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Collapse: Using Laptops Exactly as Intended

This paper proposes *collapse* as a framework for understanding the laptop as a musical instrument. It is a term that encompasses the physical laptop itself, including but not limited to specific software instruments or tools built and operated within the laptop (e.g. like a Max MSP patch). This proposal challenges a conception of musical instruments as inert tools that, through disciplined practice, become transparent expressive extensions of the body. Rather, ‘collapse’ starts from a theory that technical objects for mediation (i.e. tools; like hammers, violins, or laptops) exert, alongside their users, subjectivities and ideologies imbued by their relationships with human and nonhuman beings. Collapse describes what these subjectivities and ideologies are for laptops, and ultimately aims to be creatively generative for artists building a musical performance practice for the laptop.

Structured as three essays, I argue that laptops *perform* collapse, both by design and by consequence. This is the case of laptops both as musical instruments and as general multipurpose instruments. By design, I mean that, like a folding chair or a collapsible Christmas tree, a laptop is built to ‘usefully’ expand and collapse across certain domains. In addition to being collapsible across a spatial domain (i.e. like folding the laptop shut), laptops collapse along domains of time, production labor, mediums, and more. An example of this can be seen in how laptops, using apps like Gmail, Instagram, Zoom, and Netflix, mediate multiple digital realities across a singular physical space. This is a collapse across mediums (physical and digital). The laptop’s affordance as a portable work device is an example of collapse across space, as the ability to work becomes equally possible

from the office and from home. Time, as a resource to spend, is collapsible with the laptop, as we may schedule-send our emails, be reminded by Facebook of what we did this day 5 years ago, text our boss outside of work hours, all within the same minute. Collapsible tools, like laptops, do not only consolidate, but also *extend*. Digitally, our ability to represent ourselves in an endless number of online avatars and social profiles is enabled through a collapse of identity into an email address, Google account, Facebook login, or Apple ID, which increasingly become a primary way many users manage their passwords and credentials. Laptops in this way are collapsing and expanding our identity along the domain of internet accounts and profiles.

Yet, by these same affordances, laptops also succumb to a structural collapse (like a building collapsing under its own weight). The collapse by design begets a collapse by consequence; one that is an inevitable outcome of use. The laptop's 24/7 access to news, digital services, and people; this somehow leaves us with feeling less connected and with less mental clarity. The laptop's portability and capacity for multitasking leaves us seemingly with less time than ever before in our busy schedules. The laptop as a tool to endlessly expand our digital footprint through social profiles, online communities, posts, tweets, and reels; this leaves our mental support structures in a state of triage, frantically trying to buoy an ever-growing weight of digital information. This kind of collapse has been characterized in many ways, including decaying mental health,¹ techno-feudalism,² and a retreat away from computers altogether.³ However, a moral critique of digital tools is not the main thrust of this paper. Through the lens of using the laptop as a musical instrument, I propose that

¹ Jennifer Abbasi. "Surgeon General Sounds the Alarm on Social Media Use and Youth Mental Health Crisis." *JAMA: The Journal of the American Medical Association* (CHICAGO) 330, no. 1 (2023): 11–12. <https://doi.org/10.1001/jama.2023.10262>.

² Yanis Varoufakis. *Technofeudalism: What Killed Capitalism*. Melville House, 2024.

³ Ross Douthat and Victoria Chamberlin, "Opinion | 'This Is the War Against Human Nature,'" Opinion, *The New York Times*, November 14, 2025, <https://www.nytimes.com/2025/11/14/opinion/paul-kingsnorth-humanity-technology.html>.

collapse, in all these senses of the word, is an outcome of using the laptop exactly as it is intended. And that the framework of collapse serves useful for the aesthetic and technical concerns around building a musical performance practice for the laptop.

Each of my three essays will describe a way artists with laptops perform collapse: live sampling, instrument building, and digital mediation. These three types will be discussed as enacting collapse both by design and by consequence. And for each type I will use a piece of my own music, *Spectator Sport*, a multimedia music theater work, as a case study for how musical performance can be an intersection point for the design-side and consequence-side of collapse.

