# GANDelve — a Visual Interface for Creative AI

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## Abstract

Training generative adversarial networks with custom datasets requires a lot of technical expertise. We present GANDelve, a desktop application with a visual interface and cloud backend for training GANs. Users can upload assets, build networks, tweak hyperparameters and preview results from within the app without coding. We demonstrate results and experiences of users. We show that with our system, non-technical artists can train and interact with models using their own image datasets, model architectures and hyperparameters.

## 1 Introduction

In recent years the use of generative adversarial networks [1] to create art has steadily risen. Artists such as Mario Klingemann [2], Helena Sarin [3] and Scott Eaton [4] use GANs effectively to create fascinating pieces of art based on carefully curated datasets.

Training custom models still requires extensive background and training, not just in being able to code but also to understand the ecosystem of package managers, command shells and image conversion as well as the hardware requirements inherent in training GANs [5]. All of these requirements are *incidental complexity* [6], distinct from the essential complexity of curating the dataset or setting up and tweaking the model. In this paper we propose an application that simplifies model training using an integrated GUI-based approach.

## 2 Related Work

**Google Colaboratory** [7] makes it easy to access and use a Jupyter Notebook [8] style environment to train models in the cloud using a single click [9]. However, providing the system with custom datasets requires considerable work and expertise. Almost all examples use pre-configured datasets such as MNIST [10].

**RunwayML** [11] is a desktop application that can run models using a visual interface. They have an extensive library of pre-trained models and users can add their own. However, because the software is restricted to running pre-trained models, users can't use their own curated images.

## 3 Implementation

GANDelve is an Electron [12] desktop application. It allows users to build and tweak the generator and discriminator network by visually joining layers together. A default network based on the DCGAN architecture [13] is loaded on startup. At each layer in the model, we show the shapes (array dimensions) of the input and output, e.g. $150 \times 400 \times 300 \times 3$ (150 images, height = 400, width = 300, R/G/B color channels). This allows users to verify that inputs and outputs match. Assets can be converted and uploaded from within the software. We support image preprocessing such as

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flipping or hue/brightness/contrast variations to augment the dataset [14]. The training loop and loss functions are currently fixed but could be extended in the future.

Internally, the system builds a sequential model architecture in Keras [15] which is packaged and sent to Google's AI Platform [16]. Users can run multiple jobs simultaneously with different datasets, hyperparameters, or model architecture. Each job is represented as a tab at the bottom of the screen. Clicking the tab shows the job status, console logs, and image previews of the training. At the end of each epoch we generate 5 examples at fixed positions in latent space, allowing users to visualize and animate the training process.

## 4 Results

We used the software to develop a number of art pieces in collaboration with photographers and graphic designers before and during LAbO 2019 [17], a 10 day interdisciplinary summer school hosted by ChampdAction [18] in deSingel Art Campus in Antwerp.

**Iren Loontjes — Polaroid Memories** This work was based on found footage of incorrectly developed Polaroid images. The amount of images was quite low; we were able to augment the footage using our augmentation tools (flip horizontal/vertical, random contrast and brightness differences). The work was presented as a collection of images and a movie of the training process.

**Joud Toamah — 100 Days** Joud Toamah is a Syrian designer based in Belgium. Her visual research on the acts of remembrance and forgetfulness emerging from repetitive interactions resulted in drawing an image from memory every day, for a period of 100 days. Then she designed a system for destroying these images through analog and digital manipulations such as cutting, folding and blurring the images. She experimented with GANdelve to "restore" the original image after its destruction. She used both the 100 hand-drawn original images and the 100 destroyed images to train different models. The result is a collection of 5 movies of images being reconstructed, deconstructed and explored.

## 5 Evaluation

We observed users being able to configure and tweak the network hyperparameters, and configure convolution-based image filters to fine-tune the output. Users remarked that they found the system easy to use with some training and a basic understanding of theory behind GANs. Users found the integrated help useful in understanding the function of the different parameters and layers. Users were unaware of the memory requirements to process the model, resulting in OOM errors. Halving the batch size would often resolve the problem.

## 6 Ethical Considerations

Text or image classification systems trained on large-scale corpora (i.e. the internet) inherit human-like biases [19, 20]. We don't support pre-trained models, instead encouraging users to work with their own curated datasets. Any bias in race, gender, religion or other bias would be solely based on what the user has trained the system on.

## 7 Conclusion and Future Work

This paper presented GANDelve, a desktop application that simplifies the setup and skill required to start training your own custom GANs. Our system makes it possible for non-technical artists to run fully configurable GANs using their own datasets while avoiding the complexities of hardware and software typical for generative AI workflows. We have shown through user observation and feedback that the system opens up new possibilities for artists who would otherwise not use creative AI in their work.

For future work, we want to investigate ways to make training more fool-proof, for example by visualizing the memory needed in relation to the limits of the selected hardware. We will also research configurable training loops so we can support more reliable loss functions such as WGAN or WGAN/GP [21, 22] and more complex network architectures such as PGAN or CycleGAN [23, 24].

