



Guess, check and fix: a phenomenology of improvisation in ‘neural’ painting

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ABSTRACT

The parameter space offered by neural network image synthesis offers a creative environment that is little understood and quite literally emergent. In an attempt to come to terms with this space, an artist enters into an improvisational reflection on ‘neural painting’, made possible with what are called style transfer algorithms (Gatys, Leon A., Alexander S. Ecker, and Matthias Bethge. 2015. “A Neural Algorithm of Artistic Style.” *ArXiv*: 1508.06576 [Cs, q-Bio], August. <http://arxiv.org/abs/1508.06576>) Artistic painting offers access to transitional states existing at the interstices of expression and reflection in the creative process. Of all the conceptual dimensions offered by neural style transfer models (where the ‘content’ of one source is blended with the ‘style’ of another), the convolutional blending of ‘content weight’ offers a fertile metaphor for artistic painting phenomenology, providing a tool for the investigation of stylistic schema in the iterative, improvisational movement from concept to representation. A preliminary phenomenological framework describing the process of neural painting is developed, offering an art-as-research perspective on intersubjectively positioned creativity support technology.

KEYWORDS

Art process; embodied cognition; reflective practice; AI art; J. G. Ballard

1. Introduction: improvisation and style

Artistic improvisation has always involved a kind of play, a cycle of reflective observation and expression held partially *tacit* (Polanyi [1966] 2009, 4–7) and drawn out from elusive mental impressions through a temporally extended physical act, with the intention of encoding experience in artefactual form. The artefact is, in some sense, a child of a much wider process of engagement with a particular time and space (Kandinsky [1914] 1977, 1). It is this extended sense of painting-as-process that is investigated in this paper through a case study of a traditional painter’s improvisational

abstraction in the medium of artificially intelligent image blending.

Computational *style transfer*, as it is called, is the use of an artificial neural network (ANN) to blend abstractions of the supposedly separable visual elements of *style* and *content* (Gatys, Ecker, and Bethge 2015). In style transfer, the ‘content’ represents what an artist might think of as the setting or ‘ambient optic array’ (objective information) to use Gibson’s (1979, 65) terminology. ‘Style’ is a statistical abstraction of the colour and shape distribution in another, usually different, image that is meant to represent an artist’s individuated interpretation of the setting (subjective information). Algorithmically, the

two are convolved together to create what has been promoted, in research and commercially, as the transfer of art style, et voilà! *Rembrandt's Poodle* (Figure 1).

The problem with algorithmic models of style, from an artist's perspective, is that they do not derive from lived process but from a sampling of appearances. In art, style is not derived from quantitative descriptions of 'what' but rather from the qualitative motivations of 'why'—art is a process, not (just) an instance; an 'experience of the form or style of knowing something, rather than a knowledge of something' (Sontag 1966, 15). Artistic 'style' is thus an autonomous feature of self-expression and cannot be trained¹ (Elkins 2001, 189), which is exactly how style is derived computationally—by providing an ANN with examples of what has been done, rather than temporally extended demonstrations of the *way* things are performed spontaneously by individuals in situated environments.

In this paper, I seek instead to approach the computational modulation of painterly style from the interactive, improvisational perspective one encounters in traditional painting practice.

Here, 'style' is phenomenologically bounded, not parametrically specified. Artistic style is motivated by a concern for aesthetic experience, constituting the trace of an improvising perceiver situated in a particular space and time dealing with the terminal immediacy of contingent solutions to existential obstacles. Perhaps, the algorithm of style can be *perturbed*.² To take the faulty instrument and draw from it a beautiful unexpected tone, in order that we might better understand the instrument and the being using it. To arrive at an understanding of style, through its arousal in process.

2. Background: improvisation and artistic process

Improvisational violinist Stephen Nachmanovitch (1990, 25) offers an expanded notion of style as the vehicle of expression embodying the 'minute particulars of body, speech, mind, and movement [...] through which self moves and manifests', thus emphasizing the multimodal and situated nature of creative experience. Nachmanovitch proposes that what comes first shapes what comes later—the overall form of



Figure 1. *Rembrandt's Poodle*. Poodle photograph © Johnny Duarte (permission granted). Fragment of Rembrandt's *The Night Watch* (1642). Style transfer composite by the author (2017).

the improvisation and the self is dynamic and self-structuring—constituting style through the continuity of experience. Improvisation is *surrender*, indeed ‘creative blocks are the price of avoiding surrender’ (141). Improvisation centralizes spontaneity and lack of forethought, promotes spur of the moment decisions and is defined as the action of ‘responding to circumstances or making do with what is available’³ towards the solution of a problem or goal.

The essential spontaneity of improvisational acts mediates how we approach the genesis of every artefactual expression. Canadian painter Robert Linsley stresses that the superlative importance of improvisatory abstraction is that ‘no other method can ensure an unknown result’ (Linsley n.d.). Even spontaneity involves intention. In an effort to stand aside from pre-conception (‘let go’) and approach the work as intersubjectively suggestive, artists have tied practice to process-mediated emergence from tacit states (Figure 2). Surrealist André Masson (Ades and Masson 1994, 16) threw sand and glue at canvasses to uncover hidden images, Max Ernst (Spies 2006, 12; Ernst 1948, 7–14) invented decalcomania and frottage, Jackson Pollock defined action painting (Rosenberg [1959] 1994, 25)⁴ and John Cage, chance operations (Cage [1961] 1973, 18–41; 1969, *Preface*). Tacit, perspectival phenomenologies derive from the embodiment of space and time, as in Kandinsky’s theory of abstract composition

(Kandinsky [1947] 1979, 21, 53, 115–146). Kandinsky’s *Improvisations*, a ‘largely unconscious, spontaneous expression of inner character’ (Kandinsky [1914] 1977, 57), constitute a pre-eminent expression of ‘abstract’ visual improvisation, one that is full of intention.

I therefore submit that for the artist, there is a largely unexplored creative space held within algorithmic representations of style, and that is the opportunity to employ them as metaphors for visual conceptual blending. Conceptual blending, a metaphor-driven understanding of one concept in terms of another, first described by Koestler ([1964] 1975, 35) and later formalized as Blending Theory by Fauconnier and Turner (2002, 39–50),⁵ is hypothesized to constitute a fundamental basis of cognition (Turner 2014, 9). Essential to conceptual blends and metaphor is ‘an intuitive perception of the similarity in dissimilars’ (Aristotle n.d., Sec. 22). Algorithmic blending (convolution) occurs in ANNs which are typically trained for image recognition on vast databases of ‘supervised’ categories,⁶ a process relying on *back-propagation*, whereby weighted data are fed back into low-level layers of the network to bias higher level downstream decision-making. In ANNs, this feedback loop of information processing, where unfamiliar information is encountered as input and filtered towards levels of abstraction approaching ‘recognition’, can be used to encourage the synthesis of previously unfamiliar