Firstly, in *Spectator Sport* a live-sampling mechanic serves as the central musical gesture of the piece. I explain how this gesture is coded into the fundamental layers of real-time audio software (a collapse along the time domain, by design), and how this same digital architecture appears socially, as the economics of online content creation foment a performance of live sampling on a community-wide scale (a collapse of time, by consequence). Secondly, the laptop in *Spectator Sport* is an instrument not only for music performance, but also for music marketing, music event production, and music post-production. Types of labor and the roles associated with them are collapsed into a single individual via the laptop (a collapse of roles, both by design of the laptop and consequence of creator economies). Finally, I conclude with a reflection on collapse in the context of musical performance practice.

1. Live Sampling and Liveness

Live-sampling is an electronic music technique in which sound is captured during a performance and then used in some way for further musical performance. This is technique can perform a broad range of musical expressions depending on how the sampled audio is used and

whether that usage is apparent to a listener or not.^{4,5,6} Before I touch on how live-sampling is employed in my piece *Spectator Sport*, I will first lay out how the design of live sampling instruments involve a collapse of time, and how the theory of digital signals and systems that undergirds laptop audio and video reflects this collapse both on a musical and technical level.

Collapse as a design feature is often attributed to an object's ability to extend itself as well as make itself compact. Picture for example a folding chair, which collapses to save space. This is a form of collapse along the spatial domain. Now imagine what collapse might look like along the time domain. What you might imagine is an object that, when collapsed, takes up a narrow amount of time (such as the immediate present moment). When extended however, this object would somehow reach into the future and the past. Do these objects exist? Within a digital system, absolutely. Not only is live-sampling a technique that performs live (in the present) captured media (from the past), laptops at their very fundamental infrastructure also collapse time by capturing moments of the past (and yes, even take a brief look into the future).

The first step to supporting this claim is understanding the term “real-time”, which is a common feature of modern digital audio software. In short, Real-time audio software is that which can immediately process sound, in the moment it is recorded. This is an essential quality of any audio software that is used for live performance. However, “real-time” does not represent the ‘present’ moment of time in an objective sense. Instead, real-time is a digitally constructed an

⁴ Sam Pluta, “Laptop Improvisation in an Multi-Dimensional Space” (DMA thesis, Columbia, 2012), 19-23. Pluta describes a number of custom built sound modules for laptop-based improvisation that involve live sampling, including ‘Sound Module Vectors’ that describe their musical affordances.

⁵ Brian Ferneyhough, *Time and Motion Study II* (Peters Edition Limited, 1976). An example of live sampling employed before it was possible with computers. Tape machines live sample a solo cello to create delay effects.

⁶ Ed Sheeran, “Ed Sheeran - Azizam (Looper Performance Live from Old Delhi),” performed by Ed Sheeran, posted April 11, 2025, YouTube, 3:51, <https://youtu.be/INPJBUePl0?si=mhj6xkj8yq60TfXo>. Live looping is likely the most widely known genre of music that employs live sampling.

experience of the present, through an intricate process of managing latency and delay. Through real-time systems, laptops collapse time by pulling from the past, as well as “looking” into the future, to digitally construct a sense of present-moment liveness.

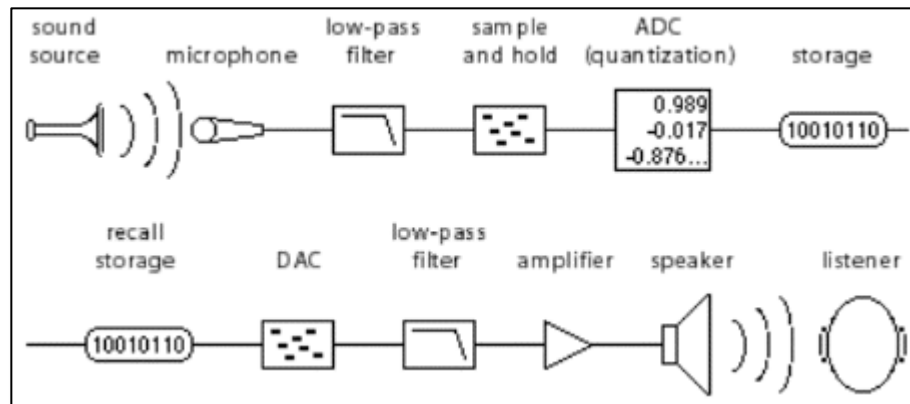


Figure 1: A digital signal processing sequence of digitizing sound, and then reproducing that sound from a binary representation.⁷

