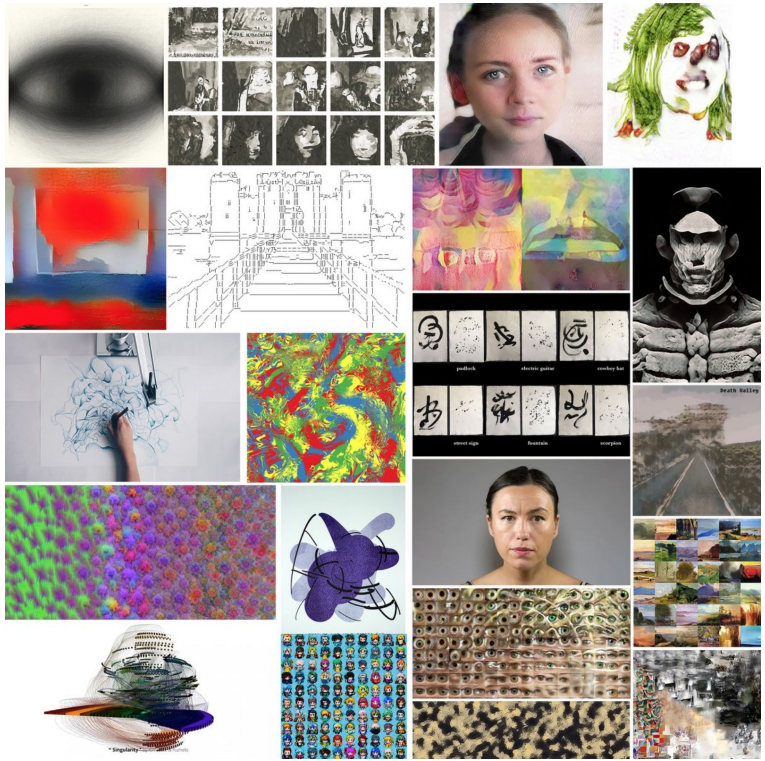
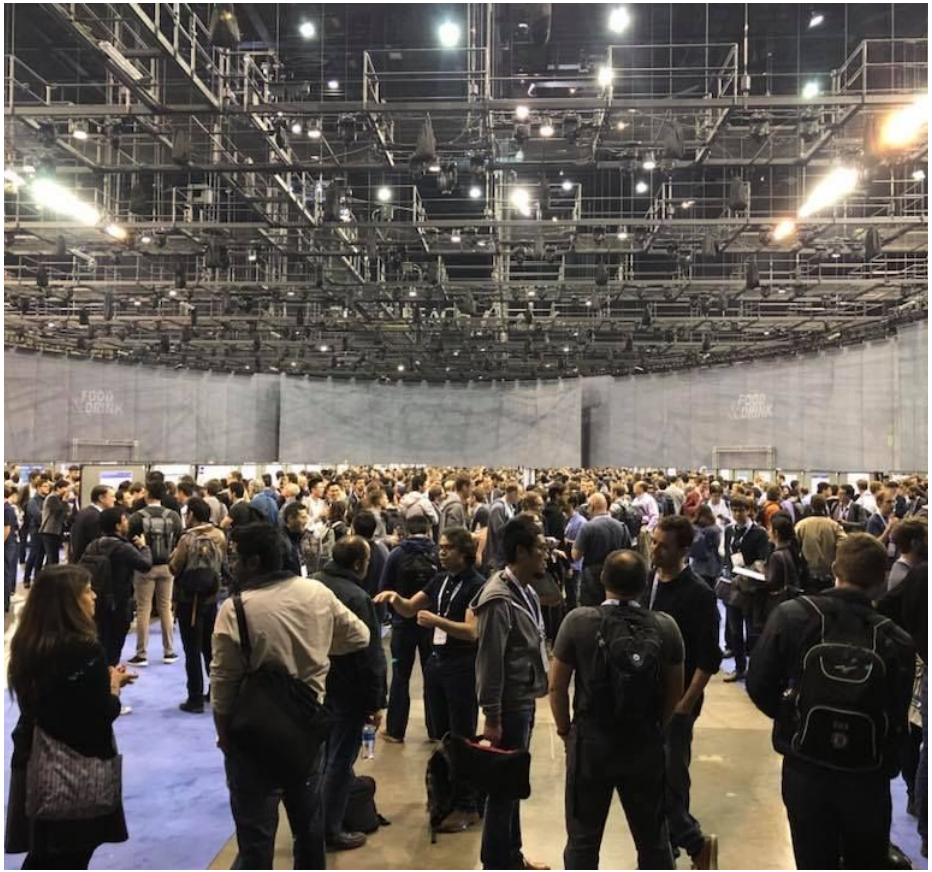


