

# Two Innovative Healthcare Technologies at the Intersection of Serious Games, Alternative Realities, and Play Therapy

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**Abstract.** Using game technologies and digital media for improving physical and mental health and for the therapeutic benefit and well-being of a wide range of people is an area of study that is rapidly expanding. Much research in this emerging field is centered at the intersection of serious games, alternative realities, and play therapy. In this paper the authors describe their transdisciplinary work at this intersection: i) an integrative system of psychotherapy technologies called MyPsySpace currently being prototyped in Second Life with the aim of offering new and virtual translations of traditional expressive therapies (virtual sandplay, virtual drama therapy, digital expressive therapy, and virtual safe spaces) and ii) a mature body of research entitled SoundScapes that is exploring the use of interactive video games and abstract creative expression (making music, digital painting, and robotic device control) as a supplement to traditional physical rehabilitation intervention. Aside from introducing our work to a broader audience, our goal is to encourage peers to investigate ideas that reach across disciplines—to both risk and reap the benefits of combining technologies, theories, and methods stemming from multiple disciplines.

**Keywords.** Second Life prototyping, psychotherapy, virtual reality, drama therapy, expression arts therapy, scenarios, physical rehabilitation.

## Introduction

The transdisciplinary use of game technologies and digital media for improving the therapeutic benefit and quality of life for a wide range of people is an area of study that is rapidly evolving into a vibrant field in mental and physical healthcare. This is illustrated in a recent book [1] we edited that highlights the work of researchers around the world engaged in developing new technologies for rehabilitation, intervention, assessment, healthcare education, and the promotion of general well-being. Most of this new work lies at the intersection of serious games, alternative realities, and play therapy and is intent on translating and/or supplementing traditional therapies using new media. For example, in traditional play therapy (and therapeutic play) the focus is typically on an interaction between therapist and client that is mediated by the use of toys and other objects that become the expressive channels enabling clients (especially children) to communicate emotional states and conflicts that are otherwise difficult to

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articulate. Play therapy using digital media (not solely screen-based, but also toys and artefacts that can act as interfaces with embedded sensors or using e.g. Augmented Reality strategies, etc.) provides additional opportunities that supplement more traditional practices, linking gameplay to serious mental health outcomes. One technology that has received a great deal of attention in the last decade is virtual reality (VR) therapy, where serious games can be played in computer generated environments (i.e. in some alternative reality) and where user interactions can be enabled by embedded virtual artifacts. Of course, the power of digital media is not limited to digitizing and augmenting established interventions; new research at the intersection of serious games, alternative realities, and play therapy can also open the doors to exploring novel—and potentially more effective, inclusive, and satisfying—mental and physical healthcare interventions (see, for example, [2, 3]).

In this paper we describe our individual transdisciplinary work using technologies combining serious games, alternative realities, and play therapy in two different areas of healthcare: psychotherapy and physical rehabilitation. In psychotherapy, VR is now a bona fide treatment option for many psychological disorders, with most VR applications limited to best practices in cognitive behavioral therapy (CBT) transposed to VR [4]. Little research has explored VR as a tool or practice modality for equally effective theory-guided and insight-based practices in psychotherapy, such as psychoanalysis and other humanistic approaches [5]. In section 1, Brahnam describes an integrative system of psychotherapy technologies called *MyPsySpace* that she is prototyping with design teams at the MSU SL (Second Life) Prototyping Center for Psychotherapy Technologies. MyPsySpace is designed to be used by psychotherapists trained in a wide range of theoretical orientations. It integrates new and virtual translations of traditional expressive therapies (e.g., virtual sandplay, CBT VR applications, virtual drama therapy, and virtual safe spaces) and is also designed to customize the psychotherapy office for each client by presenting an interface that features both collected and expressive materials that are important to each client.

