PERFORMING ARTS X TECH LAB

YEAR 2023/24

ARTISTS

CREATIVE TECHNOLOGISTS

A JOINT INITIATIVE BY

NATIONAL ARTS COUNCIL SINGAPORE

esplanade theatres on the bay singapore

SUPPORTED BY

MCCY Ministry of Culture, Community and Youth

TECHNOLOGY PARTNER

NUS National University of Singapore

INTRODUCTION

A partnership between the National Arts Council (NAC) and Esplanade – Theatres on the Bay, with the Keio-NUS CUTE Center as technology consultant, the Performing Arts x Tech Lab was launched in August 2023 and dedicated to practitioners working in the performing arts or with performance in general. It sought to encourage innovation and experimentation by seeding collaboration between arts and technology—an intersection that remains relatively unexplored within Singapore's performing arts sector. Following an open call, six project teams were carefully selected, each consisted of performing arts practitioners, creative technologists, and designers.

The first edition of the Lab, inaugurated in 2021, involved a diverse range of artistic practitioners who were tasked to explore challenge statements posed by the Lab. Building upon this foundation, the second iteration of the Lab in 2023 embraced a more open-ended framework that resonates with the performing arts practice. Throughout the nine-month-long process, the six project teams were free to explore their ideas and chosen technologies without the constraints of predefined outcomes. This approach allowed the creative process to guide them, catalysing shifts in perspectives to transform artistic creation in the long run.

In addition to supporting participants with seed funding to research and develop their projects, the Performing Arts x Tech Lab facilitated in-person and remote consultation sessions with an international advisory panel. The panel lent invaluable insights and introduced a global perspective to the projects. The Lab also organised various supplementary artist-sharing sessions, workshops and site visits to enrich the participants' understanding and engagement with the intersection of performing arts and technology.

The culmination of the Performing Arts x Tech Lab was marked by an Industry Sharing held from 5 to 13 April 2024 at the Esplanade Annexe Studio, showcasing the prototypes, demonstrations, and process documentation from the Lab, including participants' reflections on their lab journey. Open to the public, this industry sharing also provided a chance for dialogue and networking with potential collaborators and adopters.

Whether through experimenting with new tools and methodologies for performance-making or presenting alternative modes of expression, the six projects developed as part of the Performing Arts x Tech Lab offered a glimpse into a future of new audience experiences and possibilities in the performing arts landscape.

Participants and organising team of the Performing Arts x Tech Lab 2023/24.

TEAM BEHIND THE LAB

ORGANISER

National Arts Council

How does the interdisciplinary collaboration between arts and technology contribute to the arts ecosystem? What are the long-term goals of NAC for the Lab?

The Arts x Tech Lab is part of NAC's efforts to champion the growth and practice of our arts practitioners, supporting the exploration and adoption of technology in enabling new opportunities and encouraging continuous innovation in the sector.

The objective of this Lab is to enable our arts community to embrace technology to enrich their artistic practice, explore new forms of expression and performance creation, and grow their audiences. It serves as an incubation space for artists and technologists to collaborate, research and transform artistic creation and practice.

NAC aims to continue nurturing the growing community of artists engaging with technology and sustaining the conversation in this space through future Arts x Tech events and networking sessions.

Future editions of the Arts x Tech Lab will explore different themes and focus areas that respond to the arts sector's interest and needs.

Beyond the Lab, NAC hopes to see the projects spark further collaboration within the arts community, and be further developed and adopted by relevant stakeholders in the arts ecosystem such as producers, presenting venues and platforms, and local and international festivals and events.

PARTNER

Esplanade – Theatres on the Bay

As a performing arts venue/ commissioner, what value does Esplanade see in arts x technology collaborations, and how does it enrich the audience experience?

Performance creation is inherently often a collaborative and interdisciplinary process which has long experimented with technologies. In recent times, newer technologies have become available for artists to expand possibilities in the way they can shape the audiences experience and perceptions in their work. Some new technologies for example allow for real-time audience interactions, personalised experiences, greater accessibility features, and immersive experiences which add new dimensions to how audiences connect to live performances. In addition these intersections between new technology and the performing arts also bring to light to artists and audiences interesting questions examining our complex relationship to technology itself in contemporary times.