Machine Learning for Creativity and Design (NIPS 2017 Workshop) Review

Kiho Suh
AIRI
March 13th, 2018


NIPS 2017
Monday December 04 -- Saturday December 09, 2017
Long Beach Convention Center, Long Beach


CANADA
UNITED STATES
MEXICO
Long Beach
Ottawa
Washington
Nassau
Havana
CUBA
Gulf of Mexico
Gulf of Maine
Gulf of St Lawrence



NIPS 2017 통계

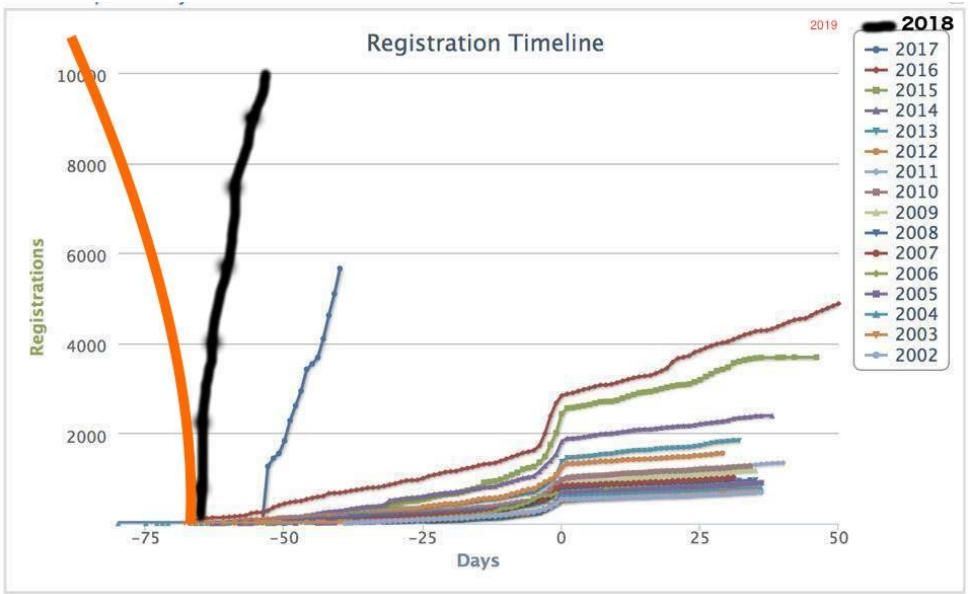
전체 등록: 8000명 (vs. 2016년 5000명)

논문 제출: 3240편 (vs. 2016년 2500편)

주제 분야: 156개 (150% 증가)

탑 분야: Algorithms (900), Deep Learning (600), Applications (600)

총 저자수: 7844명



Key Trends

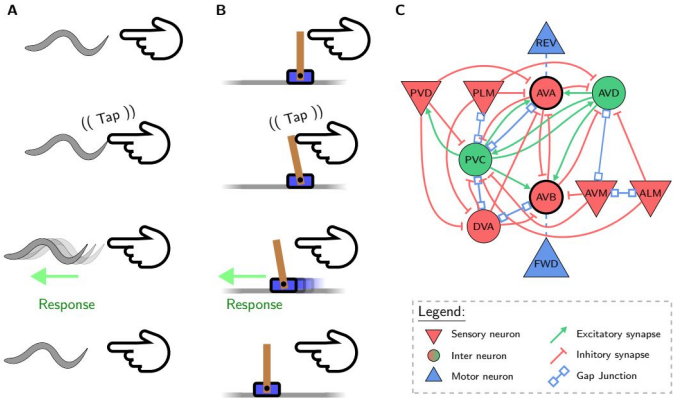
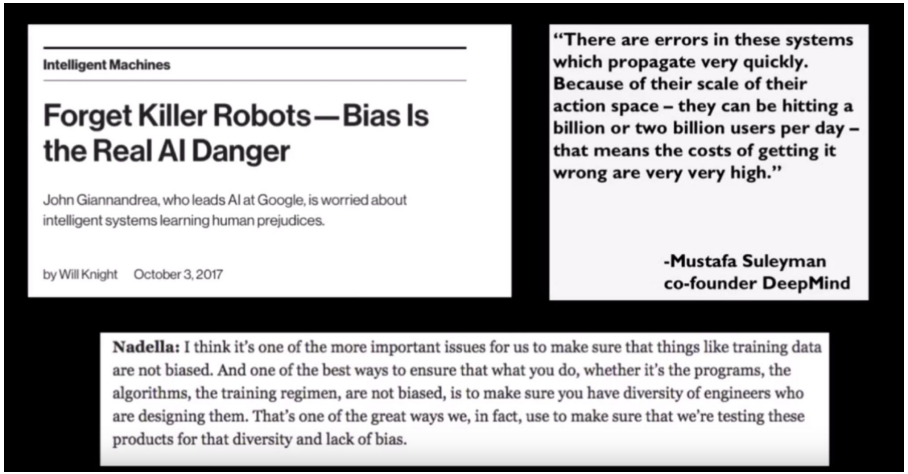