SoundScapes, described in section 2 by Brooks, is a body of evolving ongoing work from 1985 that has been active in exploring human performance in healthcare and rehabilitation and the consequences of digital media used in intervention either at a clinic or other formal institute/establishment, as well as at a patient's home. The research has taken advantage of online connectivity to establish a TeleAbilitation [6] concept (i.e. in line with a contemporary "Patient at Home" approach<sup>2</sup>); however, this concept is not presented here. Rather it is the real-time interactive intervention sessions that are presented. This is where state-of-the-art sensor-based systems are created tailored to an individual's need for intervention (e.g. in physical therapy, rehabilitation, or habilitation). The systems are designed to optimize meaningfulness of input and feedback for both the patient (also referred to here as the participant), facilitator, and those associated (therapist, family, and friends). A user's experience of enjoyment, play, fun, creativity, achievement, and success is targeted. Under this user-designed layer is a data retrieval system that collects quantitative information that is correlated to the qualitative experiences to analyze, assess, and refine the system (apparatus and method) iteratively. In this way treatment programs include multiple sessions. Training of facilitators to be able to optimize intervention is a prime concern. The research has been presented globally via keynote talks, presentations, workshops, and lectures.

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<sup>2</sup> <http://www.en.patientathome.dk>

## 1. MyPsySpace

The MyPsySpace project described in this section attempts to integrate some new and recently developed mental health technologies (such as VR exposure therapy) so that they can be used by behavioral healthcare centers, hospitals, and independent therapists practicing a range of theoretical orientations: humanistic psychology, CBT, depth psychology, drama therapy, and expressive arts therapy (EAT). Discovering the best method for envisioning this integration and expansion of mental health technologies into other theoretic modalities was the first challenge. Some common options for prototyping technologies and modeling interactions include film [7], gaming engines [8], narratives, and scenarios [9]. As pointed out in [10], however, virtual environments (VEs), such as SL, may prove to be one of the best methods for prototyping novel technologies because VEs combine many of the tools mentioned above, while simultaneously offering an ideal environment not only for building models of technological artifacts but also for iteratively redesigning interfaces and artifacts through usage scenarios. The MSU SL Prototyping Center for Psychotherapy Technologies was thus set up to explore SL as a prototyping environment for mental health technologies, and the MyPsySpace interface is the first project under development at the center. Accordingly, this section is divided into two parts, the first part providing a description of the conceptual design of the MSU SL Prototyping Center for Psychotherapy Technologies followed by a second part presenting a more detailed discussion of the MyPsySpace project.

### 1.1. The MSU SL Prototyping Center for Psychotherapy Technologies

The MSU SL Prototyping Center functions both as a design studio and as an exhibition/information center where visitors can explore interface designs for MyPsySpace by replaying usage scenarios developed by MyPsySpace design teams. Design teams are composed of CIS faculty, graduate CIS and psychology students, local actors, and professional SL builders and actors located around the world. Avatars teleporting to the MSU SL Prototyping Center arrive on a brick landing porch in front of a large one story building. Two doors open into a reception area where visitors are welcomed by a robot greeter. Links to research papers and YouTube videos describing projects and scenarios are available in the reception area as well as along the hallways. The reception area and hallways are always open to visitors, as are all other areas in the building when not in private use by the design teams.<sup>3</sup>

Behind the reception area, the rest of the building is conceptually divided into two parts, with one half representing the real world (RW) and the other half representing the virtual world (VW), i.e. virtual therapeutic environments. The RW section of the building contains models of two therapy offices (with adjacent observation rooms, see figure 1) and a larger room that can be transformed into a hospital day room, group therapy room, conference room, or lecture hall. All three rooms contain some rendition of the MyPsySpace interface. The therapy offices and observation rooms are used by the design teams to develop novel applications and to investigate client/therapist interactions using MyPsySpace. Improvisations with the interface are filmed using

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<sup>3</sup> A link to the center will soon be available at [www.mypspspace.com](http://www.mypspspace.com), at which time the reader is encouraged to explore the technologies being developed at the SL center and leave comments about the MyPsySpace project.

machinima techniques for later evaluation. Finalized versions of scenarios are then made available to visitors in the reception room and hallways as YouTube videos. When not in use by design teams, visitors are also allowed in the observation rooms where they are provided with a directory of previously recorded scenarios. SL provides tools for recording actor dialogues and avatar movements so that they can be played back in the same virtual space at a later time, much like actors repeatedly performing a play on a stage. This gives people the opportunity of viewing scenarios from multiple perspectives—not just from the perspective of the camera, as is the case with film.