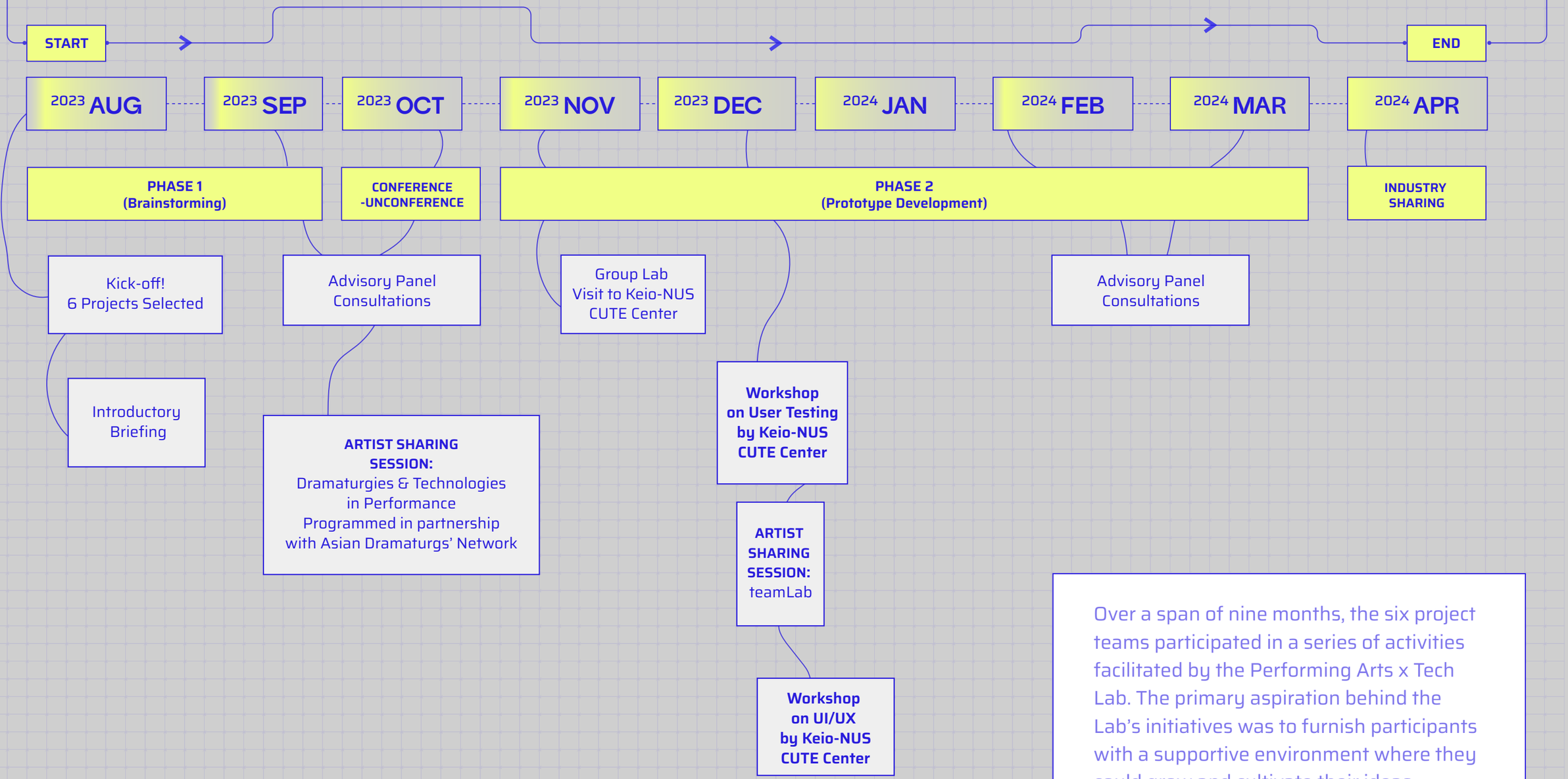
TECHNOLOGY PARTNER

Keio-NUS CUTE Center

As a recurring Lab consultant, how do the projects in this Lab differ from the previous edition? How have you approached the second edition of the Lab differently?

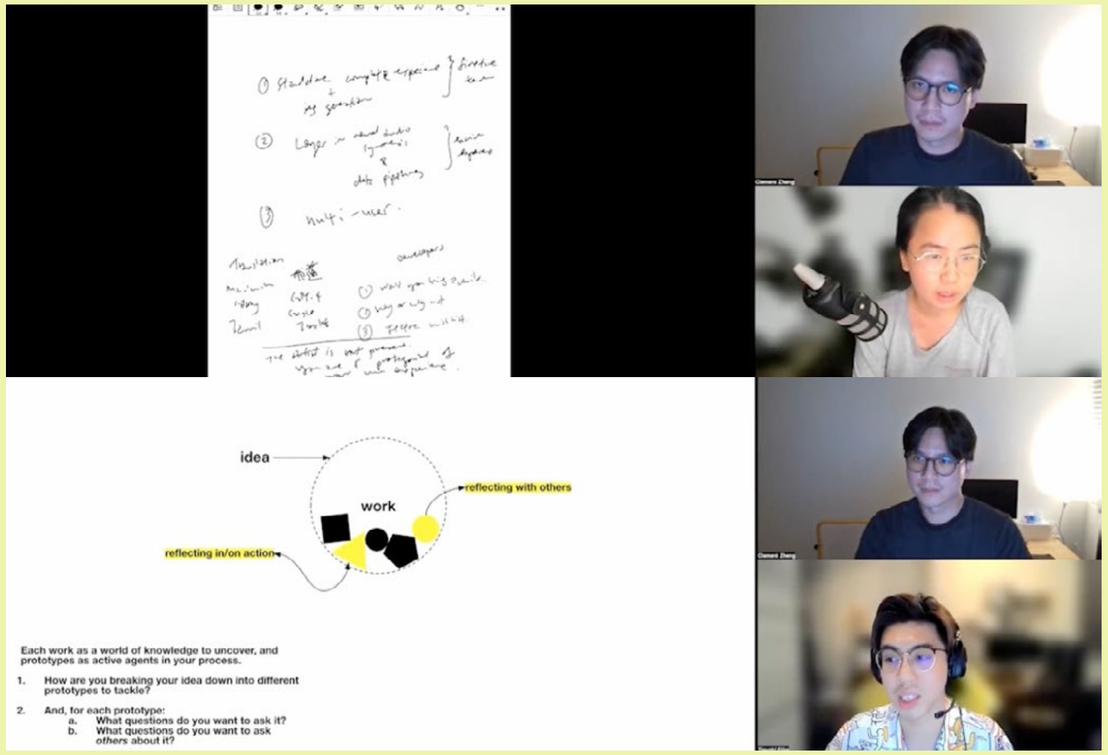
CUTE Center provided technical guidance for both Lab editions. The second edition emphasised performing arts and its intersection with technology, expanding insights in this field. Unlike the first, hindered by COVID-19, this round featured lab trips, consultations, and a midpoint conference fostering peer interaction and concept reflection, enriching participant engagement. The Advisory Panel contributed invaluable insights, aiding in refining project concepts before finalisation.

THE LAB AT A GLANCE



Over a span of nine months, the six project teams participated in a series of activities facilitated by the Performing Arts x Tech Lab. The primary aspiration behind the Lab's initiatives was to furnish participants with a supportive environment where they could grow and cultivate their ideas.

KEY EVENTS



Dr Clement Zheng conducting an online workshop on User Testing, organised by the Keio-NUS CUTE Center, with the Lab participants.

Advisory Panel Consultations

The Advisory Panel Consultations focused on project development, providing participants with opportunities to discuss and fine-tune their ideas with guidance from an experienced advisory panel. Both remote and in-person consultation sessions were conducted.

Programmed in partnership with the Asian Dramaturgs' Network. Panellists include (on-screen) Su Wen-chi, and (from left) Milton Lim and Chong Gua Khee.

Artist Sharing Sessions and Workshops

Artist Sharing Sessions and Workshops helped to enrich the participants' understanding and engagement with the intersection of performing arts and technology.

The Artist Sharing Sessions provided invaluable insights into the respective practices and arts x tech development journeys of esteemed guest speakers including Canada-based digital media artist Milton Lim, Taiwan-based new media artist-choreographer Su Wen-Chi, and local dramaturg Chong Gua Khee. Another sharing session featured renowned international art collective, teamLab, on their art and tech installations and offered insights into their creative practice.

Workshops conducted by the Keio-NUS CUTE Center focused on UI/UX design and user testing to offer participants practical skills and knowledge in these areas.

Conference-Unconference

The *Conference-Unconference* was an early check-point, organised for the first time through the format of a two-part symposium held at the Esplanade Theatre Studio. The event provided a platform for participants to find additional collaborators early in their development process. It also aimed to inspire the participants through exchanges on the possibilities, opportunities, and frictions between performing arts and various technologies.

The ***Conference*** comprised two main panels: 'Ways of Making' and 'Ways of Framing'. Throughout these panels, the audience got to hear and learn from seasoned performance-makers and creative technologists who have been actively developing and exploring diverse entry points into the realms of performance and technology.

Panel 1: Ways of Making speakers: Clarence Ng, Mitsuru Tokisato, Toby Coffey, Kuo Jian Hong. Moderated by Dr Cheng Nien Yuan.

Panel 2: Ways of Framing speakers: Ho Tzu Nyen, Danny Yung, bani haykal. Moderated by Corrie Tan.

The ***Unconference*** comprised a series of breakout sessions in the form of artist presentations, demonstrations, and group discussions. The open format—a first for the Lab—created a friendly and open atmosphere, encouraging casual interaction and networking among practitioners from the arts, design, and technology sectors.

LEFT IMAGE:
Ways of Making Panellists: (from left) Mitsuru Tokisato, Clarence Ng, Kuo Jian Hong, Toby Coffey, and the moderator, Dr Cheng Nien Yuan.

TOP RIGHT IMAGE:
Alina Ling from *Theories of Motion* demonstrates an interactive sensor system used in the project to the audience.

