

# Project Specification

## Work overview

The initial idea is to explore how machine learning could enhance artistic practices by creating a tool. As an artist it can be daunting to look at an empty canvas and then come up with ideas of a project. If we could use machine learning to create ideas based on themes or a certain aesthetic it could relieve the artist of burden and give space for new organic ideas.

The software would provide immersive ideation experience in the form of image manipulation. In my traditional creative practice I experience dull moments when ideas aren't flowing. It would be beneficial to use this tool both in place of a moodboard, colour palette, or potentially execute on full fledged ideas that form an art piece in itself.

The finished product is an interactive openFrameworks application with using tensorflow. ## Technologies and Materials

The main languages: 1. C++ using openFrameworks 1. Python using Tensorflow 2

I would use **ofxTensorFlow2** addon, that wraps the **Tensorflow 2 C** library by the **cppflow C++** interface. This way I can leverage the power of Tensorflow and use it combined with openFrameworks.

## Equipment:

1. Main computer with a GPU, would make it easier to run deep learning applications and potentially train models.
2. Secondary laptop to carry out user testing.
3. I would apply for the End of Term Show that would require a computer with a monitor / projector to display the software. I will contact the department to make the arrangements.

The minimum product would have sliders and keyboard-input to manipulate the output. As I progress it could have more advanced features such as the arduino.

## Context and research

### Pix2Pix

[https://github.com/zkmkarlsruhe/ofxTensorFlow2/tree/main/example\\_pix2pix](https://github.com/zkmkarlsruhe/ofxTensorFlow2/tree/main/example_pix2pix)

One of the example projects in OF using ofxTensorflow 2 addon is *Pix2Pix* that uses GANs to create Generative artwork with mouse input. It is informative as it showcases how OF leverages the possibilities with Tensorflow. Thinking with the codebase gave me more ideas on GUI design as well as how important intuitive user interactions are.

### **Memories of Passerby I** by *Mario Klingemann*

Klingemann's art inspired me to think about my creative process in a different way. The algorithm's constraints isn't limiting the artistic output but enhances it. The beauty of randomness makes me wonder how artists could break the boundaries of traditional art. I think perfection can be achieved with focusing on the patterns that bring out the unexpected.

Sotheby's. The Hypnotic Allure of the AI Art Generator, 2019. <https://www.youtube.com/watch?v=Jjv3m5oWICA>.

### **Art AI Gallery**

ART AI. 'AI Generated Paintings'. Accessed 20 October 2021. <https://www.artaigallery.com/>.

The website showcases some amazing pieces generated with AI. I think it's extremely important to reflect on how these artworks are created. Something that seems so organic and effortless requires knowledge and precision using our computers. It frees up the artist of the burden of endless possibilities when staring at an empty canvas and instead just experiment and fine tune the algorithm. It opens up new ways of starting out a new project.

### **Generative Adversarial Networks with Python** by *Jason Brownlee*

An informative book on GAN-s. As this topic is more advanced I research in many different areas to get a well rounded understanding of the topic. The book has hands on examples that I could utilize in my project.

Brownlee, Generative Adversarial Networks with Python - Deep Learning Generative Models for Image Synthesis and Image Translation.

## **Existing knowledge**

**Openframeworks:** During the second year programming module, I acquired knowledge of using C++ and object orientation as well as the openFrameworks library.

**Shaders:** Perception of Multimedia Computing Second year module had taught me a set of various graphic techniques of using shaders with OpenGL.

## **New knowledge**

- As I am only familiar with the basics of openFrameworks I need more research and practice of the techniques that I want to implement into the software. I am mainly interested in shader graphics using OpenGL but there are other built in functions and addons that I will look into.
- Generative Adversarial Networks are very interesting and will be a huge part of my research. I will look into how these models work and how I could incorporate them into my creative practice. Books:

1. Brownlee, Jason. Generative Adversarial Networks with Python - Deep Learning Generative Models for Image Synthesis and Image Translation. V1.5., 2019.
2. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. MIT Press, 2016.
- Interface Design is something that I had done before in my first year but I am not very comfortable with it. *Artful Design* is definitely helps me to think about the philosophy behind design more deeply. Book: Wang, Ge. Artful Design: Technology in Search of the Sublime. Stanford, CA: Stanford University Press, 2018.
- Tensorflow is a new library that I will do more research on. I am enrolled on three AI modules they should give me a well versed understanding of deep learning. Book: Chollet, François. Deep Learning with Python. Shelter Island: Manning Publications Co., 2017.

## Timeline and milestones

Most of the latter stages are very organically planned as at this moment I am not sure how the development will turn out in two months time. In the mid term report I will definitely be more detailed as I will have more insight.

1. **Stage01 (2-3 weeks, until early November)**
  - Setting up project
  - Designing UI prototype
  - Research on: shaders, models, GAN
  - Revisit base functions in openFrameworks
  - Experiment with different training sets, models
2. **Stage02 (2-3 weeks, until first prototype deadline)**
  - Prototype different themes / aesthetic for the tool
  - Fine tune user interaction
  - Attempt to create custom model
3. **Stage03 (4-8 weeks in december, January)**
  - More research on GAN
  - Refine UI
  - Implement 2 solid variation of the tool (they should work)
  - Refine Documentation for the report in December
4. **Stage04 (4 weeks)**
  - Extensive user testing
  - Training different models if possible
  - Research more uses of OpenGL in the meantime
  - Potentially new ways of user interactions eg.Arduino
5. **Stage05 (4 weeks)**
  - More user testing
  - Finalizing project
  - Finalizing documentation

**Project Repository:** <https://gitlab.doc.gold.ac.uk/smada001/finalproject>

Sandor Madacsi 2021/10/22