The VW half of the building contains two large rooms encased in glass, where examples of the therapeutic virtual worlds and VR applications created for some of the MyPsySpace usage scenarios can be rendered and explored in more detail by the design teams and later by visitors to the center. The virtual worlds are constructed by SL builders for specific interventions. Scenarios involving client-therapist and private client uses of the virtual worlds can be worked out by the design teams and recorded for later playback. The glass walls enable people to observe these worlds and what goes on in them from the vantage point of the hallway. When the VR rooms are not in use by design teams, menus are available on the hallway walls that render (or *rezz*, to use SL parlance) different VR environments so that visitors can walk inside the space to experience the VR environments for themselves.



**Figure 1.** Two SL scenarios exploring MyPsySpace technologies: (left) a virtual sandplay session in one of the center's therapist offices (with a view of the adjoining observation area), and (right) distance playback actors working with an inpatient group.

### 1.2. The MyPsySpace Interface

The primary MyPsySpace interface is best viewed on a surface computer, wall projection, or large flat screen TV (as seen in the examples in figure 1). It could also be viewed through VR CAVE systems and possibly the Oculus Rift. Interaction with the MyPsySpace interface is via laptop computer, iPad, smart phone, and gestures. Therapists create secure user accounts in MyPsySpace for each client. What appears on the screen depends on the current application and the personalized materials that have been uploaded to the system by either the therapist or the client. Clients have partial access to their own accounts and are able to upload photographs, music, journal entries, poems, art work, meaningful YouTube videos, and many other materials while either in

or outside of session using a special app for their laptops and smart devices. All these materials, as well as recorded VR sessions, can be accessed at any time by the therapist. Because pictures and materials previously uploaded and produced by the client can appear on the MyPsySpace screen, the therapy office can be personalized for each client before each session, thereby providing a warm and welcoming environment.

The primary goal of MyPsySpace, however, is to give therapists the means of providing (and creating) any number of digital interventions for their clients. Currently, scenarios are being worked out at the center for seven types of interventions: virtual safe spaces and objects, virtual play spaces, virtual memorials and commemoration spaces, virtual enactments, VR exposure therapies (VRET), distance connections, and computerized tracking and assessments. The remainder of this section briefly describes how each of these interventions might function in MyPsySpace.

*Virtual safe spaces and objects.* Safe spaces and safe objects are typically used by clients suffering from trauma to ease anxiety and traditionally take the form of real objects (boxes and other containers where words and images representing negative emotions and memories can safely be put away for processing at some later time) and of photographs and art work created by the client that represent a serene and secure environment. Safe spaces can also be imagined using relaxation techniques. MyPsySpace will allow clients to upload photographs and artwork and will provide painting applications so that clients can create their own digitized safe spaces and objects that they can call up in session or via an app whenever needed. Novel to MyPsySpace, however, will be the ability to access objects and safe spaces in VEs that can either be selected from an inventory of such spaces or created in therapy sessions with the assistance of a distance virtual world builder who has been specially trained for this task. Safe spaces and objects in VEs will have the advantage of being immersive and accessible in and out of session by clients and may contain a wide variety of expressive materials (journals, poems, artwork, and music) uploaded or created in world by the client.

*Virtual play spaces.* As mentioned above, digital painting and music applications will be accessible through MyPsySpace. Also available will be the virtual equivalent of sandplay boxes, dollhouses, and other EAT applications. Figure 1 (Left) illustrates a MyPsySpace sandplay scenario. Sandplay is one of the first and most widely used play therapy techniques. Traditionally, it is divided into two stages. In the first stage, clients are instructed to look at available materials and to pick out objects that speak to them. They are then asked to create a sandworld using the objects they have selected. In the second stage, the client tells a story about their creation. Digital sandplay would have the advantage of addressing concerns discussed by Dale and Lyddon [11], who stress the importance of the therapist's role in recording and dismantling the sandworld. Most therapists photograph or sketch the sandworld and then videotape or audio record the stage two discussions. One advantage of digitizing sandplay games is that sessions can unobtrusively be recorded. Dale and Lyddon also note how taking the sandworld apart before the client leaves the office is known to be difficult for some clients, and they spend considerable time discussing various ways of handling this problem. Digital sandworlds easily overcome this problem as they can be stored and resumed for each session. Sandworlds can also be created in VEs, where objects can be animated. Although not visible in figure 1, this sandworld (which was created in SL and can be experienced by visitors in one of the VR rooms) has lionfish that glide through the air and aimlessly roam the VR sandworld like ghostly specters.