Figure 1: Illustration of the touch withdrawal reflex. **A**) Touching the worm's tail will excite the touch sensory neuron PLM, and correspondingly induces a forward locomotion command in the animal [1] (Hand is not drawn to scale!). **B**) Working principle of the introduced touch withdrawal inverted-pendulum controller. **C**) Tap Withdrawal neural circuit of *C. elegans*.



Reinforcement Learning, Meta-Learning, One-Shot learning, GAN, VAE, Bayesian NN, Fairness in ML, Explainable ML, Graphic models 등등 수많은 주제들

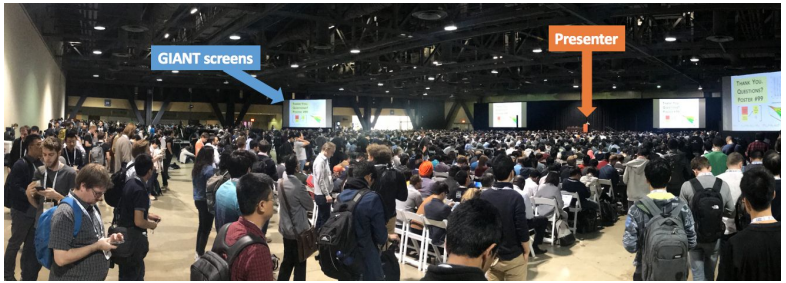
NIPS Schedule

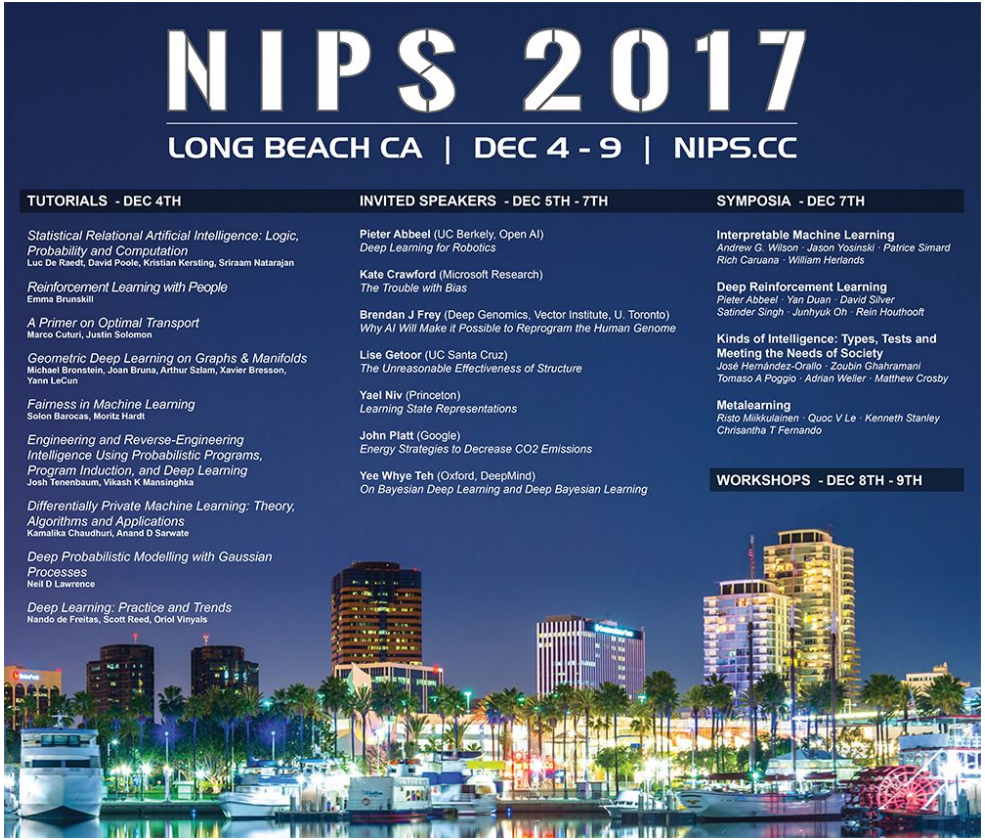
월 08:00 ~ 22:30

화, 수 09:00 ~ 22:30

목 09:00 ~ 21:30

금, 토 08:30 ~ 18:30





https://tech.instacart.com/3-nips-papers-we-loved-befb39a75ec2

NIPS party

Let the Gradient Flo

Celebrate NIPS 2017 with Intel AI

Join us for an exclusive party – and a surprise reveal.

Giveaways, buskers, acrobats, DJ Nostalgia B and a special performance by Flo Rida!

When	Where
Tuesday, December 5th	The Loft on Pine
9:00 PM – 12:00 AM	230 Pine Avenue
Door open at 9:00 PM	Long Beach, CA 90802
Show up early - space is limited	Near the Long Beach Convention Center

https://asia.nikkei.com/Business/AC/Alibaba-Naver-Didi-battle-for-AI-talent

https://pbs.twimg.com/media/DQWYB_DXkAE3E_j.jpg

Machine Learning for Creativity and Design (NIPS 2017 Workshop)