Let’s walk through the life cycle of a sound that is live-sampled by a laptop. The first stage of this process is when soundwaves are converted to microphone signal, and then this signal is converted from analog, continuous voltage into a series of discrete, digital numbers; snapshots of the voltage at a fixed moment in time. This is a process in digital signal processing theory called sampling, and it is no different from the live-sampling technique described earlier (only that here, the process is performed very quickly). Though on an extremely small scale, time is being chunked into discrete moments, like how an animated film is a series of 16 still images shown each second. The second stage of this live-sampling process is where the performance of collapse begins. For a laptop to properly function, it must group these samples into a buffer. The laptop cannot operate

⁷ “MSP: How Digital Audio Works | Cycling ’74 Documentation,” accessed March 21, 2026, https://docs.cycling74.com/learn/articles/02_mspdigitalaudio/. Quoted in Gottfried, “Situated Instrument Design.”

quickly enough to process the captured audio one sample at a time, and so the buffer is a collection space (typically ranging between 64 to 2056 samples) for audio to be held until the laptop is ready to process it (see figure 1). Just like the live-sampling musical technique, the laptop is collapsing time (albeit at a scale imperceptible to humans): the buffer is a performance of the laptop extending into the past, capturing time along its span, and then collapsing those samples into the present moment. The total time involved in this is included in a reading called the input latency, a measurement of time that acts as a benchmark for whether audio software achieves ‘real-time’ status.⁸

The next stages of a sound’s digital lifecycle also perform additional collapse by extending into the “future”. This is not a form of prediction, nor literal time-travel, but a software feature called ‘lookahead’. Lookahead is a feature in several audio effects, most commonly in limiters and compressors, but is also appearing in some EQs, reverbs, and other time-based or phase-dependent audio effects. These are effects that work in ‘real-time’ but take a noticeable amount of time to apply. To reconcile these two constraints, lookahead applies a short delay to an audio signal (1-10ms), to create a pocket of time where a signal can be analyzed and processed before being converted from a binary representation back into sound waves. For example, a limiter is an effect that prevents an incoming signal from being louder than a certain set threshold (this is essential for preventing clipping or unwanted distortion in a recording). A limiter can create a smoother, more natural sounding limiting effect if it can anticipate the exact moment in the future when an audio signal will reach its set threshold.⁹ While input latency involves a delay in time to extend the “digital present” of real-time audio into the past, lookahead involves a delay in time to perform an extension

⁸ For example, if overall latency in a system exceeds a certain length, then a user will no longer perceive the sound as being processed immediately (i.e. in real-time).

⁹ Arthur Fox, *Dynamic Range Compression: What Is The Lookahead Control?* - Fox Music Production, Processes, July 3, 2024, <https://foxmusicproduction.com/compression-lookahead/>.

of the digital present moment into the future. The present moment, in this digital system, expands forward and backward in time (see figure 2).

Input latency and lookahead depend on operating quickly enough to achieve the *perception* of liveness within a system that is ultimately requires music to be captured, held in time, and played back at a later moment. In this way, real-time is a design of laptop that collapses time as a means of constructing liveness. This alone has notable implications: liveness is not a state of sound that, by being recorded and captured, is converted into ‘recorded’ sound. Instead, liveness is a state of sound that is only made possible through first establishing a mechanic of recording and sampling.¹⁰ This collapse occurs within all but a few milliseconds. However, live-sampling as the musical technique, performs this same collapse along the time domain, but at an audible scale. In this way, collapse is performed on both micro and macro scales of time. I will continue this analysis of time domain collapse with a discussion of *Spectator Sport*, which engages with a third, larger scale of this collapse. Live-sampling as a design feature of the laptop is contrasted with a society-wide performance of live-sampling that occurs as a consequence of the economics of online content creation.

¹⁰ Philip Auslander, *Liveness: Performance in a Mediatized Culture*, 3rd ed. (Routledge, 2022), <https://doi.org/10.4324/9781003031314> 27-34. The idea of liveness being an idea constructed from recorded-ness is explored in depth by Auslander, extending it beyond laptops and into the broader field of performance studies.