*Virtual memorials and commemoration spaces.* These are virtual spaces created for trauma and grief work (see [10] for a more detailed explanation and an example).

*Virtual enactments.* These are the virtual equivalent of role rehearsal, role expansion, role reversal, narradrama, fixed-role therapy, and the empty chair dialogue intervention [12]. In the empty chair dialogue, for instance, the client is asked to engage in dialogue with an imaginary person of significance sitting in a nearby empty chair. In MyPsySpace a client can engage in dialogue with an enlarged image or avatar that represents a significant person (see [10] for a detailed explanation and an example of the empty chair dialogue).

*VRET.* MyPsySpace can provide an interface to VRET applications and VEs for exposure therapy interventions. Currently most VRET applications are only available in larger clinics and hospitals. MyPsySpace seeks to bring these applications into the private clinic.

*Distance connections.* MyPsySpace can connect the private office and groups with specialists, virtual world builders, and playback theatre (PT) troupes [12]. Figure 1 (Right) illustrates a scenario involving an inpatient group therapy encounter with a distance PT troupe. PT is a form of improvisational theater where a person called “the teller” is placed on a platform (typically in a special chair, as illustrated in figure 1) to tell his or her story to a troupe of actors. A special member of the troupe called “the conductor” asks the teller to pick out actors to represent the characters in his or her story. The actors then improvise the story, with the conductor checking in with the teller to make sure that the actors have depicted the story accurately. After the PT performance, the group is invited to share comments and feelings with the teller.

*Tracking and assessment.* Using smart phone apps, smart bracelets, and smart watches, clients can report depression levels, anxiety episodes, etc. to the system as they occur between sessions. Episodes can be charted, graphed, and assessed by the therapist and discussed with the client in the next session.

## 2. Soundscapes

SoundScapes is an ongoing mature body of research and development, from the mid-nineteen eighties, that has been responsible for patents<sup>4</sup>, bespoke commercial product and related training programs and the establishment of two companies and numerous academic publications. Emergent models for in-action intervention and on-action evaluation evolved from the empirical work. In SoundScapes digital media plasticity is investigated aligned to individual human performance plasticity and vice versa. The targeted end-users range from those most marginalized through their diagnosed impairments to those who are considered as traditionally developed (TD).

The many years of SoundScapes fieldwork research pointed to a need for a product and method that could enable accessible empowerment for all irrespective of age, ability and/or situation. A catalyst of the concept is alternative and adaptive channeling of self-driven stimulus that offers potentials to give a sense of fun and entertainment as a user experience. Alongside this was a desire for enabling creative expression, engagement, and active play as the reagent of the design. In the early years a desire was to conceive the ultimate bespoke system. In line with this, biofeedback, gesture control, and worn sensing devices were some of the explored apparatus. The author’s tacit

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<sup>4</sup> <http://www.google.com/patents/US6893407>

knowledge gained from being brought up in a family with members having profound and severe impairments aligned with an engineer education and a background as an artist, musician, and technician. The work is widely regarded as being avant-garde in nature (through its anti-conventionality; challenging of values, standards and traditions; and an aim for absolute originality in creation) and a pioneering effort with impact.

Unlike certain definitions of serious games that disregard entertainment when used in healthcare and rehabilitation, the concept of SoundScapes holds entertainment of the participant as a key in-session goal. Entertainment experience in this context is designed for and regarded as a promoter that engages the participant through the fun, enjoyment and pleasure of participating in the activity. The activity is designed as a motivational rehabilitation intervention in line with a healthcare team's goal for the participant's progression where 'actions' are the main unit of analysis.

