



Artist in the Cloud: Towards an Autonomous Artificial Artist

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Objective

We propose to build Abraham, an agent which autonomously creates unique and original art.

The agent should satisfy the following criteria.

- **Autonomy:** Act independently of its authors.
- **Originality:** Exhibit novel creativity not derivative of its authors.
- **Uniqueness:** Artworks can not be reproduced by external means.

Strategy

We propose to frame the “agent” as an open decentralized network of collaborators who design, train, and curate a generative art program. The agent’s output emerges out of the collective intelligence of its contributors. We claim this constitutes autonomy. To support this claim, we cite the “superorganism” or “hive mind” analogy in which a separate intelligence apparently emerges out of a complex system of interacting smaller agents.



Figure 1: examples of emergence or collective intelligence in nature (from left to right: coral reef, termite mound, bee hive, flock of birds)

By using a deep generative model as the base of the art generator, and crowd-sourcing its training data, the agent’s artistic palette emerges unpredictably from many contributors, and we claim this gives it originality. We compare this to how a human artist may obtain originality by amalgamating a unique set of influences.

To enforce decentralization, we seek to apply techniques from secure and privacy-preserving machine learning to make the generative model’s parameters secret and its training data irreproducible, so that no individual party can copy or retrain the model. This last property also satisfies the uniqueness constraint.

Abraham <https://abraham.ai>

Methodology

Deep generative models

We use one or more deep generative models as the basis for the generative art program. Besides for producing compelling images, sounds, and text, generative models are advantageous for our application because their training data can be crowd-sourced, making them suitable for decentralization. In contrast, a procedural generative art program is hand-engineered with complex heuristics, and it is not clear how to facilitate its construction in a way which meets the aforementioned criteria.

Federated learning

A copy of the model is sent to individual clients who compute gradients on their own private data, and send them to a third party who securely aggregates them to update the model. With proper differential privacy, the original training data can never be reconstructed.

Model splitting

A multi-party computation technique distributes the weights of the model across multiple devices who are not colluding. Subsequently, no individual party has access to the full model or can perform a forward pass on it by themselves, and instead the model is held collectively as a shared secret.

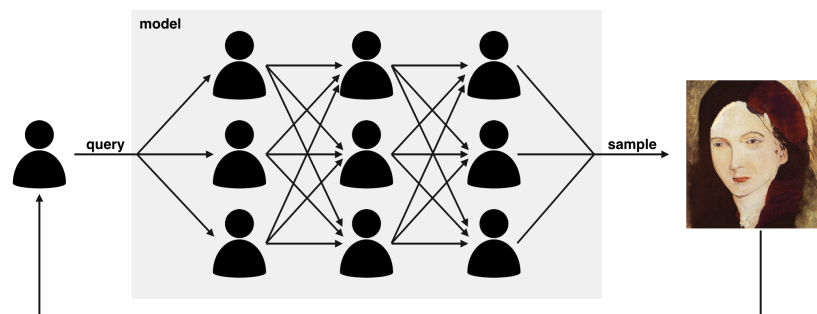


Figure 2: A neural network is split among a peer-to-peer network and held as a shared secret.

Motivations

The Abraham project is motivated by the opportunity to create a novel type of generative art which is based on collective intelligence and demonstrates intrinsic agency beyond that of previous AI art programs.

A secondary motivation is to serve as an educational vehicle and testing ground for experimental and controversial techniques from AI and decentralization technology.

Inspirations and intellectual foundations

The idea of an autonomous artificial artist is influenced by and intersects the work of multiple fields, and is inspired by numerous prior and contemporary projects with similar themes.

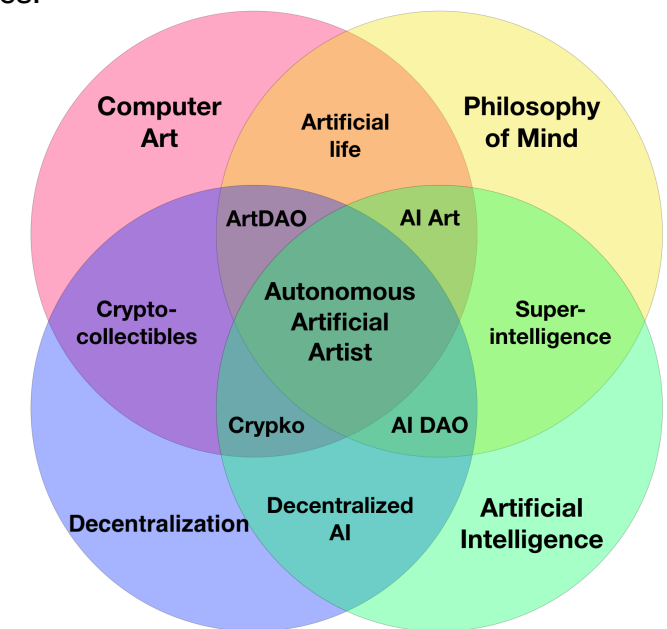


Figure 3: Intellectual foundations of autonomous artificial artists.

Experimental results

None yet :(

Future work

- Research each of the technical components.
- Make initial prototypes which meet limited versions of the full criteria towards an eventual proof-of-concept.
- Develop educational resources to facilitate collaboration.