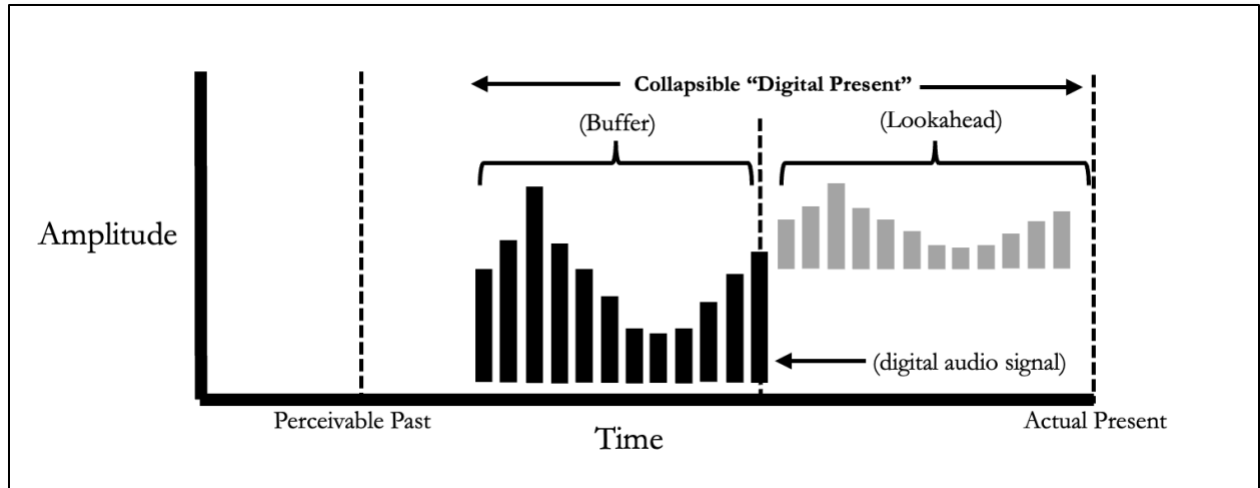


Figure 2: The “Digital Present” as a collapsible moment of time.

Live-sampling can be observed on a society-wide scale through the performances staged on social media. In place of a continuous audio signal, imagine the social media feed as the live performance experience. In place of the laptop’s buffer sampling that live performance, social media users clip and repost memes, podcast excerpts, and livestream happenings on the platform, recycling media back into the feed to be reclipped and re-reposted by other users. This performance is a fast-paced, large ensemble work moving between contrapuntal and tutti gestures.¹¹ The result is another performance of liveness through temporal collapse. While the memes, posts, and videos are forms of recorded (i.e. sampled) media, what unfolds from this process is a live performance by social networks. Laptops remain as the instruments of collapse, but one that is driven by a consequence of the attention economy, rather than any one designed software, app, or platform.

¹¹ Hito Steyerl, “In Defense of the Poor Image,” E-Flux Journal, November 2009, <https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image>. This essay by Steyerl explores in further depth the poetics of reposted images in online social media performance.

This social-media-focused “collapse-by-consequence” is a focal point of my piece *Spectator Sport*, which is organized musically by live-sampling techniques. *Spectator Sport* is a 1-hour music theater piece that uses the metaphor of sports broadcasting culture to reflect the challenges and opportunities musicians are presented with by engaging with social media. Consisting of one main performer and 2 guest musicians, the piece is staged such that the audience is surrounded by three floor-to-ceiling video screens that livestream the audio and video of the musicians’ performances, who are positioned behind the audience (see figure 3). The livestreaming technology that broadcasts the musicians’ performances is powered by three real-time audio/video software: Max MSP, Ableton Live, and Open Broadcaster Software (OBS). Additionally, the piece includes a series of character monologues in which a Software Engineer, a Social Media Influencer, and a Professor each present a manifesto for how live music should exist online.¹² These monologues, paired with the large TV screens separating the audience from the performers, theatrically stages a form of digital mediation that audiences and musicians encounter every day online.



Figure 3: Still image from the premiere of *Spectator Sport*

¹² See Appendix A for a synopsis of *Spectator Sport*, as well as a table of contents to each of its movements.

The core gesture performed by the laptop in *Spectator Sport* is a “livestream-record-playback” motif. Each of the nine movements of *Spectator Sport* are demarcated by whether the laptop is a) livestreaming the performers, b) recording them, or c) performing a live-sampled remix of a musician’s past performance.¹³ In this way, live-sampling is performed at three scales: on the micro scale of the laptop’s real-time audio software, on the concert scale of the musicians’ performances, and on the theatrical scale of the characters’ monologues.