In SoundScapes, the hypothesis is that the effect of the intervention is stronger when the participant is not focused on the rehabilitation goal or therapy situation, but rather to have fun in the moment. A direct and immediate virtual mirroring of input via responding selected digital media is central to this approach. Further than this an aim in the intervention is to engage at a conscious level whilst also addressing the unconscious as well as the bio (see biofeedback). In this way inter-subjectivity and intra-subjective afferent and efferent stimulus is played out to offer affordances for the self-agency that results in bio-reactions and interactions that outwardly result in representations of the inner activities. The resulting human behavioral representations are observed by the facilitator and subsequently directly correlated to the "designed-for" session "happenings" that contribute to closing the afferent efferent neural feedback loop (aka causality [c.]). In this way the session facilitator can increment the intervention to suit participant nuance of Microdevelopment (see, [13]) and learning (physical and cognitive as progression in development nuance) under the method aspect of the author's patent (ibid) and model that emerged from his research – namely ZOOM (the Zone of Optimized Motivation) for optimizing 'in-action' intervention<sup>5</sup>. Each session is designed and refined iteratively as a part of a larger treatment program that is subject to reiterative meta-assessments and final evaluation upon completion. Thus, each session gives the digital media designer input in regards what is required to improve the content for both the participant and facilitator. Options include the interface(s) to source the human participant's data as a means to control the digital environment; the mapping of the content (where re-routing/scaling and other manipulations can be implemented); the content (as a preferred stimulus, matching interests and desires of participant); the means of feedback (how the participant experiences); as well as any means that are pertinent to include for physiological data gathering to archive quantitative aspects of the intervention that correlate to the qualitative aspects (mostly video recorded and, where possible, interviews. For the facilitator a "sub-system" is designed that offers 'parameter-change presets' to influence the optimal focused and concentrated engagement with the participant as well as to optimize the participant's motivation: In other words, the eye contact, the physical contact, and mimicry (if needed – often improvised as an unwritten facilitator to participant learning interaction along the lines of e.g. informing where active invisible space acts as an input interface). Change parameters are designed so that the engagement is optimized and not disturbed. Thus, the sub-system is in the form of presets that the facilitator can easily step through to maximize the intervention opportunities as progress takes place whilst

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<sup>5</sup> The ZOOM *in-action model* complements an *on-action model* for post-session evaluation

communicating a direct and immediate conduit between self and other. In this way the participant is made to feel an important part of the session. The participant through their outward representations can evoke parameter changes should they wish.

System design considerations are complex (and are not elaborated due to brevity need) and include therapist goals and the participant's profile, which is addressed to include idiosyncratic nuances from the various perspectives that are considered as a potential influence including to affect the mnemonic attributes. Within the many years of field research it has been shown how the concept can influence the retention aspects of the designed for interactions thus the participant's memory ability is a factor of design.

It has been found, through commissions of the system provision alone, that the ZOOM model needs to be trained to achieve maximum potential and impact from using digital media in intervention. Optimal facilitator intervention has been found problematic and is an ongoing challenge to achieve through for example personnel profile, situation influences. A lack of training time allocated in traditional professional public situations is a cause. Thus, and in line with how the concept of using digital media and sensors has been adopted in contemporary practices (including especially games e.g. in physiotherapy, occupational therapy, and other interventions) around the world, SoundScapes has evolved to be a training of trainers entity where instruction gives the tools needed for optimized intervention with digital media. The concept includes certifications and diplomas to ensure public authority acceptance of funding.

### 2.1. A 'Training Trainers' Retreat

It became evident within the research that for continued development a focus is required on the 'training of trainers'. The approach taken is in line with lifelong learning, Assistive Technology Intervention (ATI), and the Danish model of social welfare and technology. Accordingly, SoundScapes, since 1992, has been based in Scandinavia, and mostly in Denmark where the research has flourished.

Denmark is acknowledged as a leader in ICT with Cluster centers on an advanced high-tech society, featuring a world-class ICT infrastructure and the world's most e-ready population<sup>6,7</sup>. However, it was found in the early years when the concept was introduced, that this national profile (and one can argue this as being location and generation specific) did not correspond to the establishments being ready for the SoundScapes concept. In fact many "well-being" and healthcare personnel rejected the intervention that offered a digital means of empowerment and fun feedback. Often a case of overly protecting their client was experienced – even though it was usually clearly shown by the patient (often PMLD – profound and multiple learning disabled) as a disappointment of them not being able to try to do something new. Over the years of fighting for the inclusion of digital empowerment and through demonstrating in workshops, presentations and lectures (at that time on a volunteered basis – as nobody would pay for something so crazy) attitudes eventually thawed and SoundScapes was accepted. The inclusion of games as content for gesture and other alternative control was timely, as subsequently it was evident that larger companies were making inroads with affordable commercial systems that could be used in intervention situations. Most contemporary interfaces/peripherals (NUIs – natural user interfaces) can be hacked to offer remapping to content, this is as outlined being achievable in SoundScapes in this

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<sup>6</sup> <http://www.weforum.org/issues/global-information-technology>

<sup>7</sup> [http://www.eiu.com/site\\_info.asp?info\\_name=ereadiness&page=noads](http://www.eiu.com/site_info.asp?info_name=ereadiness&page=noads)



text previously. This has resulted in a glut of therapists using such games in their work.... whether they are using them to maximum potentials is questioned though.