워크샵의 목표는 예술과 음악 발전에 관심있는 연구자와 창의적인 실무자를 모아 새로운 작품을 발표하고 협업을 촉진하며 네트워크를 구축

미술, 음악/음성, 스토리텔링, 증강현실 등등의 다양한 분야

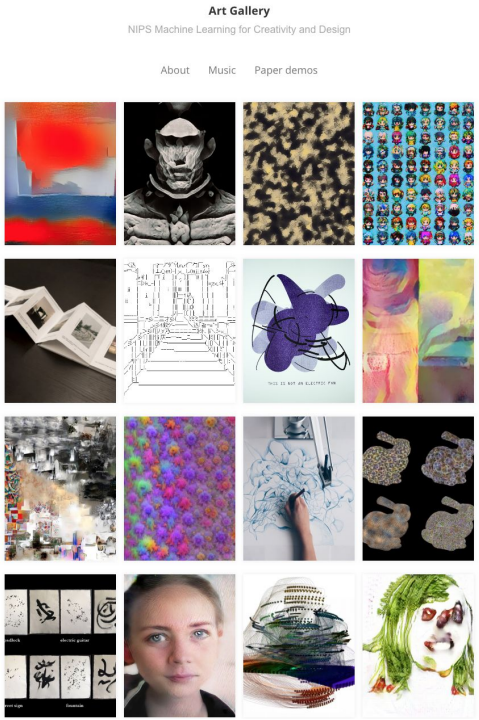
https://twitter.com/douglas_eck

총 32편의 논문들

Accepted Papers

1. GANosaic - Mosaic Creation with Generative Texture Manifolds
   - *Nikolay Jetchev, Urs Bergmann, Calvin Seward*
2. TopoSketch: Drawing in Latent Space
   - *Ian Loh, Tom White*
3. Input parameterization for DeepDream
   - *Alexander Mordvintsev, Chris Olah*
4. Improvised Comedy as a Turing Test
   - *Kory Mathewson, Piotr Mirowski*
5. Hierarchical Variational Autoencoders for Music
   - *Adam Roberts, Jesse Engel*
6. Lexical Preferences in an Automated Story Writing System
   - *Melissa Roemmele, Andrew S. Gordon*
7. ObamaNet: Photo-realistic Lip-sync from Text
   - *Rithesh Kumar, Jose Sotelo, Kundan Kumar, Alexandre de Brébisson, Yoshua Bengio*
8. Towards the High-quality Anime Characters Generation with Generative Adversarial Networks
   - *Yanghua Jin, Jiakai Zhang, Minjun Li, Yingtao Tian, Huachun Zhu*
9. Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks
   - *Hiroyuki Osone, Natsumi Kato, Daitetsu Sato, Naoya Muramatsu, Yoichi Ochiai*
10. Paper Cubes: Evolving 3D characters in Augmented Reality using Recurrent Neural Networks
    - *Anna Fuste, Judith Amores*
11. AI for Fragrance Design
    - *Richard Goodwin, Joana Maria, Payel Das, Raya Horesh, Richard Segal, Jing Fu, Christian Harris*