In this context, a performance practice for the laptop becomes possible on multiple scales, and in turn performs technical and aesthetic ideas. Not only does live-sampling encapsulate a collapse of time on a technical, musical, and social scale; those three scales are also placed in dialogue with each other. The freezing/crashing/breaking of a laptop’s audio software may carry equally technical and social meaning, depending on how it is musically framed. To the example of *Spectator Sport*, the live-sampling movements function as musical remixes of the guest musicians’ performances. These movements reflect the cognitive distortion and noise that is introduced online when a piece of media is repeatedly clipped, reposted, and recirculated. The noisy distortion of online media reveals both technical and social truths about it.^{14,15}

In this analysis laptops are agents of temporal collapse. Collapse, however, can be overserved across multiple domains. Following a framing of collapse as spatial (the shutting of the laptops screen), and then as temporal (sampling as a construction of liveness), I will discuss collapse as a design and consequence of laptops along the domain of labor (through the role of the artist) and the domain of mediation (through software design).

¹³ Ibid.

¹⁴ Hito Steyerl, “In Defense of the Poor Image.”

¹⁵ The interplay between the musical and social in live-sampling can also be discussed in hip hop traditions, where a track’s samples may carry not only the musical identity of its source, but also its sociopolitical identity.

2. Mapping Instrument Design Along the Production Domain

Laptops collapse certain forms of labor along a domain of production. Return to the image of a folding chair, which expands and collapses along a spatial domain. Now picture the full life cycle of a piece of music, including not only composing or performing the piece, but also recording, mixing & mastering, marketing, distribution, and touring; notating, arranging, rehearsing, publishing, fundraising, grant-writing, streaming, printing vinyl, writing blogposts, posting reels, pitching to curators, writing research for an academic job, and submitting to conferences and festivals. I describe this as the domain of production. In the same way a spectrogram maps sound along a time frequency domains, the life cycle of music can be mapped against a production domain, where different types of labor are engaged at different times.

This is by no means specific to music, or even a novel assertion. Anyone who uses a laptop can understand how it is a tool for multitasking and productivity. It enables one person to perform the labor of many different roles in a project. For the laptop-musician, it is almost certainly the case that their laptop is used both for music performance and the ancillary logistics that support it, such as emailing venues, making posters, texting invitations, and setting up ticketing pages. This essay doesn't make an argument for this framework of collapse (as it is somewhat self-evident). Instead, I focus on a specific angle laptops perform production-collapse: the laptop-artist as both instrument performer and instrument designer.

The modular, containerized architecture of a laptop reflects similar layers of mediation found in musical instruments. This statement has both technical and aesthetic implications for laptop-performance. In this section, I explain how the role of a laptop-musician is both that of performer and designer of instruments, and how this quality of laptop-musicians operates in both musical and societal contexts.

In a traditional sense, instrument-designers might not fully identify what they do as musical performance. A guitar luthier, while albeit engaging creatively with concerns of intonation, resonance, and durability, still seeks to create a tool that could cleanly mediate the creative agency of the guitarist that wields it. However, even the slightest investigation into the social and technical rules that scaffold this break down any sense of instrument-design as practice no less creatively subjective than musical performance.

On the topic of instrument design, Rama Gottfried describes instruments as having “layers of mediation”, revealing a key connection between instrument design and musical performance. He starts by pointing to the evolution of western keyboard instruments. Despite all having a twelve-note-per-octave keyboard design in common, keyboards instruments “under the hood” involve a diverse and ever changing array of mediated actions. Rama writes:

The keyboard is a homogenized interface that triggers a sequence of mechanical actions which combine to make the sound we hear. Organs for example are controlling wind pipes and reeds, whereas, harpsichords control a plucking mechanism, a clavichord pushes a metal blade gently into the string, and a piano has a striking and escapement mechanism; from harpsichords controlling a plucking mechanism, a clavichord¹⁶

What is revealed in Gottfried’s framing of instruments as having layers of mediation, is that the keyboard’s “homogenized interface” is a site of collapse for several stages of instrumental action. This is profound in how Gottfried goes on to describe a similar homogenization manifests in digital systems, describing how “the input and output of the [digital] system, if human readable, will be some kind of sensory media (sound, image, touch, etc.), however, between the input and output the