A consequence of such readily available systems (though the sub-systems still need to be created – see previous in this text) is how SoundScapes has evolved to be a private facility for training trainers, as well as an advice and consultation out-of-the-house service. This has been realized in Esbjerg, a harbor city with direct ferry link to UK and an international airport, which is located on the southwest coast of Denmark near the German border to encourage international participants in the training.

Advice and consultations reflect the need apparent from the many years of visiting institutes, hospitals and clinics etc., where it was obvious how technology tools were found in ‘bottom drawers’ or ‘remote cupboards’. This due to either a lack of training of use or, when training had been given, the person trained had become pregnant or changed jobs and thus was no longer at the work place that had invested in the technology. A part of the SoundScapes consultancy is to visit, compile and review such tools to see if they can be used and staff trained in how to use them before a need for further technology investment is advised. The training involves presenting the concept, which considers when a human’s faculties are hindered through impairment and the potentials of ICT-based alternative channeling of stimuli. Role-play activities involves training the experiencing of how empowering fun ‘doing’ as a core of participating and actively engaging in goal-driven activities can lead to improved quality of life, general healthcare, and well-being interventions. The promoting of increased social interactions is also a key training aspect as participants have been found to gravitate to play and create together, often also sharing their ‘doings’ with peers, family and relatives. In the SoundScapes ArtAbilitation and GameAbilitation workshops (usually a fortnight duration at international and national venues of note), which are conducted under a ‘Ludic Engagement Designs for All’ (LEDA) strategy, following the initial workshop where e.g. abstract body-gesture painted computer print-outs were created by participants, then exhibited at the workshop site, and then following cessation the participants returned to collect their ‘art pieces’ It was noted how each participant knew their own work, they had a direct association to creating it, and went direct to their ‘painting’ to claim it. The idea being that they could then show family and friends. On return to one of the venues it was reported that the establishment where some of the participant’s had come from held their own showcase where each participant told their story of how they created their piece. This was touching and revealing to the longevity of the concept and something that subsequently was encouraged at all following workshops.

### **3. Conclusion**

The two projects described in this paper provide a glimpse of future healthcare practices by showing how new technologies (one originally developed in the 1980s for physical rehabilitation and the other currently in the preliminary stages of development for mental healthcare) are emerging and gaining currency. Both projects (and increasingly many more like them) embrace the risks and rewards involved in crossing disciplines and in blending state-of-the-art ICT with games, humanistic practices, and the arts (both digital and traditional) with the intention of reinventing established healthcare practices and imagining new interventions so that they facilitate physical and psychological healing in ways that empower people, that draw out joy and

creativity, and that increase the well-being of people's entire, multifaceted human being.

MyPsySpace is designed to open ICT and VR dedicated to mental health to a wider range of theoretical orientations than CBT, which often provides cookbook interventions that too often dismiss the preferences and expressive needs of individuals. SoundScapes contributes to the needs of today in rehabilitation, well-being and healthcare intervention. It is designed as a vehicle within which future demographic societal trends and predictions needs of service industries shortfalls in catering for elderly and disabled are addressed. Temporally, innate participant microdevelopment still relies on facilitator training and understanding.

Summing up we feel it important to highlight our main purpose in writing this paper. By presenting research that is not specific but rather transdisciplinary with defined frameworks, we anticipate introducing such work to a broader audience. Our goal in doing this is to encourage peers to investigate ideas that reach across disciplines, to both risk and reap the benefits of combining technologies, theories, and methods stemming from multiple disciplines. Via this publication we welcome and encourage communications from peers to discuss the strategies and concepts we have developed and explored through both direct societal contributions and academic work.

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