BOTTOM RIGHT IMAGE:
Artist Chew Shaw En demonstrates an excerpt from the performative element of *DOTS 2.0*'s project.

Industry Sharing & Exhibition

Jake Tan and Dapheny Chen from *Dancing the Algorithm (DatA)* explain their project to guests through a brief demonstration.

Guests interact with *The Sound of Stories*' interactive chatbot, showcasing the use of AI technology to synthesise storyteller Kamini Ramachandran's voice.

The culmination of the nine-month Lab, the industry sharing and exhibition took place from 5 to 13 April 2024 at the Esplanade Annexe Studio. Attendees had the opportunity to immerse themselves in an exhibition showcasing the Lab projects, where they could engage in live demonstrations, playtests, and sharing sessions led by the participants.

WATCH AN OVERVIEW OF THE LAB VIDEO

Syafiq Halid from *The Sound of Stories* demonstrates the expressive MIDI controller from Embodme which utilises neural audio synthesis to shape the soundscape accompanying the storytelling.

PROJECTS

- Dancing the Algorithm (DatA)
- DOTS 2.0
- perfor.ml
- Theories of Motion
- The Sound of Stories
- Verge 2.0

TOBY COFFEY
FORMER HEAD OF IMMERSIVE STORYTELLING STUDIO

What do you think of the Lab's approach to fostering interdisciplinary collaboration and experimentation in the intersection of performing arts and technology?

NATIONAL THEATRE (UK)

"Having a decades-long career working at the intersection of the arts, more specifically the performing arts and technology, I know how vital the role of experimentation is to progress the field. I think that the Performing Arts x Tech Lab initiative has demonstrated the importance of developing an environment, both physical and through new connections, where interdisciplinary collaboration is championed. Collaboration is very much key to the realisation of new ideas.

I think the success of the programme is evidenced by the calibre of the projects and the progression of demonstrable skills and understanding within the teams."

DANNY YUNG
FOUNDING MEMBER AND CO-ARTISTIC DIRECTOR

What are your thoughts on the Lab's current activities? What other strategies can it employ to further innovate and push the boundaries of performing arts within the context of Asia?

ZUNI ICOSAHEDRON (HK)

"Attracting the right candidates is requisite for the creative processes and future development. Hence, starting earlier and reaching out to a wider scope in the regions may be considered. Asians tend to be bigger enthusiasts of fancy technology-led presentations, more resources allotted to supporting art-tech theatre productions which are dedicated to exploring and experimenting. Re-imagining the existence of theatre conceptually, the hardware and its operations. Linking artists more closely with key drivers in the technology industry, including engineers, researchers, and marketing departments. Encouraging artists to produce new environments and bridges instead of products."

DANCING THE ALGORITHM (DatA)

MEET THE TEAM

Dapheny Chen
Dance Artist

SERIAL CO_
Creative Technology Studio

Archival of movement and choreography by creating a system that can learn, generate movement scores through AI algorithm and motion capture technology.

The inception of *Dancing the Algorithm (DatA)* can be traced back to a simple question: 'How do we dance collectively?' By blending computer-generated elements and individually created movement sequences, this project explores the intersection of computational logic and human expression. Its goal was to expand dance-making and performance tools through a focused exploration of possibilities, rather than fixating on a final product.

Jake Tan, New Media Artist and Technology Lead at *SERIAL CO_*, demonstrates how *DatA* utilises motion capture technology to capture and archive participants' movements, which are then used to inform the generative system.

One of the longstanding questions concerning dance and its ephemerality revolves around archiving it beyond the moment. The team, comprising dance artist Dapheny Chen and Creative Technology Studio SERIAL CO_, was interested in how movement data collected from a human performer can eventually serve as a collaborator or creator of dance expressions. By bringing together the fields of dance and choreography, and technological approaches — each learning about the other's 'language' through movement research workshops that facilitated data collection—*DatA* draws parallels between dance-making and algorithmic creation, both considered to be iterative and generative.

Utilising motion capture technology, they developed a working prototype of the system. They explored how it could be used in collective dance dynamics and whether it could collaborate with humans for artistic expression. The goal is to enable the system to learn, generate, and recreate movement scores through the logical and computational aspects of an AI algorithm. Over time, it evolves into a dynamic digital dance archive, transforming into an interactive platform

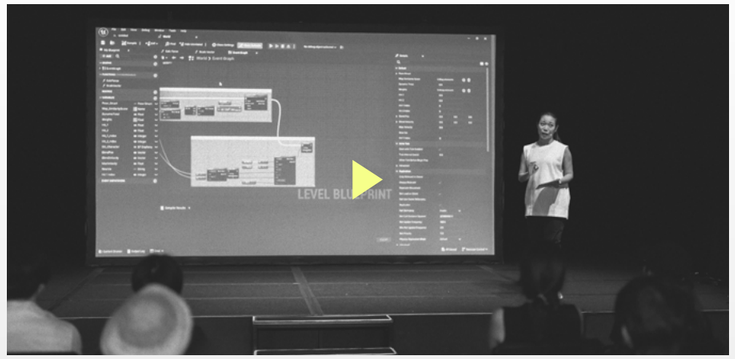
for movement artists to explore, interpret, and bring computer-generated sequences to life with their own unique style and flair.

DatA brings together the seemingly opposite worlds of dance expression and computation, forging a symbiotic relationship. The algorithm comes to life through the expressive capabilities of the human body. Importantly, it has the potential to extend its influence beyond dancers and the dance medium, offering a tool for individuals to tap into their distinct 'movement DNA' and unleash personal expressions.

"Emphasis was placed on deliberate experimentation, prioritising the exploration of possibilities over the immediate pursuit of a final product. Our focus remained on the iterative process, allowing ideas to evolve organically. Each adjustment represented a calculated progression towards a more polished vision."

At the performance lecture, Dapheny Chen showcases the first *DatA* living dance archive while sharing about the team's experimentations with collective dance dynamics.

WATCH INDUSTRY SHARING PRESENTATION VIDEO



Industry Sharing Presentation

A performance-lecture demonstrating the interaction between living and digital bodies, serving as a type 01 of a living dance archive. The presentation included selected documentation of the team's experiments with motion capture technology and a demonstration of the system in action.

What's Next?

Emerging questions from this developmental phase will form the foundation of subsequent phases. The team intends to advance *DatA* by participating in other residencies to further research and develop the system as a tool for formulating new artistic expressions. The long-term trajectory is to develop this collaboration into a performance project.

CONTACT serial.sg @daphenyc @serialco_

DOTS 2.0

MEET THE TEAM	Issy x Cher (Isabella Chiam and Cherilyn Woo)	Five Stones Theatre	Timothi Ellim

A digital experiment that reimagines interactive experience in theatre for young audiences (TYA).

Issy x Cher introduces *DOTS 2.0*, inviting children on stage to interact with the motion sensor technology through physical movements.

Conceived for young audiences, *DOTS 2.0* is a theatrical adaptation of the award-winning children's book *The Dot* by Peter H. Reynolds. Covering themes of creative empowerment and resilience, the story follows the artistic journey of a young girl who believed that she could not draw–until her art teacher advised her to "just make a mark and see where it takes you." (Reynolds, 2003). This non-verbal adaptation seeks to inspire children to find confidence in physical expression while bringing out their inherent creativity through the process of making art.