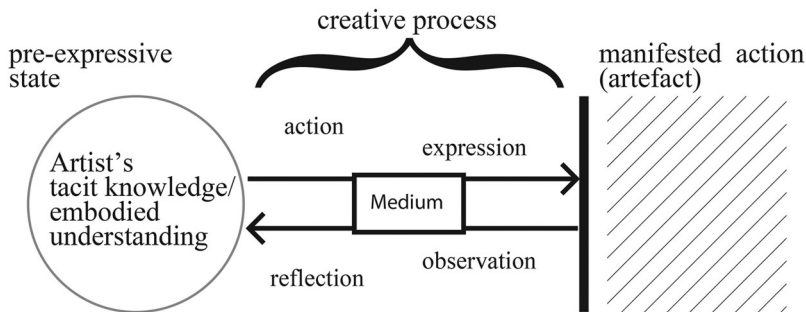


Figure 2. Improvisation in artistic process takes place in a medium at the interstices of expression and reflection (© SK. Choi 2017).

patterns. The psychological condition of *pareidolia*, where the mind perceives recognizable patterns in ‘noise’ (as in the seeing of images in clouds) also arises in ANN image processing (Mordvintsev, Olah, and Tyka 2016).

The importance of computational blending algorithms to artists therefore lays in their affordance of this ‘alchemical’ improvisatory process of development of the tacit image. For the ‘neural painter’, the algorithm of style affords an opportunity to set up the inputs structuring an imaginative visual blending space, in order to improvisationally probe the limits of the performer–instrument relationship.

Nachmanovitch (1990, 84) suggests that ‘working within the limits of the medium forces us to change our own limits’. One studies the self through adaptive improvisation within a medium. With this in mind, I enter into a phenomenology of neural network-supported conceptual blending in the development of a series of paintings inspired by Ballard’s ([1962] 1983) environmental dystopia *The Drowned World*, offering an improvisation exploring how interaction with an artificial muse leads to the origins of an embodied description of the emergence of style.

3. Overview: improvisation on context

The bulk of the city had long since vanished, and only the steel-supported buildings of the central commercial and financial areas had survived the encroaching flood waters. The brick houses and single-storey factories of the suburbs had disappeared completely below the drifting tides of silt. Where these broke surface giant forests reared up into the burning dull-green sky... (Ballard [1962] 1983, 19)

J. G. Ballard’s *The Drowned World* ([1962] 1983) is perhaps a prophetic, certainly environmentally relevant, dystopian novel proposing that rapid environmental change—brought about in the novel by ‘a series of violent and prolonged solar storms lasting several years’ (21)—could turn the global climate back to

conditions similar to the Triassic Period in the course of a generation. Ballard moreover proposes that our evolution in geologic time is embodied in consciousness and intimately tied to the environment, a notion that one of his characters calls ‘neuronic time’ (43). In this near-future scenario, as the planetary environment becomes increasingly hot, humid, covered in water, silt, jungles and lizards, the few people left behind the great migrations to dry land and cooler temperatures at the poles slowly lose touch with contemporary context and are drawn into an increasingly dreamlike world of the ancient past. Ballard’s clever use of the gradual loss of contextual normalization—a world where sanity is reframed rather than lost—leads my interpretation of his narrative towards imagery mined from the present day, or rather, from the refuse of the present day. As I walked along the Vancouver shoreline, thinking about these issues, searching for a source, I realized with a shock that in less than 100 years possibly most of the buildings around me could be under water. The essential metaphor in this paper is therefore the conceptual blending of the environment as experienced and as reported: Feeling is knowing.

Today, we are awash in information. YouTube alone sees an influx of over 300 hours of new media every minute (McAfee and Brynjolfsson 2012; see also STATS), all of it simultaneously ubiquitous and obscure, and every frame tagged with what might be called ‘absolutely vague’ attributions of ownership (Band 2001; Boyle 2008, 153–159; Netanel 2008, 3–10; Bollier 2011, 67). We live in a time of Orwellian *doublethink* (Orwell 1949) in which a unity of opposites makes decisions both paramount and impossible. This is why we are both aghast and immobile at such potentially devastating global events as the rapid increase in average global temperature (NASA 2016). Some reports would place us less than nine years away from the beginnings of catastrophic climate change of the degree suggested by Ballard, evidenced by ‘methane bombs’ in the

Arctic (Shakhova, Alekseev, and Semiletov 2010; Mooney 2013; Whiteman, Hope, and Wadhams 2013), or the unprecedented melting of the East Antarctic ice sheet (Langley et al. 2016), as well as diverse other factors contributing to predictions of mass extinction (Ceballos et al. 2015). Ballard's biological testing station outpost residents are a metaphor for all of us; overwhelmed by our (information) environment, we can only generate more information, observing, recording our self-destruction, listlessly waiting for a foreseen but unknown end.

What happens to our artefacts after we are gone? Do they revert to the earth (or noise) from which they came? Ballard asks the more pressing question of what happens to us as our artefactual world disappears. Do we also revert to more primitive forms? What do we lose when information drowns awareness? As an artist, I wanted to make this metaphor of an ubiquitous yet unseen data flood more qualitatively visceral, to blend domains of knowledge in an aesthetic space that might call viewers to existential reflection on our complicit involvement in the interlinked physical and *Hertzian* environments (Dunne [1999] 2005, 101–122) that co-constitute experience.⁷ This is why I chose to position artificial intelligence technology as a painterly foil to my compositional assumptions, to provide an alternate mediation turned back on itself exposing the situated space of information we inhabit with our creations. I could not know in what deep dreams the neural network would convolve my intentions, but the images that emerged would reflect those intentions, forming and destroying subjective belief, suffering by a parametric degree in the information stream we create but seemingly cannot control.

4. Development of a method

4.1. The creative process

You have to have an idea of what you are going to do, but it should be a vague idea.
(Pablo Picasso)

I frame the overarching 'script' of painterly improvisation as a conceptual 'journey'. Lakoff (1987, 275, 285) proposes that the SOURCE–PATH–GOAL conceptual schema is fundamental to lived experience. I will employ this schema to model the improvisational process as having an origin, a place creative practice always starts from (a context and motivation), followed by a sequence of contiguous events involving intentional relations between conceptual and physical movements that are continuously reflected upon, informing the direction of the journey (Figure 3). Finally, there is a place and knowledge of arrival, constituting the goal, or evolved motivation. This cycle repeats until the motivating context is recognized as changed. Further progress at this point initiates a new sequence, or process, aimed towards a new goal.

