# Math+Code+Art: An Initiative for Learning Mathematics and Computation Through Creative Expression

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## Abstract

Mathematics, code, and art rarely intersect in ways that are both accessible and rigorous. Consequently, *Math+Code+Art* is created as an open initiative and forthcoming public-education book that addresses this gap through hands-on Jupyter notebook tutorials, art exhibitions, and research. It is centered on a simple idea: computational thinking expands artistic practice, and creating art builds intuition for mathematical and computational concepts. All materials are open-access, and the project has grown from a faculty–student collaboration at UCLA Mathematics into an expanding community.

This special session introduces the initiative and its open curriculum to computing educators through a multi-perspective format. It begins with a five-minute overview of the initiative's three pillars, *Education*, *Creation*, and *Exploration*, along with its forthcoming book as an adoptable resource. Three student contributors then present ten-minute talks on their projects: Traveling-Salesman-Problem-based single-line portrait art, neural-network-driven music visualization, and differentiable-Voronoi-guided adaptive photo collage art. Each talk includes five minutes of Q&A. A ten-minute research highlight connects tutorial-level ideas to current graphics research. The session concludes with fifteen minutes of structured discussion on classroom integration and feedback for the book.

## CCS Concepts

• **Broadening Participation in Computing Topics** → **Accessibility, Inclusive computing curricula and pedagogy**; • **Computing Topics** → *Artificial Intelligence/Machine Learning, Algorithms*; • **Education and Experience Topics** → Active learning; • **Methods Topics** → Outreach.

## Keywords

computing education, algorithmic thinking, creative coding, mathematical visualization, interdisciplinary curriculum, broadening participation

**ACM Reference Format:**

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## 1 Overall Objective

Math, code, and art are routinely taught in isolation, yet they share a common language of pattern, structure, and transformation. Math+Code+Art (https://math-code-art.github.io) [3] bridges this gap through a bidirectional thesis: algorithmic thinking enables creative expression, and making art builds intuition for mathematical and computational ideas. The initiative is built around three pillars:

- *Education*: open-access Jupyter notebook tutorials, each centered around a mathematical or algorithmic idea and ending with a visual or auditory result.
- *Creation*: student art exhibitions that show what these ideas look like when developed with genuine creative intent.
- *Exploration*: research that investigates how far the same mathematical ideas extend at the frontier.

A forthcoming public-education book ties all three together as an open resource for anyone curious about the intersection of math, code, and art. The initiative is designed to be inclusive and approachable: all tutorials are open-access, the book will be publicly available, and the community spans high school students, undergraduates, graduate students, and faculty across multiple institutions.

This session showcases student voices and invites computing educators to share how open materials like these can best reach a broad and diverse audience of learners.

## 2 Session Outline

The 75-minute session is structured as shown in Table 1. Approximately 30 minutes (40%) are dedicated to audience interaction through per-talk Q&A and a closing structured discussion.

**Table 1: Session schedule**

| Time | Segment | Presenter |
|---|---|---|
| 0–5 min | Opening overview | Yue Sun |
| 5–20 min | Student talk 1 + Q&A | Dengyuhan Dai |
| 20–35 min | Student talk 2 + Q&A | Shanmei Wanyan |
| 35–50 min | Student talk 3 + Q&A | Meichen Wan |
| 50–60 min | Research highlight | Jiayin Lu & Ying Jiang |
| 60–75 min | Structured discussion | Yumeng He & Wanxi Yang |

### 2.1 Opening Overview (5 min)

Dr. Sun introduces the central challenge: math, code, and art are usually taught in separate courses despite sharing common ground. She establishes a framework that connects each discipline, outlines the project's three foundational pillars, and previews the forthcoming open curriculum designed for educators.

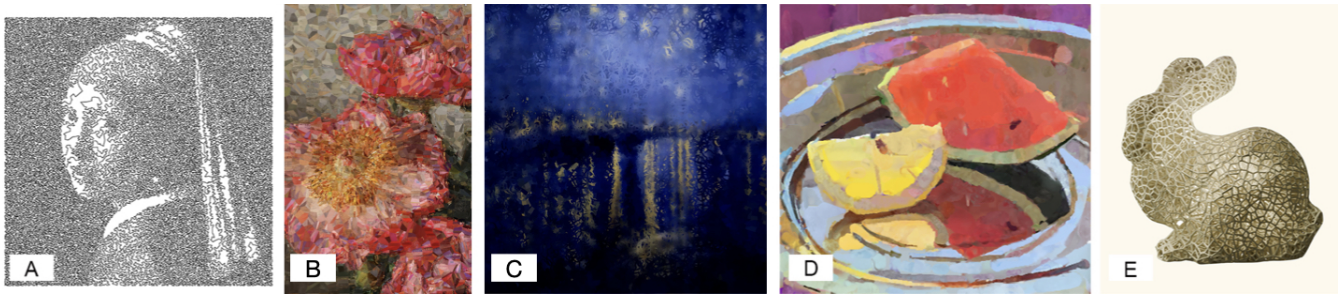



**Figure 1: Examples of student projects and research highlights: (A) line art, (B) *Whisper of Nature*, (C) *Inner Landscapes*, (D) Birth of a Painting, (E) VoroLight.**

### 2.2 Student Talk 1: The Traveling Salesman Problem as Line Art (15 min)

Starting from an input image, a stippling process converts pixel intensity into points, which are connected by a Traveling Salesman Problem (TSP) solver to form a single continuous drawing path tracing the portrait. Dengyuhan Dai presents this pipeline, from preprocessing and point generation to solving and drawing, and the resulting artwork. He reflects on how this visual setting reframes optimization not only as minimizing path length, but as shaping structure through constraints.