A collaboration between Isabella Chiam and Cherilyn Woo who form Issy x Cher—a duo creating playful and engaging theatrical experiences for all ages—*DOTS 2.0* was originally incepted in 2020, and further developed as part of the Lab into a visual- and movement-based interactive performance alongside creative technical director Timothi Ellim. Motion sensors are set up to track the movements of the performer and the audience.

As the narrative progresses, the performer's movements form paint strokes that are projected on the walls. The same sensors also pick up on the audience's movements, inviting them to "make a mark" and express their creativity using their entire bodies. By enabling the children to partake in art-making, the team hopes that *DOTS 2.0* can help build creative confidence among children.

Recognising that technology is a part of everyday life, this project seeks to find new ways for young audiences to engage with theatre through technology. Combining art (physical movement and visual art) and technology (motion capture and multi-media projection), *DOTS 2.0* encourages children to express themselves freely through storytelling, play and technology, creating a contemporary theatre experience.

Children participate in a *DOTS 2.0* play-test session, expressing their creativity and engaging in art-making.

"As theatre-makers, we recognise that our audiences have changed and we want to find more interesting ways to engage them and resonate with them."

WATCH INDUSTRY SHARING PRESENTATION VIDEO

Industry Sharing Presentation

At the live demonstration and play-test sessions, children aged 4-9 were invited to interact with the technology and "paint" on a digital wall. The main goal was to better understand the responses of the young audience, allowing for further refinement and improvement of the user interface and environment to enhance the theatrical experience.

What's Next?

Apart from activating this project in a theatre or gallery space, the team is considering an AR app to extend the after-show experience. The app will enable children to bring a part of the interactive experience home to further engage with the story's themes and bond with their families through play. There is also potential for *DOTS 2.0* to be expanded to interest other age groups in non-verbal, movement-based educational contexts.

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PERFOR.ML

MEET THE TEAM

FEELERS IS A RESEARCH LAB OF ARTISTS AND DESIGNERS FOCUSED ON THE INTERSECTIONS OF ART AND TECHNOLOGY. THE FEELERS TEAM MEMBERS ARE:

Ang Kia Yee
Ashley Hi
Alysha Chandra
ants chua

Developing a new performance methodology to explore machine learning in performance.

perfor.ml—where 'ml' refers to machine learning—is an ongoing project by *Feelers*, a research lab of artists and designers focused on the intersections of art and technology. *perfor.ml* introduces a new performance methodology and investigates the possibility of integrating machine learning into performance, as if questioning, 'on whose terms, and for what goals?'

In their early proposals, the team explored what a collaborative dynamic between machines and human performers could look like in performance. For instance, the team considered how machines and human actors might communicate through movement, and how this spatial or kinetic dialogue could impact decision-making on stage.

A movement-based performance offers a speculative glimpse into the world of data centres, where performers interacted with the kinetic sculptures.

The research led the team beyond the process of generative output to consider the physical infrastructures that enable such technology. They directed their attention towards the vast network of data centres where much of the storage and processing for machine learning takes place, alongside the people working in the shadows to keep them running.

At present, the work-in-progress iteration of *perfor.ml* is presented as a movement piece consisting of a collage of found and fictional text, human actors, and kinetic sculptures. The kinetic sculptures both respond to and represent the compression of vast quantities of data, offering the audience a speculative glimpse into the world of data centres.

Throughout the Lab, the team strove to consider the machine as a collaborator with its own peculiar features and personality. Rather than approaching machine learning as an inert tool, or subjecting it to the logic of human cognition and culture, *perfor.ml* is an attempt to go beyond hype, hysteria, and spectacle to arrive at vital questions about sustainability and the artistic potential of technology.

A work-in-progress performance methodology that unites kinetic sculptures with human performers on stage.

"During the *Conference-Unconference*, Kuo Jian Hong, the Artistic Director of The Theatre Practice, shared that she saw the incorporation of technology into theatre on three levels: (1) as a tool, (2) as a theme, and (3) as a mindset. Her perspective changed our approach, creating a framework. In the end, our research process and performance incorporated technology on all three levels."

WATCH INDUSTRY SHARING PRESENTATION VIDEO

Industry Sharing Presentation

A work-in-progress movement-based performance was unveiled, integrating human performers and kinetic sculptures on stage. The performance excerpt offered a speculative glimpse into the world of data centres, inviting the audience to reflect on the human-machine relationship.

What's Next?

Against the backdrop of constant technological advancement, the team plans to delve further into the human entanglement with machines and data, through a speculative and material lens. They also aim to engage with a full stack of technologies and infrastructures that comprise machine learning, creating in-person manifestations and representations for future editions of *perfor.ml*.

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THEORIES OF MOTION

MEET THE TEAM

Andy Lim
Performance and Technical Director

Alina Ling
Interactive Designer and Technologist

Zhuo Zihao
Movement Artist

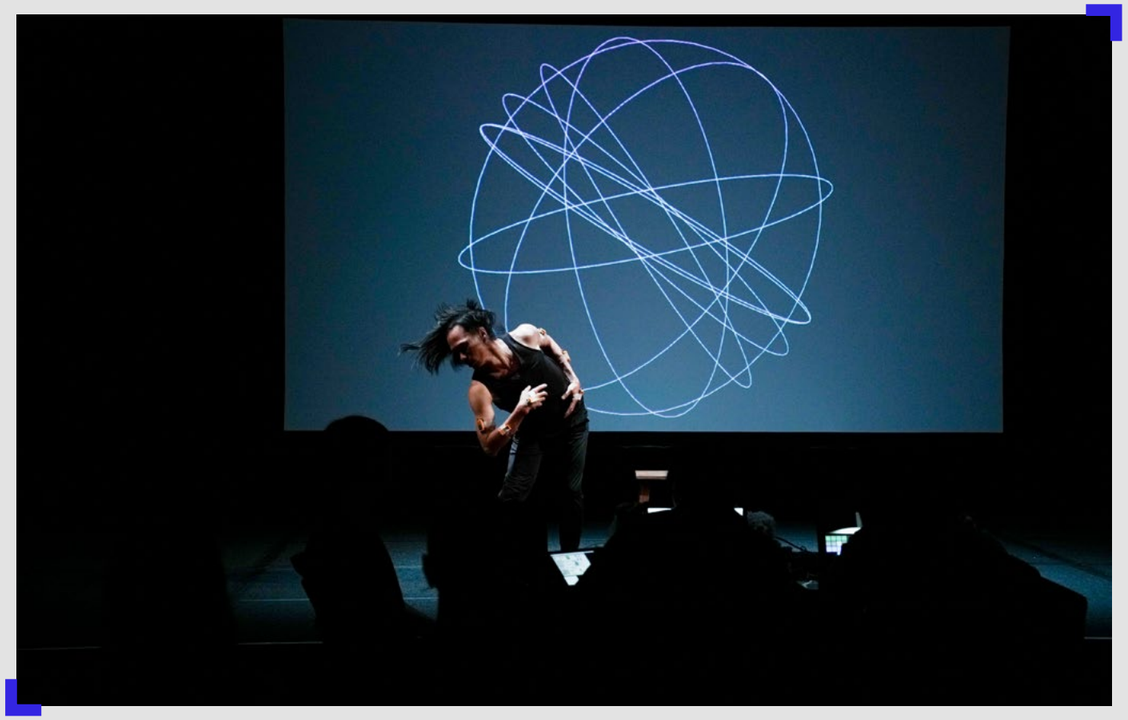
rongzhao
Sound Designer

Justin Ong
Technical Consultant

Deconstructing and mediating different perceptions of movement to generate sonic and visual expressions.

