ECE 471/ TE371

Course Title: Machine Learning and Art

Instructors: Sam Keene(EE) and Ingrid Burrington (Art)

Course Description: An exploration into the intersection of machine learning algorithms and creative works, including, but not limited to, the creation of images, audio and text. Students will collaborate across disciplines to explore and translate complex concepts in machine learning into creative projects.

Topics may include creative expression of data-mined information, machine-learning driven tools, and fully generative machine learning models that spontaneously create works from random seeds. A particular focus will be on the exposure of algorithms in a way such that tools can be created to enable new methods of expressive creation. Applications include images, audio, video, objects and language/text. Guest lecturers with expertise in merging the fields of art, programming and machine learning will be invited.

Readings will cover the history of art-engineering collaborations, critical interrogations of emerging technology, and computation as tool for creative expression. Machine learning is a rapidly changing field being pursued by industry in real-time; students will be expected to engage in substantive discussion of current events in the field in addition to engaging with its technical implementations.

Coursework will consist of a small number of exploratory exercises related to the application of machine learning to creative works, and a public capstone project. Students will identify, design and implement their own project, and work in small interdisciplinary teams consisting of architects, artists and engineers. Coding experience or knowledge is not a prerequisite for non-EE students; the entire goal of this course is to make machine learning a legible resource to students who might not have otherwise explored the medium.

Open to students in all 3 schools, by permission of instructor(s). 15 students maximum, with an effort made to have a balance between all 3 schools. To receive graduate level EE credit, the students must demonstrate significant programming expertise to enroll, and must complete a technical paper related to the capstone project.

Projects:

Project 1: Communication - Teams will select a machine learning algorithm and produce a work communicating how the algorithm works to non-experts in any medium except computers.

Project 2: Transformation - Teams will use machine learning methods to transform images, video, sound, text or objects from one form to another. This can be same medium (i.e. image -> image) or from one medium to another (image -> sound).

Project 3: Discovery - Teams will create a dataset and use machine learning methods to discover new knowledge from this dataset, and communicate the results.

Project 4: Generation: Teams will use generative machine learning algorithms to generate entirely new works.

Capstone: Teams will propose and implement a project, culminating in an end of semester exhibition.

Possible Guests:

- Kate Sicchio ("Hacking Choregraphy", http://blog.sicchio.com/works/hacking-choreography-2-0/)
- Taeyoon Choi (author of "Handmade Computer", http://avant.org/thread/handmade-computer/, co-founder, School for Poetic Computation, http://sfpc.io)
- Ross Goodwin (*Sunspring* https://arstechnica.com/gaming/2016/06/an-ai-wrote-this-movie-and-its-strangely-moving/)
- Mimi Onuoha (http://mimionuoha.com/)
- Stephanie Dinkins (http://www.stephaniedinkins.com/)
- Sougwen Chung (http://sougwen.com/)
- Meredith Whittaker (Google, AI Now Initiative)

Possible Readings:

- "The Real World of Technology", Ursula Franklin https://www.dropbox.com/s/xupp909advbk6md/Franklin_Real_World_Of_Technology_Chapter_1.pdf?dl=0
- "A Brief History of Experiments in Art and Technology", http://ieeexplore.ieee.org/document/7323929/?part=1
- "Missing Datasets", Mimi Onuoha https://github.com/MimiOnuoha/missing-datasets
- Current events and emerging reporting on industry applications of machine learning as needed; examples may include http://www.foxbusiness.com/features/2017/09/13/history-syrias-war-at-risk-as-youtube-reins-in-content.html
- A Neural Algorithm of Artistic Style
- CAN: Creative Adversarial Networks, Generating "Art" by Learning About Styles and Deviating from Style Norms
- http://karpathy.github.io/2015/05/21/rnn-effectiveness/

- Developing Creativity: Artificial Barriers in Artificial Intelligence
- Creative Generation of 3D Objects with Deep Learning and Innovation Engine
- NSynth: Neural Audio Synthesis
- Generative Models
- Latent Dirichlet Allocation

Schedule:

Week 1: Introduction to machine learning and latent space representations, introduction to art/engineering collaborations in art history (Experiments in Art and Technology, history of graphics engineering collaborations). Assignment of Project 1.

Week 2: Communication of machine learning methods, examples from openai, google, etc

Week 3:Critique Project 1

Week 4: Latent dimensionality representations

Week 5: Style transfer and other transformative methods in ML, assign project 2

Week 6: Style transfer continued

Week 7: Critique project 2

Week 8: Knowledge discovery from text and other data formats, via clustering and latent space representations of data, Assign project 3

Week 9: Knowledge discovery continued

Week 10: Critique project 3

Week 11: Generative models, Assign project 4

Week 12: Generative models continued

Week 13: Critique proj 4

Week 14: Computational creativity

Week 15: Computational creativity continued

Week 16: Critiques prior to final exhibition