4.2. The critical method

Embodied cognition and *enactivism* take perception and cognition to be understandable only in terms of situated action in a local environment. This position prioritizes agent–environment dynamics over mental computation and representation (Chemero 2009, 47; Shapiro 2011, 158), a stance which I claim is an effective method of investigating creative practices such as art painting where tacit processes come into play. In embodied mind theory, the body–mind interacts *directly* with information rather than building up internal models of the world. Wilson and Golonka (2013) propose that four key steps must be considered when engaging with the implications of embodiment: The first step is to characterize the task from a first-person perspective, a stance based on the presumption that an enactive process 'solves particular problems using heuristics made possible by stable features of the task at hand' (2). Tasks are differentiated from each other in terms of their underlying dynamics. The second step is to identify the task-relevant resources

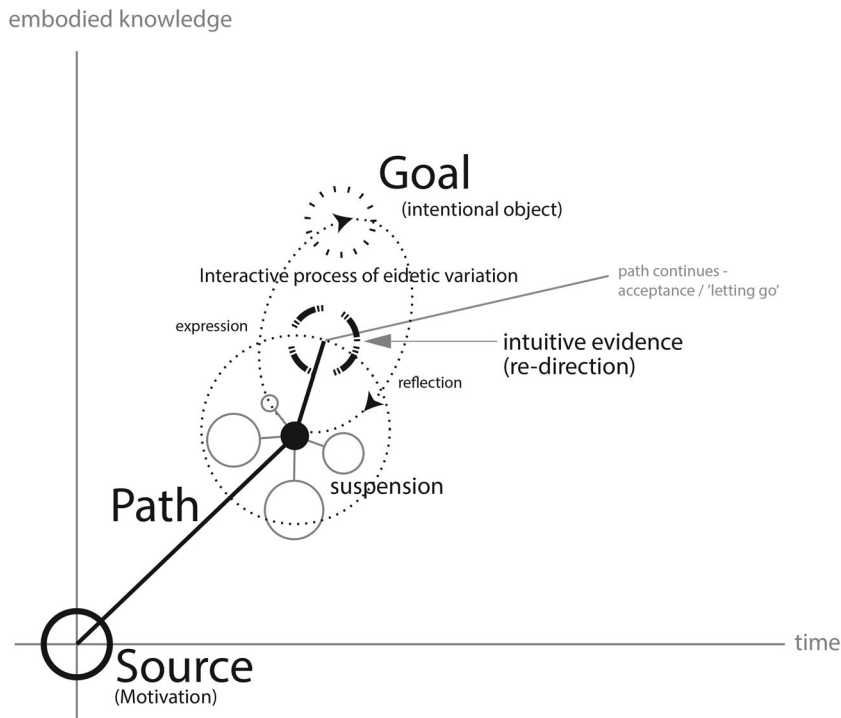


Figure 3. A Source–Path–Goal schema model of creative process (© SK. Choi 2017. [Figure 2](#)).

the agent has access to in order to solve the task. Asking, ‘What are the resources that are available in this task?’ hones in on a heterophenomenological⁸ position, not the presumption of mental calculations. The resources available are inclusive of brain, body and environment. The third step is to identify how the agent can assemble these resources into a dynamic system capable of solving the task at hand as its behaviour unfolds over time. The last step is to test the agent’s performance to confirm that the agent is actually using the solution identified in the previous step. The authors note that systems respond to perturbations of resources in a manner that is specific to the role that a resource plays in the system.

Perturbation in the context of painterly improvisation may be understood as an interactive exchange of modulated information approaching intuitive resolution: Guess, check and fix. Classically, this is described by the

perturbation series where a nominal solution A is assumed to be approachable through a power series summation:

$$A = A_0 + \varepsilon^1 A_1 + \varepsilon^2 A_2 + \varepsilon^3 A_3 \dots$$

Here, A_0 is a known (assumed) solution with successive higher order terms (A_1 , A_2 , etc.) arrived by some systematic iterative procedure (as in improvisational exchange, or interactive composition). Where ε represents an arbitrarily small positive quantity <1 , these higher order terms (system states in the process model) become successively smaller as the perturbation series approaches the nominal condition. This iterative reflective process, familiar to artists and designers during creative process, has been hypothesized by neuroscientist Christoph Redies (2007) to induce a particular functional state in the nervous system he calls ‘resonance’. Pointing out that the resonant aesthetic effect of art depends on composition, he draws

association between ‘contextuality’ and visual gestalt, describing artistic composition as contextually delimiting;

During the creation process, the possibilities of variation are large at the beginning. As the art object approaches its completion, the degree of freedom for making changes and additions decreases. At the end of the creation process, each part of the art object is embedded in the structural context of the entire object and no part can be removed, or changed substantially, without endangering the esthetic appeal of the overall object. (Redies 2007, 102)

Therefore, creative systems should respond to perturbation in a manner that reflects the actual application of available resources if these resources are in fact central to the improvisational task and its immediate resolution, and the perturbation series should approach a condition of subjective resonance in interactive creative practice for it to be considered ‘successful’ by those participating in the process.

In my method, I attempt to apply this structural analysis to the stages of the neural painting process, which starts primarily with a dynamic manipulation of approximated forms and resources but moves towards an increasingly fine-grained internalized reflection as the process nears an end.

4.3 Procedure

In the interpretive framework I set up around the development of this painterly improvisation, my intent was to limit human preconceptual intention, ‘standing back’ to observe the computational mediation of the generative image space I set up. Initially, composite ‘master sketches’ (Figure 4) were assembled quickly, intuitively, to attempt to diminish expectations of control over the image generation in order to expose and emphasize the ‘intentionality’ within the network architecture. From this perspective, I adopt a conversational ‘call and response’ metaphor borrowed from jazz

improvisation, that Berliner (1994, 386) identifies, along with the ‘journey’ metaphor, as characteristic of the ‘dynamic reciprocity’ of improvisation. I was therefore more interested in exploring the *dynamics* of the algorithmic response returned from my thematic content and style variations than in any empirical extraction of quantifiable behaviours and limits. ANN research has attempted to understand the inner workings of the ‘black box’ by encouraging response on particular layers and by particular neurons, a process known as ‘feature visualization’ (Olah, Mordvintsev, and Schubert 2017). Alternately, in an art-as-research paradigm, I seek to draw out the phenomenological response of how *my* neuron mapping (the enactive process of composition) is modulated by an ANN. Therefore, initial influence was limited to two input generalities: rough material that reflected my interpretation of the spatial relationships of Ballard’s world (‘content’), and loose instinctual expressions of texture and colour (‘style’) evoking my emotive response to that world. My subsequent control would be limited to manipulation of the algorithm’s parameter space and the attempt to encourage the emphasis of pareidolic images that emerged. These could in turn be further directed by layering in additional visual resources that were inspired by the previous iteration, thus setting up the ‘give and take’ interplay of improvisational exchange (rather than deliberate destructive editing in an image editing program). These processes are further described in Section 5. At each stage, I adopt the analytical method of enactive investigation as proposed by Wilson and Golonka, as a heterophenomenological approach to drawing out embodied responses that may not at first be evident in the artist’s affective relationship with the mental image and the all-consuming nature of improvisation.