The inception of *Theories of Motion* can be traced back to the collaboration between multidisciplinary practitioners seeking to understand motion within performing arts. This collaborative effort involves a movement artist, an interactive designer and technologist, a sound designer, and a performance and technical director, utilising technology as a mediator to reconcile varying viewpoints.

Considering the body as a central instrument, the project seeks to integrate projection, sound, and moving bodies,



During a performance lecture, *Theories of Motion* collects motion data from movement artist Zhou Zihao, translating it to shape the sonic and lighting experience in a live performance.

where refined physicality merges with digital and sonic realities. The primary objective was to explore how technology could seamlessly translate into or extend expressions in movement, or vice versa.

The team commenced by organising workshops to deconstruct a performer's movements into fundamental principles. Using an interactive sensor system, quantitative data were extracted from the qualitative movements. They then analysed and filtered the data in an attempt to identify nuances across the different dimensions of movement. These sessions evolved into extensive discussions on the essence of movement and its potential categorisation or structure. After the workshops, the movements and data were translated into sonic and visual outputs that were further synthesised, refined and controlled.

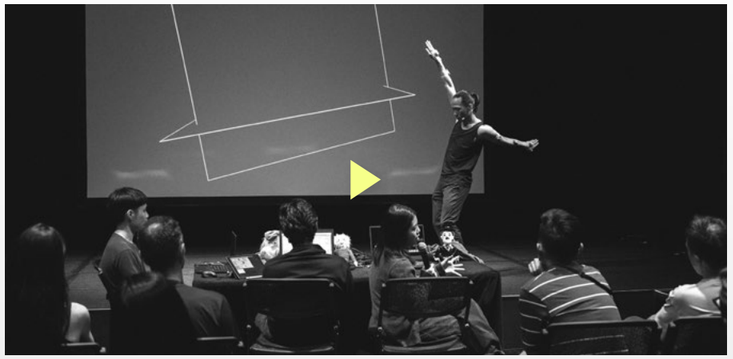
Ultimately, the goal is to unite the performer, the system and the environment to transcend physical and virtual expressions of the

body. *Theories of Motion* stipulate that there are new possibilities for amplifying expression, where the subtleties of the performer's movement can influence the derived environment—body, projection and sound. The project seeks to explore the sensations that are evoked through finding harmony between the various means of movement.

Artists from various disciplines—an interactive designer and technologist, a sound designer, and a performance and technical director—collaborate to develop unconventional modes of performance.

"The Lab provided us with the opportunity to collaborate across various disciplines, working together toward a common goal: aligning different perspectives and theories of motion through performing arts."

WATCH INDUSTRY SHARING PRESENTATION VIDEO



Industry Sharing Presentation

The live demonstration comprised a performance-lecture that showcased the inception, evolution and transcendence of the project. The exhibition was a presentation of the team's findings with a small interactive system for users to play with the sensor.

What's Next?

The team hopes to enhance the interactive sensor system to create immersive environments where the audience's movements can influence sound, light, and projections.

CONTACT www.alinaling.com

THE SOUND OF STORIES

MEET THE TEAM

Kamini Ramachandran
Producer
and Lead Artist

Syafiq Halid
Sound Artist
and Sound Designer

Chen Enjiao (Ernie)
AI Engineer

Using AI to transform oral storytelling experiences to engage diverse audiences.

Storyteller Kamini Ramachandran, sound artist Syafiq Halid, and AI engineer Ernie Chen of *The Sound of Stories* test the AI storyteller interface.

One of the oldest modes of human expression, oral storytelling is an engaging art form that exists across cultures, conveying narratives, histories, folklore, and tales across generations. Yet, its delivery is confined to the physical presence of the storyteller, often excluding audiences who share a different language.

In *The Sound of Stories*, technology is perceived as an artistic ally, enhancing and safeguarding traditional oral storytelling practices to ensure its endurance in an ever-evolving world. Utilising deep learning and neural audio synthesis as creative tools, *The Sound of Stories* explores ways for storytelling to be delivered in numerous languages whilst maintaining the original voice and cadence of the human storyteller, offering possibilities for engaging multiple, diverse audiences in the same room, or for the storyteller's unique delivery to be experienced even when they are not physically present.

As part of the Lab, the team trained the AI to listen to hours of stories told by Kamini Ramachandran, lead artist and veteran oral storyteller. Beyond mere translation, the machine can also emulate Kamini's voice, cadence and expression for the story as it is experienced in another language. The team further explores audience interactivity through the use of a prototype AI Storyteller, which poses questions to the audience and weaves their answers into the story; and an interactive MIDI controller from Embodme that utilises neural audio synthesis to shape the soundscape that accompanies the storytelling.

The Sound of Stories offers a glimpse into the future of storytelling practices, through combining the ingenuity of AI with the artistry of oral storytelling. Through the blend of human input and AI, audiences can become an active part of the narrative experience, whilst the storytellers can reach a broader audience, passing on their stories and delivery techniques to future generations.

The audience participates in the storytelling, providing input and shaping the narrative in real time.

"In many ways, the three of us are storytellers, each employing our own mediums and tools. This project combines our diverse approaches."

WATCH INDUSTRY SHARING PRESENTATION VIDEO

Industry Sharing Presentation

The AI storyteller interface was showcased during live demonstrations and interactive sessions, enabling the audience to experience firsthand the transformative potential of AI and neural audio synthesis in storytelling. The audience also observed how their input could influence the story's development in real-time.

What's Next?

The team hopes to bring *The Sound of Stories* to life as an interactive installation at different festivals or more accessible venues, while exploring potential extensions, such as tailoring it to specific target audiences, themes, or outcomes.

CONTACT @the.sound.of.stories

VERGE 2.0

MEET THE TEAM

CORE TEAM

James Lye
Project Lead
and Chief Technologist

Dr Noramin Farid
Dance Researcher
and Dancer

Norisham Osman
Creative Producer
and Project Manager

Eugene Soh
Creative Technologist

KEY COLLABORATORS

Cassie Shi
Dancer

Dalifah Shahril
Material Consultant

Ian Pereira
Lighting Consultant

Nessa Anwar
Script Consultant

Dancer Cassie Shi showcases *Verge 2.0*'s gesture-responsive technology, manipulating sound, light, and visuals through movement.

Gesture-responsive technology for dynamic multi-sensory performance experiences.

Verge began as a university tech project by creative technologist James Lye and has evolved over the past decade through collaborations with multidisciplinary art practitioners. In its early experimental phase in 2014, choreographer and dance researcher Dr Amin Farid came onboard, introducing a new dimension of "human gestures" and catalysing an ongoing exploration of dance and technology.