Art Gallery


Art Gallery
NIPS Machine Learning for Creativity and Design
About
Music
Paper demos

Schedule

Time	Event
8:30 AM	Welcome and Introduction
8:45 AM	Invited Talk *Jürgen Schmidhuber*
9:15 AM	Invited Talk *Emily Denton*
9:45 AM	Invited Talk *Rebecca Fiebrink*
10:15 AM	GANosaic - Mosaic Creation with Generative Texture Manifolds *Nikolay Jetchev, Urs Bergmann, Calvin Seward*
10:20 AM	TopoSketch: Drawing in Latent Space *Ian Loh, Tom White*
10:25 AM	Input parameterization for DeepDream *Alexander Mordvintsev, Chris Olah*
10:30 AM	Art / Coffee Break
11:00 AM	Invited Talk *Ian Goodfellow*
11:30 AM	Improvised Comedy as a Turing Test *Kory Mathewson, Piotr Mirowski*
12:00 PM	Lunch
1:00 PM	Invited Talk *Ahmed Elgammal*
1:30 PM	Hierarchical Variational Autoencoders for Music *Adam Roberts, Jesse Engel*
2:00 PM	Lexical preferences in an automated story writing system *Melissa Roemmele, Andrew S. Gordon*
2:30 PM	ObamaNet: Photo-realistic lip-sync from text *Rithesh Kumar, Jose Sotelo, Kundan Kumar, Alexandre de Brébisson*
3:00 PM	Art / Coffee Break
3:30 PM	Towards the High-quality Anime Characters Generation with Generative Adversarial Networks *Yanghua Jin, Jiakai Zhang, Minjun Li, Yingtao Tian, Huachun Zhu*
3:35 PM	Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks *Hiroyuki Osone, Natsumi Kato, Daitetsu Sato, Naoya Muramatsu, Yoichi Ochiai*
3:40 PM	Paper Cubes: Evolving 3D characters in Augmented Reality using Recurrent Neural Networks *Anna Fuste, Judith Amores*
3:45 PM	Open Discussion
4:15 PM	Poster Session
5:00 PM	End of Workshop

Sungmin Kang, Jaegul Choo, Jaehyuk Chang , Consistent Comic Colorization with Pixel-wise Background Classification, 2017

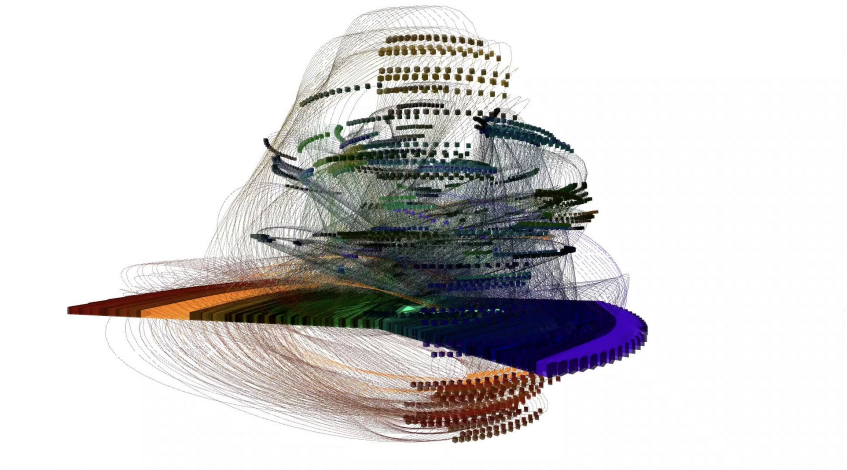
흑백만화에서 내용과
배경을 사람의 도움없이
분할한후 자동으로 색칠.