5. Reflections on a process

Though there was land and sea and air, it was unstable land, unswimmable water, air

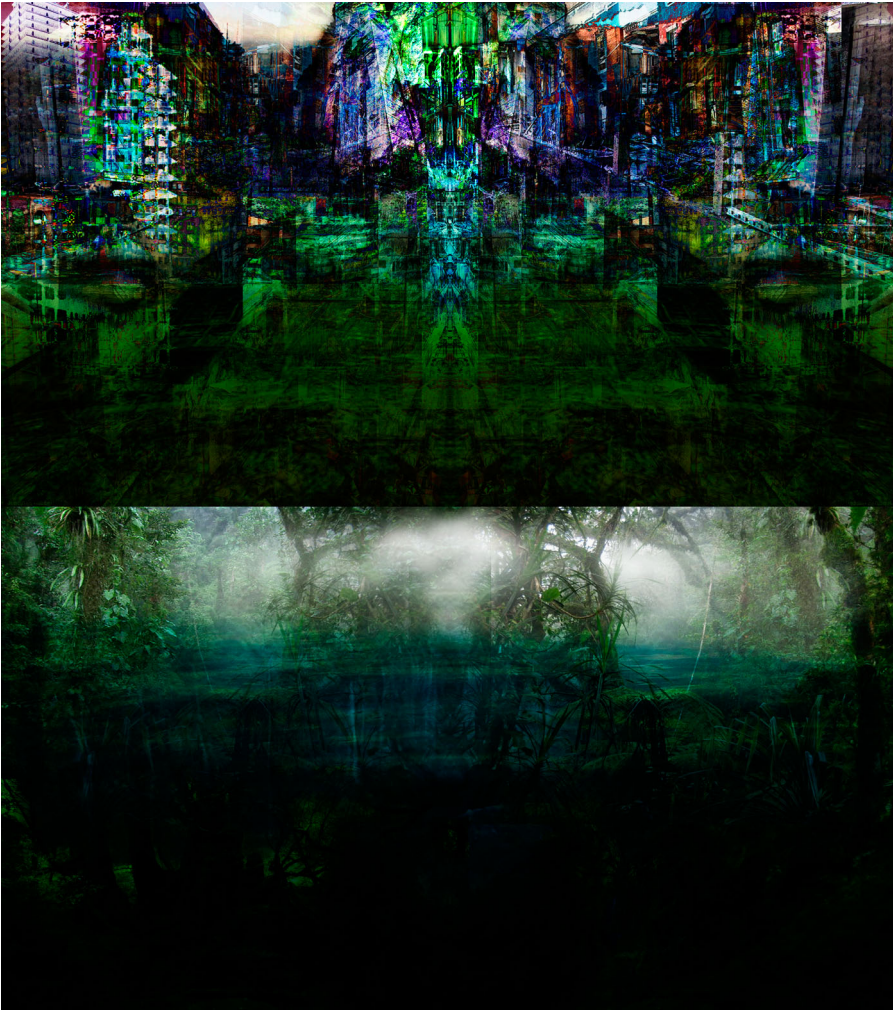


Figure 4. The intent was to begin with quickly iterated rough material that captured two central visual metaphors of Ballard’s text; that of cities (top) destroyed by the environment and that of the environment (bottom) nurtured by the dying cities (© SK. Choi 2017).

needing light. Nothing retained its shape, one thing obstructed another. (Ovid n.d.)

5.1 Source: setting the scene of motivation

The task of ‘enactively’ painting a dystopian environmental nightmare through interaction with an ANN presented several initiating motivations. For instance, in Ballard’s text, reference is made to a (possibly fictitious) painting by the surrealist painter Paul Delvaux, and another to

‘one of Max Ernst’s self-devouring phantasmagoric jungles’ (Ballard [1962] 1983, 29). These defined stylistic dimensions that could stand as visual resources available for input. Another strategy employed was to analyse the text for frequent and thematically relevant words: ‘city’ and ‘water’ being two frequently contrasted metaphors in the narrative. Metaphor and metonymy were used to extend visual relations by conceptual blending: environmentally situated terms like rust, mud and jungle are therefore associated, along with active states such as rot, decay

and dissolve. These were used for web-based image retrieval and the returned images sampled to create loose texture sketches evoking the core visual themes (Figure 4). The artist may also make free sketches, in a kind of daydreaming or gestural evocation, a method I employed in responding to emergent pareidolic effects. Lastly, I found that serendipity plays into events in surprising ways and indeed may be an essential feature of improvisational creativity; here, the sudden appearance of a water-soaked movie ticket on the street struck a chord with Ballard's several references to a drowned Planetarium. I included it because it looked like

a drawing of some obscured buildings (Figure 5). In some cases, if not all, these general motivations reflect a weighted valence, as in 'spontaneous' mental imagery vs. 'considered' thought or 'random' occurrences (happencance) vs. 'chance operations'. In either case, response in the assembly phase of process presumes intention if the process is to remain guided, or intersubjective (communicative).

These source materials were used as input into the image-blending algorithm used in this paper, Katherine Crowson's *style_transfer* (Crowson [2016] 2017), which is an implementation of the code first developed in *A Neural Algorithm of*

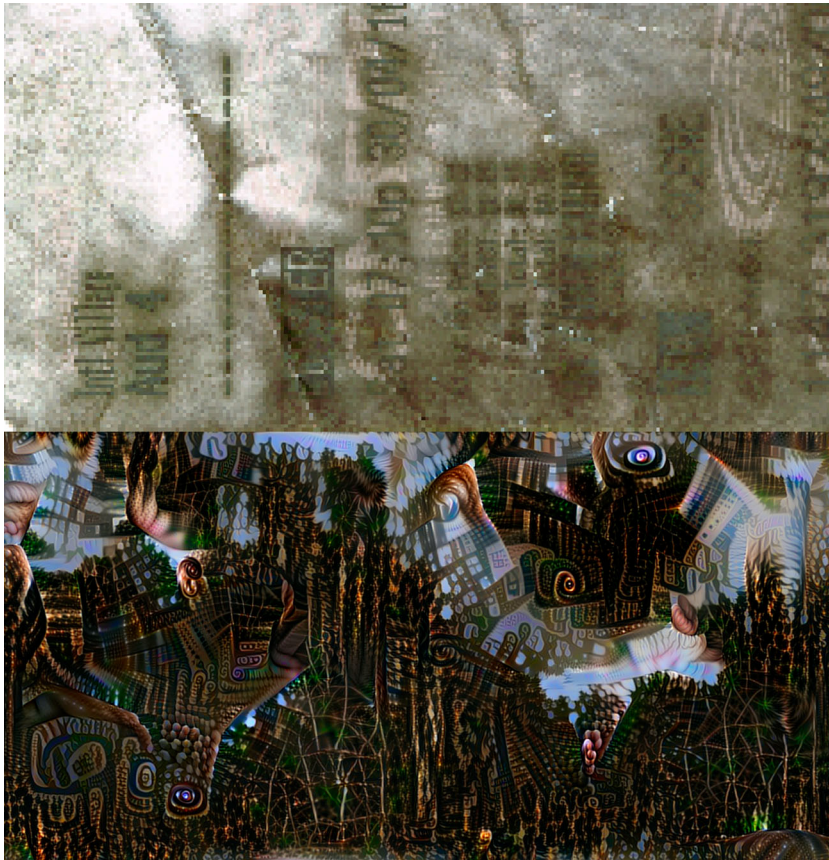


Figure 5. A found by chance water-soaked movie ticket (top) convolved with a painting (not shown) by Dada/Surrealist artist Max Ernst obliquely referenced in Ballard's novel. This pairing (bottom) represents the 'chance operations' aspect of compositional process. The Ernst painting I chose to match Ballard's description was 'Petrified Forest' (1927) retrieved from the National Museum of Western Art in Tokyo. It may be seen at <http://collection.nmwa.go.jp/en/P.1965-0005.html>.