Developed as part of the Lab, *Verge 2.0* magnifies this integration. A performance-lecture video demonstrates how dancers, equipped with wearable tech on their arms, can control and manipulate sound, light, and visuals through their movements. This gesture-responsive technology creates a dynamic, multi-sensory environment that synergises with the choreography, enriching the performance.

For traditional dancers, accelerometers and flex sensors are strategically attached to the upper limb joints where movement is most pronounced. These components are then integrated with an Arduino microcontroller, enabling the wireless transmission of real-time movement data to a central computer. A visual-based programming software then translates this data into actionable commands, allowing for control over various stage elements such as brightness and colours of light, volume, pitch and timbre of sound.

Apart from facilitating the fusion of movement and multimedia elements, *Verge 2.0* is relevant to dancers of diverse cultural backgrounds and genres. For instance, *Vergo 2.0* has expanded from Malay dance into the Chinese dance genre, where movements and gestures are vastly different. Moreover, it enhances the creative process for performers and delivers an immersive experience for the audience. With the potential to add more sensors, stage controls or dancers, new performance possibilities are waiting to be unlocked with future renditions.

The *Verge 2.0* team explains how a series of accelerometers and flex sensors attached to the arms enable the transmission of real-time movement data to a central computer.

"Our work with the Lab has underscored the importance of diving into each other's specialisation, not just superficially but with a genuine desire to understand and integrate this knowledge to maximise outcome."

WATCH INDUSTRY SHARING PRESENTATION VIDEO

Industry Sharing Presentation

At the Industry Sharing, the team conducted a live demonstration of *Verge 2.0*. This demonstration was accompanied by a panel discussion featuring core team members and key collaborators, who reflected on the pivotal discoveries made during the Lab. Additionally, attendees were able to view the performance-lecture video and examine a prototype of the wearable technology at the exhibition.

What's Next?

In the near term, the team aims to undertake adaptations of *Verge 2.0*, focusing on performance-based experiments to test and refine their concepts in live environments. Subsequently, they will continue research and development to broaden and deepen the project through an interdisciplinary approach. Ultimately, the long-term goal is to make the hardware and software components accessible and open-source. By equipping diverse practitioners with tools to integrate interactive technologies into their art, the team hopes to encourage deeper exploration of hybrid outcomes, contributing to the emergence of new genres within tech-based art forms.

CONTACT jameslyemusic.com/verge

LESSONS FROM THE LAB

Key Challenges

Key Takeaways

YAMAGUCHI CENTER FOR ARTS AND MEDIA (JP)

"What are your thoughts on the Lab's current activities? What other strategies can it employ to further innovate and push the boundaries of performing arts within the context of Asia?"

"Advising the Lab's participants was enriching, sparking ideas from diverse cultural perspectives. The Lab's flexible approach fosters creativity and exploration, leading to unexpected outcomes and nurturing potential projects. While developing technology alone doesn't solve creative challenges, the overall concept and examining what technology means is the key. Supporting experimental expression is crucial. Discussing technology application and meaning was invaluable, underscoring the importance of a non-outcome-driven approach. We hope this platform continues to evolve and offers more opportunities for deeper exploration."

HO TZU NYEN
ARTIST (SG)

"In your opinion, how can the Lab cultivate a lasting culture of collaborative creation/ experimentation that extends beyond its programme?"

"I believe that more important than artists having access to technologists and technology, is a spirit of inquiry and criticality. This seems to me inseparable from the will to understand the larger contexts in which these technological tools and processes are developed, deployed and disseminated. Without it, such collaborations and engagements will likely end up being merely instrumentalising, opportunistic, and unsustainable. But having such a programme and asking such a question is a great first step!"

KEY CHALLENGES

Feelers presents their work-in-progress for *perfor.ml*. Following consultation sessions, the team pivoted to a process-driven approach, enabling deeper exploration of the technology.

01 Getting on the same page

"With some team members' practice being rooted in technology and the visual arts, and the others' in theatre and creative writing, our approach and understanding towards devising the process clashed at times," says *Feelers* of *perfor.ml*. To bridge these gaps, the perfor.ml team organised discipline-led workshops from the get-go to gain a better sense of each other's practices and working processes. Acting on the advice of advisory panellist Toby Coffey, former Head of the National Theatre, they also conducted vocabulary-sharing sessions to enhance communications. "We took time to go over key technological terms and shared what we understood of them. During the process, we found inconsistencies in how we each defined terms that were fundamental to our project," added *Feelers*. Addressing these discrepancies early on helped prevent potential misunderstandings, streamlining their collaborative efforts.

02 Setting parameters

Given that this edition of the Lab emphasised the creative process rather than specific outcomes, there was a tendency amongst the teams to try to accomplish too much. "It can be dangerous to expand in multiple directions—almost like an octopus with many tentacles branching out all over the place," remarked Kamini Ramachandran of *The Sound of Stories*. To stay focused, the team employed a strategy of categorising their "crazy octopus" ideas as "Phase 2" or "Post Lab". This approach helped them remain centred on their immediate objectives and be realistic about what is achievable within the course of the Lab. More importantly, the Lab views each project as a work-in-progress that continues to evolve even after the Lab has concluded. Without the expectation of a specific end product, the teams were able to streamline their efforts while remaining open to future possibilities.

03 Switching gears

"The introduction of the perspective of the dancer/mover helped us structure a way to understand movement with his 5 derived principles of movement." Alina Ling, *Theory of Motion*.

Following consultation sessions with the Advisory Panel, the *perfor.ml* team was prompted to reassess their assumptions about the integration of technology in artistic endeavours. "We had to put aside our initial goal of incorporating machine learning into our staging, to prioritise the exploration of the technology within the plot of our presentation. It was challenging to let go of our original intentions," admitted *Feelers*. However, this shift enabled them to pivot from striving for a perfect final product to developing a process that was more conducive to generating novel artistic expressions and fostering meaningful exchanges within their multidisciplinary team.

The Sound of Stories team conducts extensive user testing before their presentation at the Industry Sharing.

04 Working with limited resources

"The tremendous support provided by this Lab in terms of funding, marketing, management, and knowledge is undeniable. However, the inherent complexity of technology-driven projects, combined with an extensive R&D process, highlighted a need for more substantial financial backing and specialised expertise," noted James Lye of *Verge 2.0*. To optimise their resources, the team at *Dancing the Algorithm (DatA)* engaged in detailed research and cost-benefit analyses, which were time-consuming. "Since the Lab was formulated as a part-time endeavour, it was difficult to conduct more extensive research into the technologies," said Dapheny Chen of *Dancing the Algorithm (DatA)*.

The definition of adequate resources tends to vary between the arts and tech sectors. One way to address this is to engage more tech partners who are inherently interested in the arts. "Technology is capital-intensive, so having access to powerful machines and partners willing to share their data and computing resources makes a difference," explained Chen Enjiao Ernie of *The Sound of Stories*. With access to existing tools and expertise, less time and resources need to be spent on building technology from scratch, allowing a greater focus on considering the role of technology and how it can enhance artistic expression.

When approaching potential sponsors or partners, *The Sound of Stories* team recommend adopting a proactive approach. "Maintaining a can-do attitude and resilience when approaching sponsors has helped us secure suitable product sponsors. Our advice is not to be disheartened by rejections but to keep moving forward," said the team.