Sey Min, What if machines can see music …?, 2017

음성 뭉치들의 비슷함과 관계를 시각화

얼마나 많은 음성 이벤트들이 한 음성 파일에서 일어나는지 볼수 있음

모든 음성 파일들은 다른 음파 이벤트들과 특징들을 가지고 있어서 각 음성 파일들은 자기만의 형태를 가질수 있음.



https://www.youtube.com/watch?time_continue=45&v=yGl5KFIfSsY

https://www.youtube.com/watch?v=iv58cGv7B2k

Contents

CAN: Creative Adversarial Networks
Generating "Art" by Learning About Styles and
Deviating from Style Norms*

Ahmed Elgammal[1†] Bingchen Liu[1] Mohamed Elhoseiny[2] Marian Mazzone[3]
The Art & AI Laboratory - Rutgers University
[1] Department of Computer Science, Rutgers University, NJ, USA
[2] Facebook AI Research, CA, USA
[3] Department of Art History, College of Charleston, SC, USA

June 23, 2017

Towards the High-quality Anime Characters Generation with Generative Adversarial Networks

Yanghua Jin[1] Jiakai Zhang[2] Minjun Li[1] Yingtao Tian[3] Huachun Zhu[4]
[1]School of Computer Science, Fudan University
[2]School of Computer Science, Carnegie Mellon University
[3]Department of Computer Science, Stony Brook University
[4]School of Mathematics, Fudan University
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[3]yittian@cs.stonybrook.edu

GANosaic: Mosaic Creation with Generative Texture Manifolds

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Zalando Research

Urs Bergmann
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Calvin Seward
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Zalando Research

TopoSketch: Drawing in Latent Space

Ian Loh* and Tom White*
School of Design
Victoria University of Wellington
Wellington, New Zealand
{lohjun@myvuw.ac.nz, tom.white@vuw.ac.nz}

ASCII Art Synthesis with Convolutional Networks

Osamu Akiyama
Faculty of Medicine, Osaka University
oakiyama1986@gmail.com

Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks

Natsumi Kato **Hiroyuki Osone*** **Daitetsu Sato** **Naoya Muramatsu**

Yoichi Ochiai
University of Tsukuba
Pixie Dust Technologies, Inc.

Combinatorial Meta Search

Matthew Guzdial and Mark O. Riedl
Georgia Institute of Technology
{mguzdial3;riedl}@gatech.edu

Paper Cubes: Evolving 3D characters in Augmented Reality using Recurrent Neural Networks

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Judith Amores
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Amit Pitaru
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Improvised Comedy as a Turing Test

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Piotr Mirowski *
HumanMachine
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Learning to Create Piano Performances

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Neural Translation of Musical Style

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Carl Henrik Ek
Department of Computer Science
University of Bristol
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Hierarchical Variational Autoencoders for Music

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Jesse Engel
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jesseengel@google.com

Douglas Eck
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deck@google.com

ObamaNet: Photo-realistic lip-sync from text

Rithesh Kumar*†, Jose Sotelo*†, Kundan Kumar*†, Alexandre de Brébisson*†, Yoshua Bengio†
*Lyrebird.ai
†MILA

CAN: Creative Adversarial Networks Generating "Art" by Learning About Styles and Deviating from Style Norms*

Ahmed Elgammal[1†] Bingchen Liu[1] Mohamed Elhoseiny[2] Marian Mazzone[3]
The Art & AI Laboratory - Rutgers University
[1] Department of Computer Science, Rutgers University, NJ, USA
[2] Facebook AI Research, CA, USA
[3] Department of Art History, College of Charleston, SC, USA