### 2.3 Student Talk 2: *Inner Landscapes* (15 min)

Shanmei Wanyan presents *Inner Landscapes*, a series of abstract dynamic paintings that translate music into evolving visual expressions of emotion. A coordinate-based neural network learns from an emotion-inspired reference image while responding to music spectrograms, allowing color, structure, and visual scale to shift with the sound. The learned imagery is then rendered through a stochastic painting process whose strokes respond to musical intensity and mood. She discusses how combining neural networks, computer vision, and generative painting can turn sound and emotion into continuously evolving visual landscapes.

### 2.4 Student Talk 3: *Whisper of Nature* (15 min)

*Whisper of Nature* is a series of large-format, nature-themed collages featuring flowers, animals, and landscapes. The works combine adaptive spatial partitioning with differentiable Voronoi optimization: Sobel-derived vector fields guide preferred cell directions, while each cell is filled with photographic fragments matched to local signals in the original image. Meichen Wan discusses how these techniques work together to transform natural imagery into richly structured geometric collages.

### 2.5 Research Highlight: From Tutorial Concepts to the Research Frontier (10 min)

The same ideas introduced in tutorials turn up as open research questions. *Birth of a Painting* [1] reconstructs artworks in a stroke-by-stroke manner via differentiable rendering, enabling the faithful recovery of watercolor, oil, digital, and ink painting processes. *VoroLight* [2] learns smooth Voronoi surface meshes for 3D fabrication. Rather than presenting these as technical papers, the speakers use the projects to show that the curriculum has depth: students who engage these ideas through art-making are already working with concepts at the research frontier.

### 2.6 Structured Audience Discussion (15 min)

The moderators will guide a discussion on applying these materials in classroom settings and navigating challenges in interdisciplinary student projects. The discussion will revolve around three topics, with five minutes for each:

(1) *Classroom fit:* Which tutorial topic resonates with a course you teach, and what would it take to adopt it?
(2) *Barriers and support:* What obstacles might prevent you from using these materials, and what support would help?
(3) *Interdisciplinary value:* Based on your experience, what unique opportunities do interdisciplinary approaches create for student learning?

## 3 Expectations

**Target audience.** CS instructors teaching introductory computing, algorithms, or machine learning; faculty exploring creative approaches to computing; educators interested in broadening participation through interdisciplinary curricula.

**Learning outcomes.** Attendees will learn strategies for making computing and mathematics more accessible and intuitive through project-based creative work; gain insights from student perspectives on the learning process; explore how the initiative connects hands-on tutorials with research depth and artistic practice; access open materials for classroom use; and provide input on the forthcoming public-education book.

**Feedback.** Feedback is gathered through a short QR-code survey asking attendees to identify one tutorial they would consider using and one gap in the materials, as well as through structured discussion at the end of the session.

## 4 Suitability as a Special Session

This session demonstrates an accessible education initiative through the people who built it. Student learning narratives, research context, and interactive educator feedback coexist in a single discussion format. A panel without students would miss the core evidence; a tutorial focused on a single technique would lose the coherence of the broader curriculum; a paper alone would not capture the interactive and multi-perspective nature of the work. The special session format is therefore the right fit.

## Acknowledgments

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## References

[1] Ying Jiang, Jiayin Lu, Yunuo Chen, Yumeng He, Kui Wu, Yin Yang, and Chenfanfu Jiang. 2025. Birth of a Painting: Differentiable Brushstroke Reconstruction. arXiv:2511.13191 [cs.GR] https://arxiv.org/abs/2511.13191

[2] Jiayin Lu, Ying Jiang, Yumeng He, Yin Yang, and Chenfanfu Jiang. 2026. VoroLight: Learning Voronoi Surface Meshes via Sphere Intersection. arXiv:2512.12984 [cs.GR] https://arxiv.org/abs/2512.12984

[3] Jiayin Lu, Ying Jiang, Yue Sun, Wanxi Yang, Yumeng He, Shanmei Wanyan, Hanyin Zhang, Junhao Jia, Weimo Zhu, Tucker Nielson, Meichen Wan, Dengyuhan Dai, Qiyang Chen, and Chenfanfu Jiang. 2026. Math+Code+Art: An Initiative for Education, Creation, and Exploration. https://math-code-art.github.io. Open initiative and forthcoming book.