Artistic Style (Gatys, Ecker, and Bethge 2015). This open source code runs in Caffe (Jia et al. 2014), a Deep Learning framework with a Python programming language scripting interface. It may be freely downloaded from GitHub at https://github.com/crowsonkb/style_transfer. Crowson's implementation exposes a wide range of underlying parameters allowing for extensive exploration of the image-blending space of the neural style transfer algorithm. This is achieved by first defining 'content' and 'style' images, with an optional initialization image (the default initial condition is random polychromatic noise). Additional resources ('auxiliary' images)

may also be incorporated into the processing. I used this feature to introduce 'pareidolic response sketches' (see Figure 8). The artist may also swap out content or style images and employ previous output as either in an endless chain of improvisational 'call and response' (Figure 6).

Brief phenomenological reflections on the dynamic aspects of this process are presented in the three tables of this section. Due to space restrictions, the phenomenology presented (offered tentatively) in the tables is not extensively discussed in this paper; my intent upon uncovering these preliminary bases is to attempt to delimit the experiential and improvisational dimensions

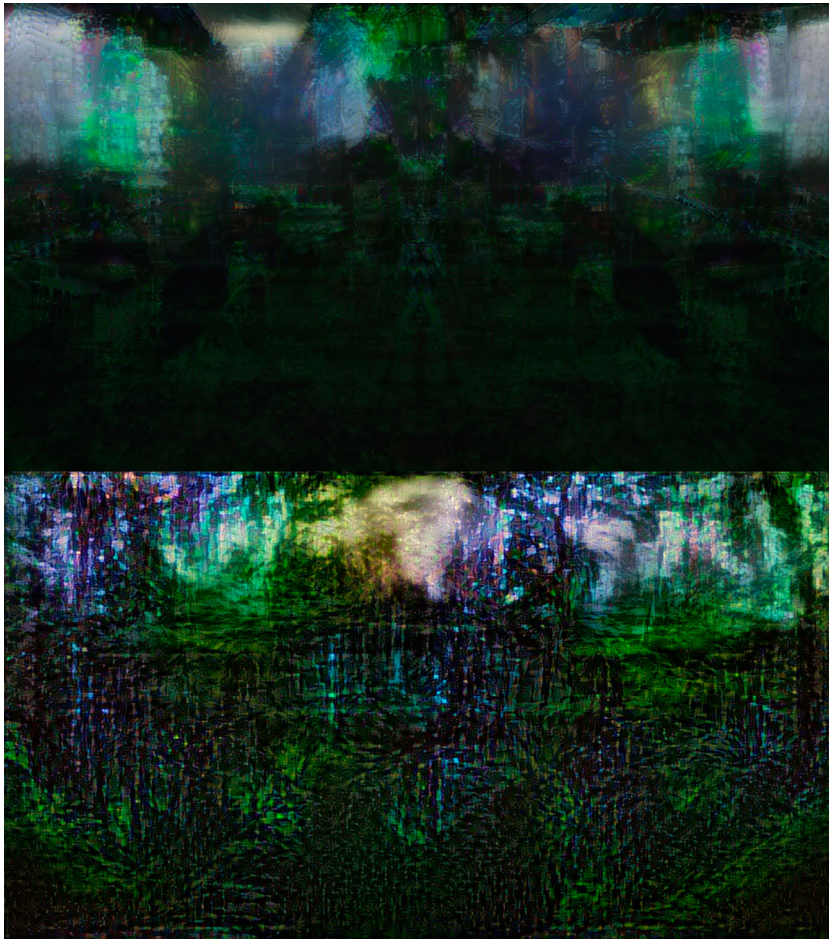


Figure 6. Two visual blends. The city image from Figure 4 has been defined as 'content' and the environment from Figure 4 as 'style'. The result is a visual metaphor where the city is 'styled by' the environment through computational convolution. The bottom image reverses the relationship (images by the author).

Table 1. Phenomenological reflections on the initial stages of improvisational painting.

SOURCE			
Task	Resources	Method	Efficacy
Mental image (presupposition)	Emotion, memory, situatedness	Reflective: biases composition or 'ready state'	Subjective—Not externally available
Search (gathering)	Image matching, semantic mapping, Web search	Narrative: rearranging remnants of past worlds	Can be modelled computationally
Serendipitous occurrences (chance)	Situated, contextual, environmental	Array: collage, multiplicity, detached attention	Intersubjective aspect
Embodied gesture (free sketching)	Subconscious, 'automatic writing'	Reactive, habituated	Hard to model
Visualization (drawing)	Sampling of human actions, manual editing	Compositional acts	Intentional
Analysis (of text), data mining	Keywords, descriptions	Semantic: tags that feedback to image search	Computationally equivalent to supervised learning
Association (metaphor)	In text, personal meaning, interpretation	Poetics: extends other resources	Additive, enriches personal meaning

Notes: Source motivations seem to be divided generally into intentional and serendipitous events. Dynamic systems analysis should consider internal subjective states (as reported) but does not necessarily take them as intersubjectively available.

of the 'neural painting' process. I will however, in each sub-section below, give a brief explanation of an exemplary instance drawn from the tables. For instance, in the 'beginning' of a creative process (Table 1, 'Source'), I identify that a vague and irresolute 'image' is encountered as one of the initiating 'Tasks', or more accurately, a mental inspiration towards the *propensity* of image generation. 'Propensity' in this sense closely ties to an enactive stance on perception as being the 'readiness to perceive' (Neisser 1976, 130). This readiness extends to painterly improvisation in the willingness to draw out pareidolic forms in imagination (chasing thoughts) and through development of forms on paper (Da Vinci's 'paint splashes'), constituting a 'Task' for the improvising creative agent. We may then ask what 'Resources' are *immediately* available in terms of this phenomenology to examine or stabilize this image—to arrive at a *theme*. The 'Source' state deals with imagery that can hardly be described as 'visual'. Even a momentary reflection on the difficulty of trying to maintain a photographic image in the mind, as it shifts, recolors and joins to other transient forms that intrude upon the imagination, reveals that this mental 'image' is itself an improvisation, the propensity towards which stimulates entry into an embodied 'searching'. The environmental resources available then tend towards conceptual

search strategies through metaphors of the places that one might encounter images in experience. This motivates a locative and perspectival phenomenology, which focuses not so much on *what* an image may be (the tacit image) as to *where* one might find it. In an enactive model of improvisatory composition, the perceptual information available in the contextual array⁹ is co-constituted with the expressive and reflective aesthetic acts modulating that context.