June 23, 2017

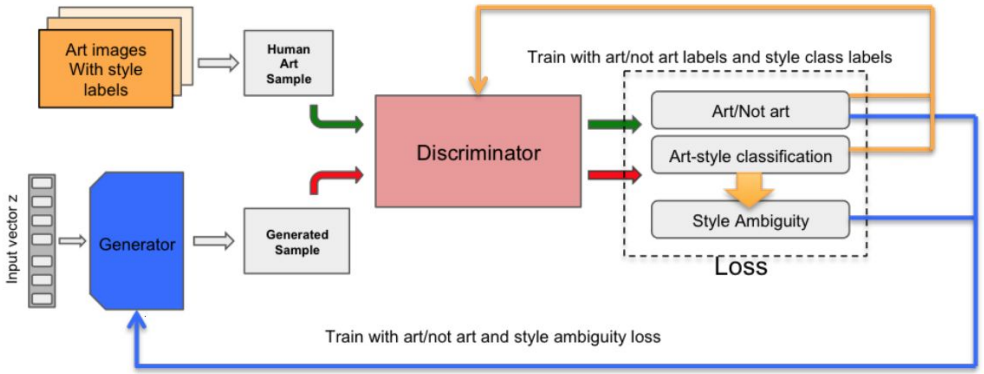
CAN: Creative Adversarial Networks

CAN은 독특하면서도 엄청 이상하지 않은 범위내의 작품을 생성한다. 너무 적은 자극은 심심하고 너무 큰 자극은 혐오감을 불러일으킨다 (Colin Martindale의 심리 이론).

CAN 구조

Discriminator가 각 이미지가 진짜 이미지인지 가짜 이미지인지 판별. 또한 이미지를 25개의 예술적인 스타일(큐비즘, 추상, 르네상스, 등등)을 분류.

Generator는 Discriminator를 만들어진 이미지가 진짜라고 속이도록 생성한다. 또한 Discriminator가 스타일 분류하기 어렵게 만듬.



CAN에 사용된 데이터셋 - WikiArt

Table 1: Artistic Styles Used in Training

Style name	Image number	Style name	Image number
Abstract-Expressionism	2782	Mannerism-Late-Renaissance	1279
Action-Painting	98	Minimalism	1337
Analytical-Cubism	110	Naive Art-Primitivism	2405
Art-Nouveau-Modern	4334	New-Realism	314
Baroque	4241	Northern-Renaissance	2552
Color-Field-Painting	1615	Pointillism	513
Contemporary-Realism	481	Pop-Art	1483
Cubism	2236	Post-Impressionism	6452
Early-Renaissance	1391	Realism	10733
Expressionism	6736	Rococo	2089
Fauvism	934	Romanticism	7019
High-Renaissance	1343	Synthetic-Cubism	216
Impressionism	13060	Total	75753

15세기부터 21세기에서의 25가지의 예술적 스타일

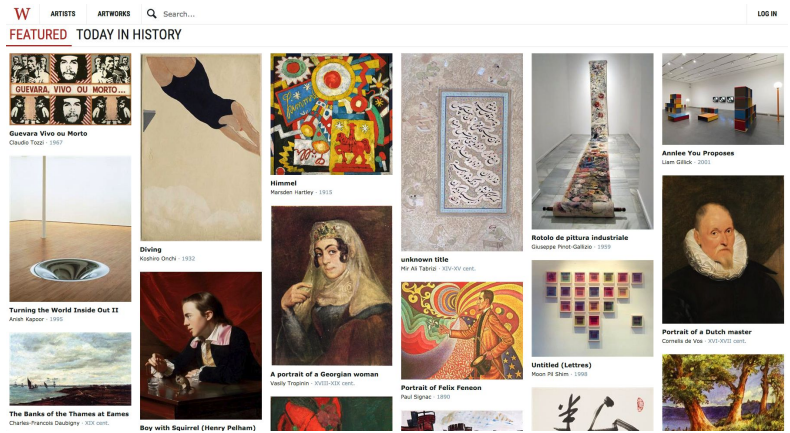
Vincent van Gogh, Self Portrait with Bandaged Ear, 1889

Andy Warhol, Campbell's Soup Can, 1962

Salvador Dali, The Persistence of Memory, 1931

Georgia O'Keeffe, Music Pink and Blue, 1918

CAN에 사용된 데이터셋 - WikiArt



https://www.wikiart.org/

Copyright policy

WikiArt presents both public domain and copyright protected artworks. The latter are showcased in accordance with fair use principle:

- as historically significant artworks
- as used for informational and educational purposes
- as readily available on the internet
- as low resolution copies unsuitable for commercial use

Abstract Expressionism (추상 표현주의)

"일반적으로 1940년대와 1950년대 미국 화단을 지배하던, 미국 회화사상 가장 중요하고 영향력 있는 회화의 한 양식을 가리킨다. 추상표현주의는 서구 근대 미술의 복합적인 요소를 모두 포함하고 있다. 야수주의, 표현주의, 다다, 미래주의, 초현실주의로 이어지는 한 계보와 인상주의, 입체주의, 기하학적 추상의 계보를 모두 받아들이고 있다."