¹⁶ Rama Gottfried, “Situating Instrument Design: Towards an ecological approach to media performance” Video Essay. Recorded June 23, 2021. Vimeo. 1 hour and 23 minutes. <https://vimeo.com/569361888?fl=pl&fe=sh>

signals are converted into binary data.”¹⁷ The digital system Gottfried is describing is the same DSP sampling process discussed in the previous essay (see figure 1). This connection establishes a material similarity between keyboard instruments and digital systems, and validates a base hypothesis that laptops can carry similar constraints and affordances as traditional musical instruments. Yet, what is key from this connection is that these layers of mediation are not inanimate, but are encoded with artistic agency from instrument designers:

From an instrumental perspective, we can see that the more layers of mediation there are in an instrumental system, the more opportunity there is for the designer of the system to embed their own understanding, aesthetics, and desires into the tool’s inner working; and digital systems are particularly mediated systems.¹⁸

He concludes this line of thought with a quote from Thor Magnusson:

The objects around us – the technologies that serve as props in our thinking and music making – are stuffed with people and their ideas; in them we find programmes of action, manuals of behaviour, and political and sociocultural constructions, including aesthetic tendencies.¹⁹

If laptops are not only “particularly mediated systems,” but also that their layers of mediation are “stuffed with people and their ideas,” then the act of instrument-design (especially that of designing digital software instruments) is a form of deeply creative, subjective artistic performance. The difference between instrument and design and instrument performance may be simply a superficial one. Musical performances are enacted on a music venue’s stage, while instrument-designs are performed on the stage of online forums, conferences, and other spaces where performers gather to discover new instruments.

¹⁷ Ibid. Ch. 8

¹⁸ Ibid. Ch. 8

¹⁹ Thor Magnusson. “Of epistemic tools: Musical instruments as cognitive extensions”. *Organised Sound* 14.2: 168-176. 2009.

Within the laptop-music community, the boundaries between these roles (instrument-performer and instrument-designer) are completely absent. For many laptop-artists, it is an assumption that their practice may involve performing, creating, and using other artists' presets, plugins, sound modules, and other instrument systems. Software like Max MSP, Supercollider, and Ableton Live are popular tools that function as sandboxes for computer musicians to build sound modules within, which can be shared with other users and combined into customized instrument systems. The containerized, modular architecture of these software enables an instrument system with layers upon layers of mediation, each of which with creative agency imbued in them. David Zicarelli, the founder of Cycling '74, which maintains Max MSP, compares digital tools to works of music, and suggests that our relationship to tool-makers is the same as that to music artists: to use another artist's tool is to essentially perform an artistic collaboration with them.²⁰ This is the case for myself as well. The live-sampling instrument system from *Spectator Sport*, described in the previous essay, was built using modules designed by myself and others.

Returning to the ways laptops collapse across the lifecycle of music production, a more negative consequence of all this is likely equally self-evident. The collapsibility of labor made possible by laptops also engenders burnout and alienation, consequences of an economy obsessed with gains in efficiency and capital. A large majority of professional artists are "solopreneurs," meaning they are freelancers and are the only employee in their artistic practice.²¹ By necessity they must engage not only in performance and instrument-design, but also in marketing, event production, and all other ancillary tasks for their music. In my piece *Spectator Sport*, I appropriate

²⁰ David Zicarelli, "Ableton Education Day: Keynote Talk." Ableton Live (Los Angeles, 2026).

²¹ Diane R. Scott, "Artist Entrepreneurship for Life: Making Art Work for You," Routledge & CRC Press, accessed March 21, 2026, <https://www.routledge.com/Artist-Entrepreneurship-for-Life-Making-Art-Work-for-You/Scott/p/book/9781032748313>. 13.

these economic circumstances for artistic purposes, orienting them to serve aesthetic purposes in the work.

A core component of *Spectator Sport* is that I perform alongside *guest* musicians. In the works 9 movements, each character monologue (a manifesto about live music and online spaces) is followed by a musical performance that is recorded and then “remixed” by a Sports Broadcaster character (myself), who “noisily” mediates the musician’s performances to the audience. To realize this concept, I invited the guest musicians to prepare an existing musical work from their repertoire. I did not compose any musical material. Additionally, I did not schedule any rehearsals. In place of a notated score, the musicians received a run-of-show document (in the form of an excel spreadsheet) that simply laid out when and where they would perform.