5.2 Path: the sequence of process

Recognition as improvisation plays out the artist's embodied narrative into physical form. Artists appear to leverage this condition in a resonant interaction with emerging pareidolic form, a method of visual guidance known to have been used by Leonardo Da Vinci: '[...] stop sometimes and look into the stains of walls, or the ashes of a fire, or clouds, or mud or like things, in which, if you consider them well, you will find really marvellous ideas' (Da Vinci 1956, 51). At times, the developing image seems to evoke particular directions which when pursued are elusive. Colours and forms emerge gradually with each iteration as the image is refreshed to the screen every few calculation cycles, displaying barely perceptible changes, growing rather

than completing, leaving one with the unsettling feeling of watching a living thing come into focus rather than be created. Initialization images based on pareidolic tracings of the images seem to bring out an unusual number of valid responses to the theme (as in extending the improvisational intent), yet bear only loose relation to the input image (Figure 7, Table 2).

The introduction of ‘pareidolic response sketches’ (Figure 8) into the processing has the effect of ‘sculpting the tacit’, or what I think of as ‘reshaping the canvas that the image starts

convolving from’ more than any specific pixel addition or subtraction. Pareidolia seems closely related to perception of *scale*; we embody a lifetime of relationships with spatial dimensions and depending on where one places oneself in the image in relation to these embodied ‘distances’, one sees forms of various sizes in turn tending to modify their compositional relations with nearby forms. The efficacy of this method then relies on a self-aware suspension of judgement allowing for ‘multidirectional’ potentiality to develop in the improvisational space (Figure 9).

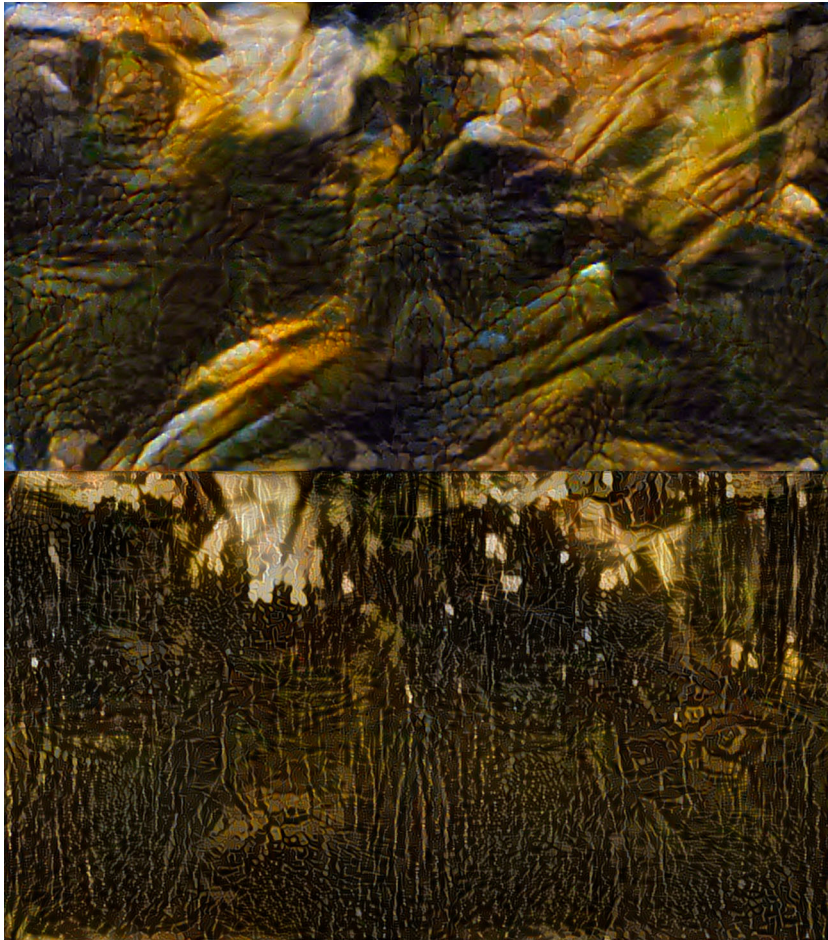


Figure 7. Here, an image of an iguana (Ballard’s world is crawling with them) retrieved from https://commons.wikimedia.org/wiki/File:Portrait_of_an_Iguana.jpg is used to style the top image in Figure 6 (top). The bottom image is a blend of the bottom image in Figure 6 (content) and the bottom image in Figure 5 (style). In this way, perturbations in the sequence can be introduced virtually endlessly (images by the author).

Table 2. Phenomenological reflections on the intermediate stages of improvisational painting.

PATH			
Task	Resources	Method	Efficacy
1. Exploration/ Perturbation	Reiterated/new input, output returned	Return to Source, and extension from state	Depends on cycle of self-awareness (constructs 2, 3 and 4 in this table)
2. Suspension	The developing image, dispassionate observation, watching the image change	Pareidolic effects	Multidirectional pause
3. Reflection	Situating the self	Relation between input and output	Consideration of direction
4. Letting go	Curiosity	Serendipitous input	Surprise leading to furtherance
5. Semantic separation	Picture depth, content weighting	'Sketching into': Greyscale initialization, parameter weighting	Intention vs. statistical sampling
6. Texture	Localized frequency	Scale manipulation	Intention vs. statistical sampling
7. Palette shifting	Redirection or sampling	Embedded overlays	Intention vs. statistical sampling

Notes: Here, an increasing entanglement of input and output defines the resource space. Rows 1–4 relate to more phenomenological dimensions, and 5–7 to pragmatic aspects of image composition. Again, there is an inherent conflict between intentional acts and algorithmic routines.