KEY TAKEAWAYS

Through interdisciplinary collaboration, the *Theories of Motion* team debunks the preconceptions they had about their project at the start of the Lab.

01 There are many ways to consider technology in artistic creation

Technology can serve as a tool to enhance artistic creation and audience experience. In some cases, it becomes the artist or a worthy partner. For *DOTS 2.0*, the use of technology made the intangible tangible. "Technology breaks through barriers and limitations to achieve what's in the imagination. We felt that the use of technology inspired free movement and courageous expression [in children]," said Isabella Chiam of *DOTS 2.0*. However, she emphasised that technology had to be thoughtfully integrated rather than being applied for the sake of it, adding "technology isn't just an element in space; it has to come alive as well." For Chen Enjiao Ernie of *The Sound of Stories*, it was about re-framing her technological perspective to see things from an artistic viewpoint. "I try to balance the trade-off between what is exciting to me as a technologist to learn and develop versus relying on the expertise of my teammates to define what's interesting from an artistic standpoint, always aiming to gradient descent towards an optimal sweet spot," said Chen.

02 The power of inquiry in the creative process

Creating an environment where questions could be asked freely was essential to the artistic process for most teams. In addition to bridging understanding, new branches of thought emerge when questions are asked, and better rapport is built among team members. "We found ourselves asking each other to 'please explain that again; can you say that differently; can you show me this a few more times or can you let me try?' We are all aware that we bring very different knowledge to the team and we can't expect that same level of insight in our teammates," explained Kamini Ramachandran of *The Sound of Stories*. Beyond internal discussions, inquiries from the Advisory Panel significantly enhanced the teams' projects. "Their insights and the challenging questions they posed were crucial in our developmental process. It forced us to critically evaluate our approach and methodologies," said James Lye of *Verge 2.0*.

03 Effective yet flexible working structures facilitates strong collaboration

Establishing clear yet flexible working structures, roles, and processes from the outset proved beneficial. “Coming from different disciplines, our collaboration was built on a series of empathetic inquiries, negotiations and investigations regarding the technological and artistic processes. This approach established a framework of inquiry and a reflexive process within the team,” remarked Dapheny Chen of *Dancing the Algorithm (DatA)*. Similarly, *Theories of Motion* devised structures to nurture both individual expression and collective achievement. “After deciding on the core team, we structured our research process to promote an iterative approach, which embraced prototyping, testing, exploration and refining,” explained Alina Ling of *Theories of Motion*. Ling also noted that having designated spaces for teams to gather regularly could enhance the working process. “Such a setting would facilitate deeper collaboration and better tracking of progress,” she added.

The *Verge 2.0* team, who have been collaborating for nearly 10 years, continue to push the boundaries of interactive technology in performance art.

04 The significance of a safe space for experimentation, iteration and artistic creation

Safe and open platforms where interdisciplinary artists and creators can come together to experiment freely and learn from each other enable continuous improvement and innovation. Participants shared that the Lab provided opportunities to collaborate with individuals they typically wouldn’t encounter, enabling artists to connect with technologists and vice versa. This has always been a challenge, according to Timothi Ellim of *DOTS 2.0*. As a creative technologist, he hopes that people will start to recognise that technology can be utilised for the arts and culture, and not just enterprise settings, and platforms like the Lab help exemplify this.

Similarly, creative technology studio SERIAL CO_ of *DatA* has always been interested in exploring the intersection of arts and technology. “Working with Dapheny, a dance artist, we saw how technology became a tool for the art-making process.” Chiming in, Syafiq Halid of *The Sound of Stories* who saw the Lab as a place to experiment and collaborate with new partners and fellow technologists said, “through the Lab, I discovered that there is much more to explore in the tech world.”

EPILOGUE

Moving Forward

As the Performing Arts x Tech Lab concludes, there is hope that the projects initiated here will continue to evolve, potentially attracting collaborators, adopters, funders, and commissioners who can propel their development further. Ultimately, the Lab's long-term goal is to leave a lasting impact on the participants' artistic endeavours, seeking to inspire new methods of performance-making, storytelling and the birth of new artmaking methodologies that tap into the vast potential of art and technology collaborations.

Although the Arts x Tech ecosystem is still in its early stages in Singapore, the first two iterations of the Lab have served as a launchpad, facilitating collaboration opportunities and the development of artistic practices, laying the groundwork for future developments. It marks the beginning of an ongoing dialogue about the impact of interdisciplinary efforts on creating innovative artistic expressions and experiences. The Lab will remain dedicated to nurturing the intersection of arts and technology, and to amplify the impact of these endeavours, by continuing to foster strong ties with arts practitioners and creative technologists who are passionate about the transformative power of the arts.

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Advisory Panel

Zuni Icosahedron
HONG KONG

Founded in 1982, the epitome of experimental theatre in the region, is a Hong Kong based international experimental theatre company and a non-profit charitable cultural organisation. Zuni is one of the nine major professional performing arts companies directly supported by the HKSAR government and has made venue partner with the Hong Kong Cultural Centre since 2009. As a premier experimental theatre company, Zuni has produced more than 200 original productions of cross-disciplinary theatre and multimedia performances and been invited to more than 80 cities around the globe for cultural exchange and performances. With the support of our members, and under the leadership of Co-Artistic Directors, Danny Yung and Mathias Woo, Zuni has been active in new media, video, sound experimentation and installation arts, as well as in arts education, arts criticism, cultural policy research and international cultural exchange. With “Art Tech Lab”, “Reinterpret Classics”, “Reinvent Tradition”, “Recreate Theatre and Media Technology” and “Reconnect Theatre with Social Movement” as our major artistic directions, Zuni has been most inspiring in developing the aesthetics of theatre in Chinese society, with its experimental and conceptual nature.

Danny Yung Founding Member and Co-Artistic Director

Danny Yung is a founding member and the Co-Artistic Director of Zuni Icosahedron since 1995. Zuni is the epitome of experimental theatre in Hong Kong. After having graduated from the University of California at Berkeley and Columbia University, Yung started his creative journey in New York City, and returned to Hong Kong in the late 1970s. Since then, over the last 50 years, Yung has been deeply involved in diverse artistic fields, including cross-disciplinary and experimental arts, conceptual theatre, cartoon, film, video, visual and installation art, and new media creations.

Yung is the recipient of “Award for Outstanding Contribution in Arts” (2022) and Artist of the Year (Drama, 2015) presented by the Hong Kong Arts Development Council; The Fukuoka Prize – Arts and Culture Prize for his contributions to the development of Asian arts and culture (2014); the Cross of the Order of Merit of the Federal Republic of Germany (2009) in recognition of Yung’s contributions towards the arts and the cultural exchange between Germany and Hong Kong (2009); the Music Theatre NOW Award presented by the UNESCO’s International Theatre Institute for his theatre work Tears of Barren Hill (2008), to name a few.