These structural constraints forced me and the musicians to fully embody our roles as broadcasting mediator and as live performer, respectively. As a visiting guest with no prior rehearsal, the musicians were necessarily the driving force of their performances (embodying the piece’s thrust as a reflection on performer-audience connection). They could take no cues from me, nor could they consciously or unconsciously perceive how I, as the producer of the show, might want them to sound. Instead, they were encouraged to rely on their own performance practice and their own repertoire as the well from which to draw from. At the same time, I, as Sports Broadcaster, with no prior rehearsal time with the musicians, could only react to (and never drive or cue) the actions occurring in the performance, even if I wanted to. This, of course, is more true to how an actual Sports Broadcaster operates, as they have no influence on how the athletes they cover will perform.

These constraints served *Spectator Sport*’s aesthetic around liveness and digital mediation. At the same time, these constraints are a performance of collapse along the production domain, and are in direct dialogue with the consequences of labor-collapse from the economics of modern artist

entrepreneurship. The economic reality behind *Spectator Sport* was that there was little production budget for rehearsal time or rehearsal space. Rather than seeking to fit rehearsals or a composed score into this limited production budget, those same limitations were employed towards building the premise of the piece itself (i.e. a reflection on the challenges of live music production today). In this way, the labor of emails, run of show documents, and other logistical tasks as a performance of both music and logistics. The laptop, being a common instrument between both domains, performs collapse along this domain of production both despite, and in partnership with, the logistical and musical constraints of the piece.

This collapse of production serves as the groundwork for a concluding discussion around collapse and mediation. With an understanding that mediation is not an objective, technical matter, but one that involves human agency and subjectivity, it becomes possible to see the laptop's mediating layers as a form of collapse between tools and culture. This proposes significant answers to a question commonly posed to laptop-music artists, that of finding a "balance" between technical skill and musical expression.

Towards a Performance Practice of the Collapsing Laptop

I conclude this paper with two theses of a musical performance practice of the laptop that is informed by *collapse*. While the prior content of this paper served to expand conventional notions of how a laptop might function as a musical instrument, this conclusion considers how a musician's approach to laptop musicality might, in turn, be reimagined.

The first thesis is that the idioms of a laptop are encoded in our choice of tools. In the context of musical performance, "idiomatic" playing refers to music that consists of gestures core to the mechanics of the instrument. Idiomatic French horn music involves a particular voicing of thirds, fourths, and fifths, in accordance to what was possible on the natural horn. Idiomatic harp

music engages chromaticism in a way that makes sense to how the pedals are to be depressed. In this context, music that is idiomatic to the laptop is typically relying on the way a particular software feature might be programmed. For example, live looping (music that involves multiple, overlapping loops of live recorded music) may be considered idiomatic for the software Ableton Live, whose default user interface is a table of cells where snippets of looped audio can be triggered. What is notable about this example is that live looping becomes idiomatic through the software Ableton Live, which exists within the laptop. The idiom, in a computational sense, is *encoded* into a layer of mediation in the laptop instrument.

For the musician, this means that the idioms of their laptop-music are customizable. A musician's choice of software (Max MSP, Supercollider, Garageband, etc), though made far before the first moment of their performance, holds a strong aesthetic consequence for their music. Though some music software seeks to be a transparent tool for the artist's expression, the reality is it is a layer of mediation that necessarily inherits the "ideas and programmes of action" built into it.²² Additionally, a musician may choose how "close to the metal" they wish their idioms to be. "Close to the metal" is an expression that refers to code and software that interfaces with the lower-level components of a machine. The C++ code that Max MSP is built on is "closer to the metal" than a Max Patch. In the essay on temporal collapse, I explained how *Spectator Sport's* live-sampling technique reflected a mechanic that was operating on the smallest scale of the laptop's programming. In this example, sampling is the primary idiom of the laptop, one that is found at its most fundamental layer of mediation. Notably, I still employed high level software tools, such as

²² Bruno Latour, "On Technical Mediation -- Philosophy, Sociology, Genealogy", Paper (1994). <http://www.bruno-latour.fr/node/234.html>. Latour presents this idea in further theoretical depth, particularly focusing on how the dialogue between human and nonhuman beings (such as tools) creates a social genealogy within both layers of society and the layers of mediation within a tool.

Ableton Live, Max MSP, and OBS to build my sampling instrument. However, by distributing the architecture of my live sampling instrument across three separate software, I was able to minimize the perception of idioms specific to each software, and maximize the idiom of sampling, which is borne from the low-level digital signal processing system common to all three software.