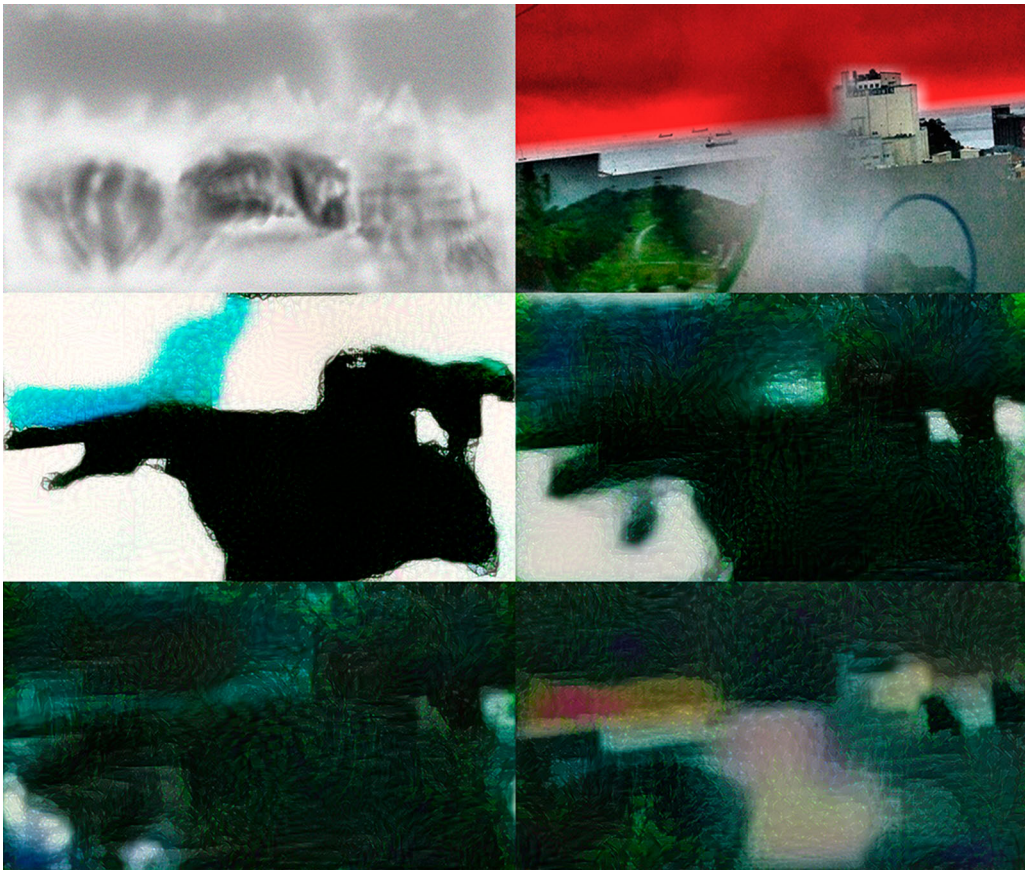


Figure 8. *Triassic cliffs*. Here an iteration of loose greyscale *pareidolic response* sketching over perceived forms (upper left) is used as an 'initialization image' and an edited photograph of a stormy coastal city (upper right) as 'auxiliary image' in a second stage of processing of the images used to create Figure 6. The variations are due to manipulation of the auxiliary image weight. Images by the author.

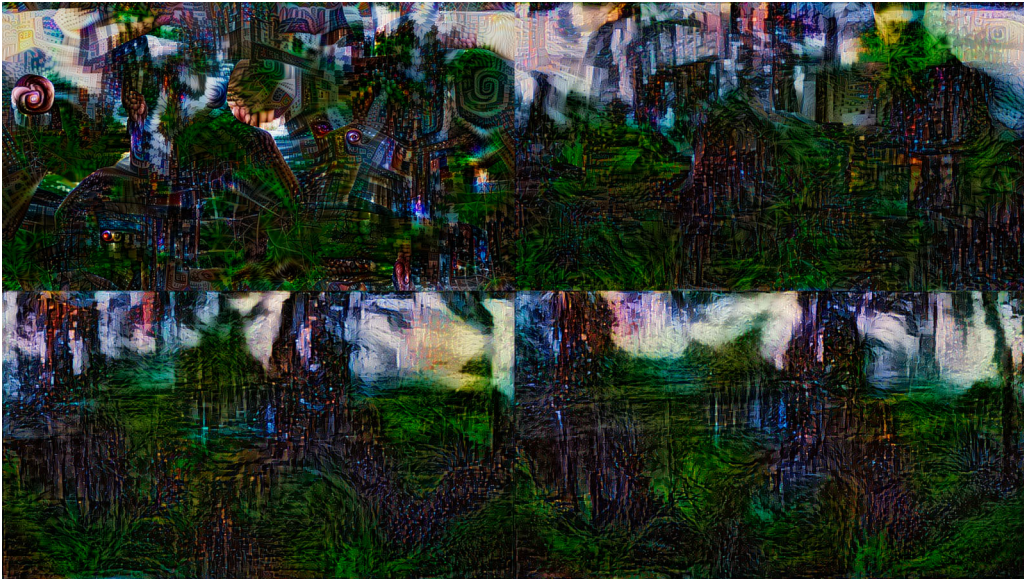


Figure 9. By varying the *content weight*, thematic variations can be encouraged to emerge in the processed image. This image shows four variations achieved with different weighting of the same pair of content and style images. Images by the author.

5.3. Goal: The elusive mental image

How does one know when one has ‘arrived’? When is a painting finished? Improvisation, unlike scripted performance, *approaches* a resolution, a tacitly recognized sense of balance, rather than an end condition. Something in the resolution of art inspires its rebirth. I must find the resonance point (Redies 2007) of my own style in the digitally drowned world.

German abstract painter Anselm Kiefer¹⁰ speaks of process originating in shock, of the doing that manifests within uncontrolled material, where first analysis or even perhaps awareness comes *after* stepping back from experience. For Kiefer, the paintings are *always* in process; the end is meaningless, or unknown, unachievable. The need to engage in the process on the other hand is unavoidable. Robert Linsley believes that ‘one of the most important aspects of the temporality of abstraction is that works are made to be evaluated in the future’ (Linsley n.d.). But unlike the machine, unlike the artefact, the artist has an embodied goal set within bounds of

mortality. Improvisation is always in the present (Figure 10, Table 3).

5.4 Reflection

I have laid out a phenomenological framework for improvisatory image synthesis as experienced in the process of ‘neural painting’ with an ANN. The phenomenology begins to identify limits to be tested in further iterations of a process-based examination of intersubjectively positioned creativity support technology. The intent here has been to set up a ground for the qualitative investigation of how ‘style’ is formulated in practice, by entering into an unfamiliar improvisational space with reflective intentionality.