Yamaguchi Center for Arts and Media

JAPAN

The Yamaguchi Center for Arts and Media (YCAM), located in Yamaguchi City, is a unique fusion of art and technology. With facilities ranging from exhibition spaces to a theatre, cinema, library, and workshops, YCAM has been a hub of artistic innovation since its inception in 2003. Driven by rapid advancements in media technology, YCAM has established itself as a groundbreaking art centre, encouraging creative exploration with a focus on technology acceptance, in collaboration with local citizens and experts. YCAM’s mission revolves around its Research & Development (R&D) Projects, which encompass themes such as human body, natural landscape, sociology and history. Through collaboration with its internal “InterLab” team, local residents, and experts, YCAM delivers comprehensive programs that yield original artwork, software, workshops, and research publications. Three key pillars shape these R&D Projects: Artistic Expression, which emphasises the production of unique works; Education, which connects locals to media technology through innovative workshops and programs; and Community Engagement, which actively supports creative initiatives linked to regional challenges in Yamaguchi. YCAM’s seamless integration of art, technology, and community involvement marks a new era in artistic expression, inspiring creativity for future generations.

Clarence Ng Production Project Manager

Clarence began his career in the arts as a freelance crew in the year 2000 Singapore Arts Festival. In 2004, He joined Esplanade Production Department as a full-time staff member. Seeking further development, he participated in The Japan Foundation’s “Future Leaders Programme” and became an intern at the Yamaguchi Center for Arts and Media (YCAM) in 2009. In 2012, Clarence’s dedication and expertise led to his appointment as the Production Manager to oversee the planning and production for YCAM’s 10th anniversary. Recognising his capabilities, YCAM offered him a full-time position to restructure and manage

production operations, focusing on creating, researching, and developing new media artwork.

Throughout his tenure, Clarence was instrumental in supporting the Technical Director and overseeing the YCAM interlab, the R&D technical production team. His efforts have been integral to many original YCAM productions. Notable among these are the 2013 Art, Environment-Life installation series by Ryuichi Sakamoto and Shiro Takatani, the 2015 experimental dance production “Dividual Plays” by Yoko Ando & YCAM, and the 2019 AIinfused flamenco dance performance “Israel & イスラエル” by Israel Galvan. Recently, Clarence embraced the challenge of conceptualising and co-directing an experimental project, “Sakoku Walled Garden”, which evolved into the 2022 performance installation “Unlearning Language” by Lauren Lee McCarthy and Kyle McDonald.

Akiko Takeshita Producer of Performing Arts

Akiko is a Performing Arts and Technology Producer at the Yamaguchi Center for Arts and Media (YCAM). She seamlessly blends arts and technology by collaborating with a diverse array of artists, creators, and technologists. Her innovative approach seeks to understand how technology alters our view of the human body. Akiko’s standout works include the “Reactor for Awareness in Motion (RAM)“, a research collaboration with Yoko Ando, a former dancer of the Forsythe Company, focused on designing tools for dance education and creation. Akiko curated 2017 VR installation, “The Other in You”, along with Richi Owaki and this project earned an Honorary Mention (Interactive Art +) at the 2018 Ars Electronica. She also produced the cutting-edge dance performance “Israel & イスラエル (Israel)” in 2019, featuring an unprecedented interaction between flamenco dancer Israel Galván and AI. “Echoes for unknown egos” (2021), a live performance integrating percussionist Shun Ishiwaka and AI, and the experimental performance work “Unlearning Language” (2022) with Lauren Lee McCarthy and Kyle McDonald, further underscore her creative ingenuity. Akiko’s projects have been showcased globally, reaching audiences in Europe and Asia, including countries such as France, Germany, UK, Korea, and Taiwan.

Mitsuru Tokisato Artist and Video Engineer

Mitsuru Tokisato was born in 1990. He graduated from the International Academy of Media Arts and Sciences in 2010 and Tama Art University in 2012. Tokisato’s works are rooted in digitalising his experiments and observations of cameras and screens, translating these through precise measurements and cognition. Beyond his artistic practice, Tokisato is also known for his role as a Video Engineer at the Yamaguchi Center for Arts and Media (YCAM), where he leverages his unique blend of artistic and technical expertise. In addition to his solo work and professional role, he is active as a part of the musical unit “Shojiki,” in collaboration with Muku Kobayashi.

Ho Tzu Nyen (Artist)

SINGAPORE

A plethora of historical references dramatised by musical scores and allegorical lighting make up the pillars of Ho Tzu Nyen’s (b. 1976, Singapore) complex practice that primarily constitutes video and installation. Features in their own right, each work unravels unspoken layers of Southeast Asian histories whilst equally pointing to our own personal unknowns. Permeating Ho’s work is a pervasive sense of ambiguity, theatricality, and unease, augmented by a series of deliberate literary, art historical and musical references. Centrally, Ho charges the viewer emotionally and physically to deliver a multisensory consideration of what we know and crucially, do not. At the heart of Ho’s films is an observation of history; more specifically, a weaving of fact and myth to unravel and reveal what one is told versus what one believes to know, interprets, and remembers. Ho’s work titters on the edge of fact and artifice, tending in scope from research-driven documentative exposure to the fantastical.

Recent one-person exhibitions of his work have been held at the Hammer Museum (2022), Toyota Municipal Museum of Art (2021) and the Yamaguchi Center for Arts and Media [YCAM] (2021). His theatrical works have been presented at festivals such as TPAM (Yokohama, Japan); The Holland Festival; Wiener Festwochen; Theater der Welt; KunstenFestivaldesArts. His films have been presented at the Berlin (2015); Sundance (2012); Cannes (2009) and Venice (2009) film Festivals.

National Theatre

UNITED KINGDOM

About National Theatre
The National Theatre makes theatre that entertains and inspires using its creativity, expertise and unique reach – sharing unforgettable stories with audiences across the UK and around the world – on stage, on tour, in schools, on cinema screens and at home. The National Theatre supports world-leading artists to make their best work and for it to have the widest possible audience and impact as well as working with schools and communities across the UK to inspire creativity and create pathways for careers in theatre.

Toby Coffey Former Head of Immersive Storytelling Studio

Toby Coffey is a former Head of the Immersive Storytelling Studio at the National Theatre in London, established in summer 2016. The Studio examines how Virtual, Mixed and Augmented Reality along with other emerging technologies can enhance the NT's remit to be a pioneer of dramatic storytelling. The Studio's portfolio of work has been shown at the Venice, Sundance, Tribeca, and London Film Festivals, IDFA, National Theatre, The Young Vic, MoMA, and TATE Modern. Work includes: fabulous wonder.land a VR music video; enter wonder.land an immersive exhibition that attracted more than 90,000 visitors over a 5 month period; HOME : Aamir, a cinematic VR verbatim documentary; Draw Me Close a VR performance between one audience member and a live performer; All Kinds of Limbo a communal, VR, musical performance; Museum of Austerity a mixed reality exhibition that preserves memories of public and private events from the austerity era, and: All Kinds of Limbo XR which allows audiences worldwide to simultaneously experience a musical performance: via a Virtual Reality headset, as Augmented Reality on a phone or tablet, or as a computer based video game experience.

Toby has over 20 years expertise in the digital arena from creative, technical, production and social perspectives.

Open Call Panellists

A total of thirteen panellists were involved in the selection of the six participating teams through an open-call process. Their critical feedback and helpful advice were shared with all teams at the start of the Lab.

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Mitsuru Tokisato
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