The second thesis is that musical performance, like a laptop, occurs beyond the bounds of a musical work. Instrument design is a primary example of this. In practice, artists in the laptop-music community are both performers and instrument designers. Even if they use instrument modules built by others, they must still design a system in which these modules speak to each other. But I have discussed how even before this community developed, instruments like pianos, organs, and synths, are “stuffed with people and their ideas.”²³ The overlap between instrument design and instrument performance is a form of collapse along the production of domain. When I explored this in *Spectator Sport*, it was through not just instrument design, but also through a collapse of musical labor with music business labor. The piece’s focus on the connection between audience and musician was informed jointly by musical decisions, as well as logistical constraints instigated by the production budget of the project.

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Marshall MacLuhan’s famous expression “the medium is the message,” laid out a thesis of media studies, that broadcast systems, radio, television, and other communication tools are full of meaning, and are far from being neutral mediators of the messages they carry.²⁴ In many ways, *collapse* is both part of the laptop’s medium and its message. Aspects of laptop design, such as DSP

²³ Magnusson, Thor. “Of epistemic tools”

²⁴ Marshall McLuhan and W. Terrence Gordon, *Understanding Media : The Extensions of Man / Marshall McLuhan ; Edited by W. Terrence Gordon.*, Critical ed. (Ginkgo Press, 2003).

sampling, and a portability that begets multitasking and increased productivity, these are features that mediate action for the laptop user. I've outlined in my own music how laptops perform a message of collapse, namely through the live-sampling performances of social media, and the burnout culture of online economies of attention. Today in computer music, the laptop is the most common form factor. And while the software and digital systems in laptops have a lot in common with desktops, phones, and other computers, the laptop's physical portability and collapsibility (by nature of its clamshell design) pair with this digital infrastructure to embody a picture of collapse that can be viewed from all angles.

Appendix A: Synopsis and Form of *Spectator Sport*

While *Spectator Sport* is not explicitly a narrative-driven music theater work, it does contain three interrelated monologues, each by different 'characters', performed by myself, that each comment on the topic of social media and live music. These monologues serve as spoken vignettes that provide the social frame and commentary for an audience to consider during the musical performances that make up a majority of the performance. As a way to frame the writing in this paper as well, I start with a synopsis of those three monologues:

Background: In this fictional world, the experience of live music is something encoded in a cultural operating system that, like a computer's operating system, sets scripts and frameworks for musicians, audiences, and other human beings to participate in and experience live music.

Monologue 1 - The Software Engineer: *Spectator Sport* begins on a Zoom Call held by the director of engineering at the Live Music Operating Systems Team. This director explains that live music is not operating as effectively today as it did in the past, largely because of the role digitalization has played in fragmenting audience's attention across many different

platforms. In response to this, the Live Music OS Team is releasing a new update to Live Music, in which a Sports-style broadcaster will commentate, analyze, and mediate every live music performance, similar to how such things operate in sports broadcasting.

Monologue 2 - The Social Media Influencer: On an Instagram Reel, the Influencer gives an impassioned video essay on why the Sport Broadcaster update ruins the live music experience. He proclaims that digital mediation detracts from live music, and that there should be as little digital mediation as possible.

Monologue 3 - The Professor: At an academic conference, the Professor proposes that the Software Engineer's embrace of digital mediation, and the Influencer's critique of it, embody two sides of a singular concern around mediation and authenticity. Before the Professor presents the details of this argument, he is cut for time, as his talk has already gone beyond the allotted time for conference presentations.

These monologues are followed by a musical performance by a guest musician. These musicians were invited to perform any piece from their repertoire. Following this performance, the Sports Broadcaster (a character played by myself), performs a response to the guest musician, in which audio/video recordings of their performance are spliced and played back, along with commentary, to create a kind of remix-version of their piece. All together, the form of *Spectator Sport* is as follows:

<u>Section Title</u>	<u>Start Time</u>
1. Monologue from the Computer Engineer	(0:00)
2. Trumpet Performance #1 by Kenken Gorder	(6:04)
3. Remix of Trumpet Performance #1	(11:10)

4. Monologue from the Social Media Influencer (12:31)
5. Trumpet Performance #2 by Kenken Gorder (17:27)
6. Remix of Trumpet Performance #2 (26:39)

7. Monologue from the Academic Theorist (33:51)
8. Drumset Performance by Jordan Walsh (40:57)
9. Remix of Drumset Performance (49:08)

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