In neural painting, conceptual blending is made explicit in the manipulation of pixels. The set of one image is transformed into another as the network seeks to resolve the data space of the content image with that of the style image. By varying the style scale (how finely it is mapped to the content) and

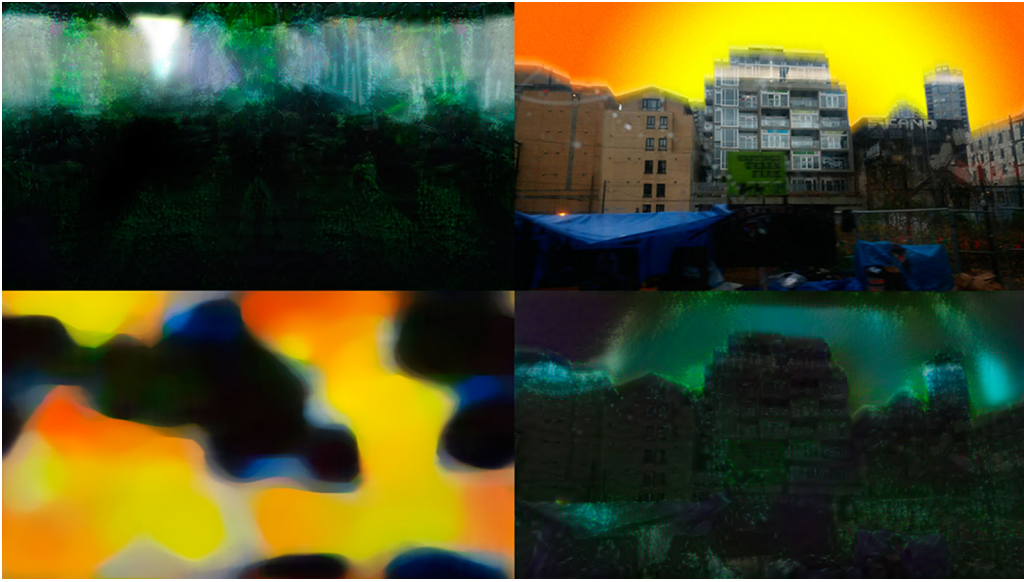


Figure 10. Here I have reintroduced new ‘content’ (upper right) in the form of edited photography of local buildings whose future seems uncertain. The ‘style’ (upper left) is an image that emerged earlier in the process. The lower left blend is an abstraction resulting from negative content weighting and some post-production noise reduction, the lower right blend is approaching the ‘feel’ of the intended theme (© SK. Choi 2017).

the weighting (the degree to which one or the other image influences the blend), a vast image space is exposed. This does not even begin to explore the variations posed by emphasizing particular network layers or the number of iterations performed during the convolution. In this virtually unlimited image space, the ‘unfathomable’ is often met with the muse of serendipity. Completely unexpected, wild variations emerge from the blend, suggesting alternate directions. In this manner, neural painting closely mimics traditional process with the media redirecting and driving the composition ever forward.

The pareidolic emergence in this media is extremely evocative. Unlike the predictability of image filtering (as in Photoshop), the ANN produces surprising, compelling results; the response is unpredictable but intriguing and only partially controllable, giving the sense of playing against another perception. Although we cannot claim that the computer is reflectively subjective in itself, if the returned conceptual convolution inspires such reflection in interacting humans, then we have a technology that is already intersubjectively improvisational by nature. Watching these images develop, which takes place over several minutes on

Table 3. Phenomenological reflections on the final stages of improvisational painting.

GOAL			
Task	Resources	Method	Efficacy
‘Painterly’ look (embodied mark-making)	Experience with embodied gesture	Critical looking	First-person report
Evocative resonance	‘Honing’, ‘standing back’	‘Satisfaction’, ‘letting-go’ of the artefact	Second-person report
Communicative	Relations between visual elements	Intersubjective composition	Consensus

even small images and fast machines, is qualitatively similar to observing a natural phenomenon. I am drawn to return to the canvas, with brushes, as much as to digital manipulation when absorbed with this media. A complementarity of improvisational exchange emerges, I do not control but only suggest.

6. Conclusion: improvisation and commitment

Art has always existed in a complex, symbiotic and continually evolving relationship with the technological capabilities of a culture. Those capabilities constrain the art that is produced, and inform the way art is perceived and understood by its audience. (Aguera y Arcas of Google's Machine Intelligence group; 2016)

Impressionism, dismissed when it first emerged in the shared visions of 'radical' artists of the nineteenth century, is now generally recognized as having inspired a wide-ranging cultural aesthetic shift to notions of perception-as-experience (Lewis 2007, 1). Indeed, these artists grounded their practice on then current scientific research and a set of phenomenological concerns including the primacy of lived experience, expressed as the necessity of painting *en plein air*.¹¹ Today, with the claimed advent of artificially intelligent technologies, artists are again at a place where further research calls out for creative interaction with our enactive landscapes. An 'impressionism' of the twenty-first century cannot ignore its entrenchment in the mediated geopolitical landscape of Hertzian space.¹² 'En plein air' today amounts to an improvisational wandering through databases, a shifting assemblage of virtual interactions, a search for the intersubjective self in the global machine. *Impressions* are fractalized, deep, momentary and distributed. From this fragmented landscape emerges a neo-impressionist stance of critical observation of the technologies that form us. Neural networks are not only a new paint but also the mediating canvas. I have

therefore offered in this paper a preliminary description of neural painting phenomenology in the hope of encouraging an improvisational debate across disciplines, one that might lead to the foundations of what intersubjectively collaborative artificial creative intelligence might look like, and how it should behave. Our future work will depend on the benevolence of our creations. More than ever, we need the humanness of improvisational play in our designs.

Improvisation with artificial intelligence brings us, perhaps unwittingly, to the interstices of biology and information; our conceptualization has built machines that offer conceptual blends we alone could never conceive of. I submit this puts us already past the crossroads of strictly humanistic Turing metrics and into new experiential territory. New visions arise through stochastic resonance between the billions of genetic neurons in the billions of people who dance through data, increasingly touched by the sensitive data-hungry taps of AI. We create and are created. Increasingly, digital mediation will define who we are and who we can be. Artists must rise to this challenge.

Notes on contributor

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Notes

1. Rather, ‘style’ is, I would suggest, *informed*—by situated experience.
2. The contextual relevance of *perturbation* in improvisation is discussed in Section 4.
3. See *Oxford English Dictionary*, s.v. “Improvisation, *n.2.*,” Accessed December 4, 2017, <http://www.oed.com/view/Entry/92872>.
4. See also <https://www.jackson-pollock.org/>.
5. But see also Lakoff and Johnson ([1980] 2003) for a related approach through metaphor theory.
6. See, e.g. Reingold (n.d.).
7. Dunne ([1999] 2005) first pointed out that we move not only through physical space but that our movements are simultaneously constrained by an invisible electronic landscape that permeates the physical one. See also Mitchell (2003, *Prologue*).
8. Daniel Dennett’s ‘third person phenomenology’ stresses that to study subjectivity seriously we need to take first-person reports as *objective* data, as reports about ‘what it is like’ to experience something. See Dennett (2003).
9. Here, I appropriate Gibson’s sense of the ‘optic array’, but extend it to the realm of themes and concepts held within improvisational space.
10. Interview at Louisiana Museum of Modern Art (n.d.).
11. ‘en plein air’: (French) simply, ‘outside’—as a metaphor for ‘real’ experience in the world.
12. Here, I use Dunne’s ([1999] 2005) terminology because I believe it evokes more of the felt, embodied dimension of the liminal spaces we inhabit than the closely related term ‘digital environment’, and preserves the poetic urgency of media permeating walls and flesh.

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