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## Supplementary Materials

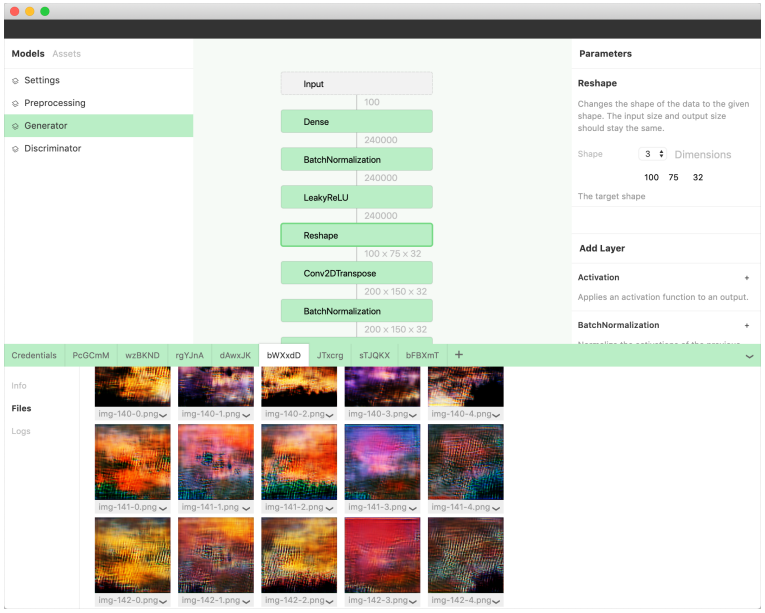


Figure 1: Screenshot of the GANDelve desktop application, showing the generator network architecture and its parameters. At the bottom, the results of a running job are displayed.

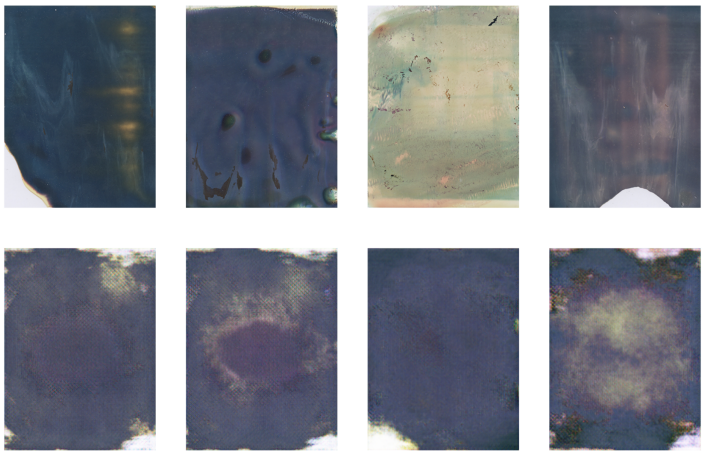

Figure 2: "Polaroid Memories" by Iren Loontjens. Top row are the original images; bottom row are generated using GANDelve.

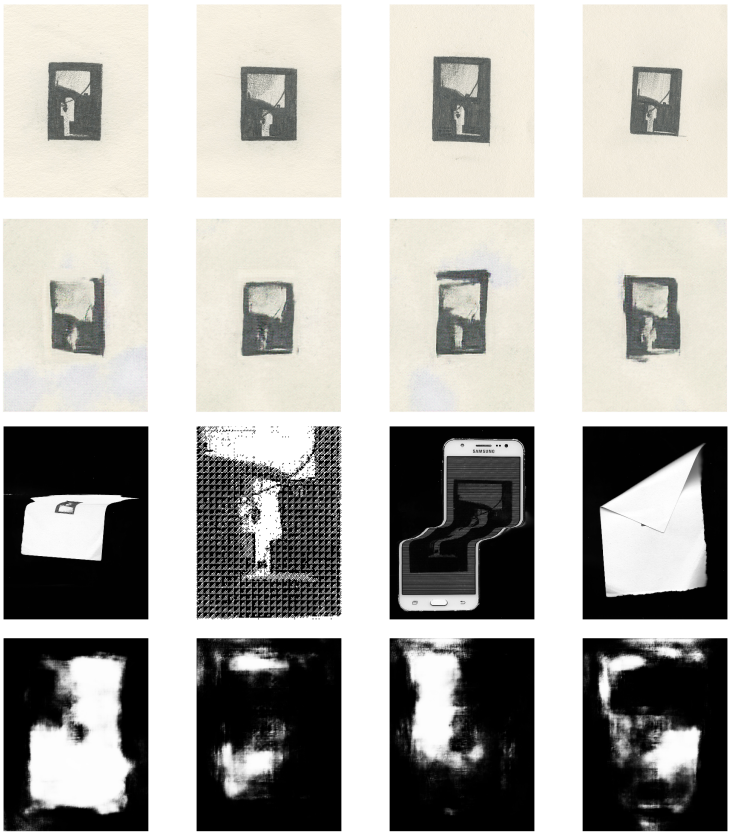

Figure 3: "100 days" by Joud Toamah. First row are the original drawings, second row are generated using GANDelve. Third row are digitally destroyed images; fourth row are generated using GANDelve.