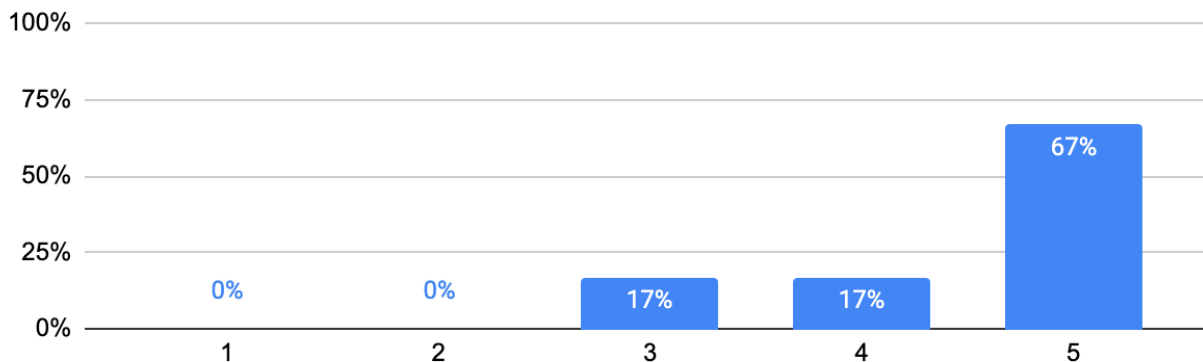
How useful were the **industry presentations** by Lattice Automation, Mitre, BIO-ISAC, and Asimov overall? (1: Not useful; 5: Very useful)



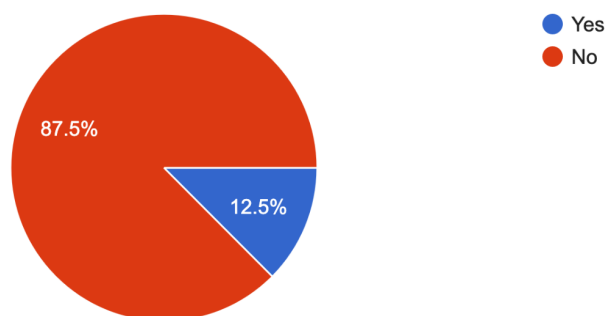
How was the **audio/video** experience from your perspective? (1: Poor; 5: Great)



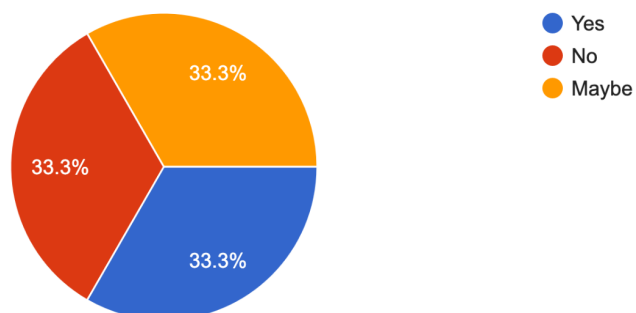
How was the **food**? (1: Poor; 5: Great)



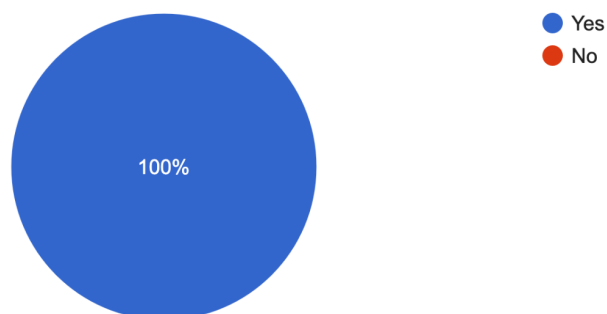
Did you apply for travel sponsorship (through the online form)?



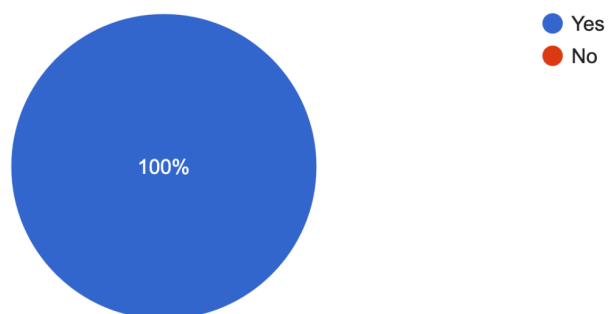
If you did *not* attend in person: Would you have attended in-person had there been more travel sponsorship?



Are you interested in attending **NonaWorks** at IWBD in Boston between September 7 - 10?



Are you interested in attending **NonaTalks** (likely in CO or UT) in the Summer of 2026?



Next Steps

Nona will follow up by email with participants and the broader community regarding the following points:

- An update to the Nona website to include a **form through which one can request support, hosting, promotions, etc. for software.**
- Additional communications about **NonaWorks 2025**. This year, Nona will now be holding NonaWorks as a **virtual** event, rather than in-person, to allow for participation from a broader community of stakeholders and interested participants. NonaWorks will occur on **September 10-12**, right after [IWBDA](#). You can find more information about NonaWorks here: <https://www.nonasoftware.com/nonaworks25>.

To those who attended NonaTalks 2025, we hope you had a good experience. We will strive to improve in future events, so we greatly appreciate your ongoing feedback. We look forward to future and ongoing collaborations!



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