Course Title: Machine Learning and Creative Programming
Level: Undergraduate

Note: As the course is in its initial development and launch, all below is subject to change at the instructor's discretion.

INSTRUCTOR: Jonathan Sherman, PhD Student in Social Networks and Human-Centered Computing, Academia Sinica-National/Tsing Hua University; M.A. Digital Music and Media Composition, University College Cork

DATE & LOCATION: TBA

COURSE DESCRIPTION:
The 2010s have seen the entrance into the mainstream of machine learning and artificial intelligence (AI). While plenty of great expectations and anxieties revolve around industrial applications the technologies, this course will ask and explore: *what does machine learning and AI entail for human creativity?*

This course introduces students to fundamentals and examples of creative programming, machine learning and AI, and how these fields are being novelly combined. In particular, we will inquire about the current and potential impact these technologies and their techniques have on *creative expressivity* - the term 'expressivity' implying a combined contextual meaning of artistic expression, genetics and expressive power in computer programming languages. (Don't worry if that seems dense - it will become clear in the course!)

In simpler terms, we want to inquire and experiment with how the technologies of machine learning, AI and creative programming further and/or restrain the range of human creativity.

We will do so by interacting with functioning examples, critiquing texts and inquiries, and experimenting further with real functionality. Depending on student interest, creative programming examples can be visual, musical or textual (e.g. NLP). Sensors will be introduced as well when the course considers human interface devices (HID).

PEDAGOGY:
The course is both theoretical and project-based. Thus, learning will be both inquiry-based and experiential (e.g. learning by doing).

Students are expected to have basic to no programming experience, though students with programming skills should still find the course engaging.

PROGRAMMING LANGUAGES:
At minimum, Python and Tensorflow. Depending on student interest and projects, other languages such as JavaScript and Max MSP may be included.

COURSE PREREQUISITES:

None - though some programming experience will be helpful, it is not a requirement.

REQUIRED MATERIALS & RESOURCES:
Hardware: wifi-enabled laptop computer (*please speak with instructor if the student does not have access to one)

COURSE OBJECTIVES:

1. Fluency and skill with basic programming concepts

2. Fluency and skill in modifying a program for creative purposes

3. General comprehension of how machine learning and AI function from end-to-end.

4. General comprehension of human interfaces for inputting and outputting data from machine learning/AI programs.

5. Conceptual and practical knowledge of how machine learning and AI programs can be used for creativity.

6. Conceptual and practical knowledge of the limitations of machine learning/AI programs in regards to creative expressivity; and how these technologies may adversely impact human creativity

7. Basic fluency and skill in training, testing and modifying an AI program for creative purposes.

ASSESSMENT CRITERIA:
As the course is designed towards comprehension and competence, student work will be assessed on completeness and functionality. That said, other considerations such as aesthetics, creativity and inventiveness are most welcome, and any efforts towards these will not go unnoticed.

COURSE MATERIALS:

We will review selections from a variety of texts and programming tutorials. If you are new to programming and would like a headstart on Python, the following tutorials are recommended:

- [A quick run-through of plotting in Google Colaboratory with Python and Matplotlib](). Best part is no setup is necessary besides having a Google Account. Try modifying some of the plots to get a feel for it.

- [A much more thorough Python and Numpy tutorial from Stanford](). You can run this in Terminal (Mac/Linux) or Command Prompt (Windows). Open the Terminal or Command Prompt on your computer, then install the necessary Python libraries like so:

  - `python -m pip install --user numpy scipy matplotlib`

  Then simply run `python` and you should be good to go. If for some reason something does not work as expected, don't worry - it will be covered in class.

Note, our first class tutorial will be somewhere between these two tutorials in terms of content and difficulty - plus some image processing.