-세계미술용어사전

Willem de Kooning, Woman V, 1952–1953

Jackson Pollock, No. 5, 1948

https://en.wikipedia.org/wiki/Abstract_expressionism

Art Basel 2016

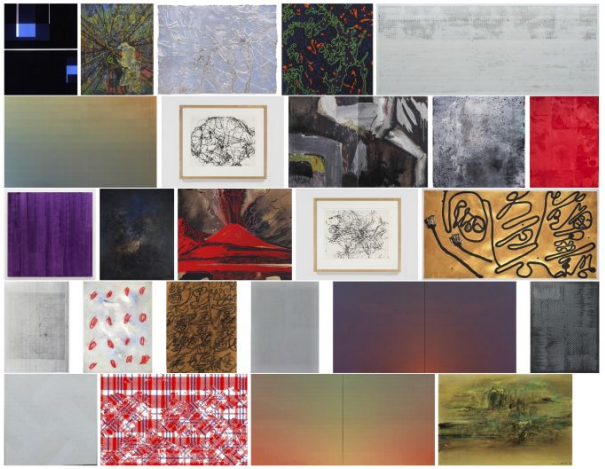
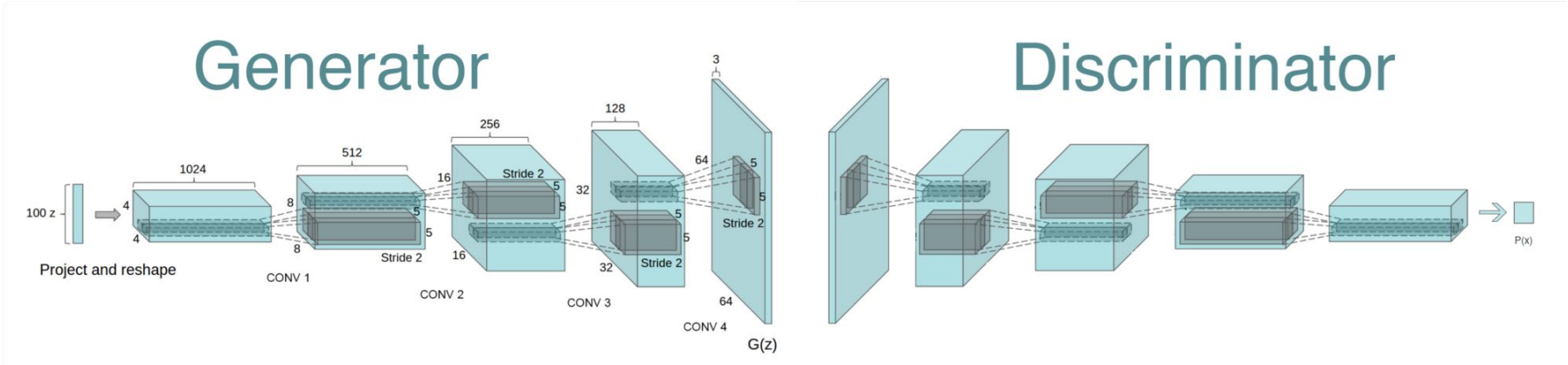


Figure 8: Art Basel Set: a collection of 25 paintings selected from Art Basel 2017 art fair. Artist and year in order: Richard Caldicott 2003, Jigger Cruz 2016, Leonardo Drew 2015, Cenk Akaltun 2015, Lang Li 2014, Xuerui Zhang 2015, David Smith 1956, Kelu Ma 1989, Xie Nanxing 2013, Panos Tsagaris 2015, Heimo Zobernig 2014, Zao Wou-Ki 1958, Andy Warhol 1985, David Smith 1956, Wei Ligang 2014, KONG Chun Hei 2016, Ye Yongqing 2015, Wei Ligang 2010, Xiaorong Pan 2015, Xuerui Zhang 2016, Xiaorong Pan 2015, Xiaorong Pan 2015, Xu Zhenbang 2015, Xuerui Zhang 2016, Zao Wou-Ki 1963.

*"세계에서 가장 규모가 큰 아트 페어. 동시대 수준 높은 예술 작품을 선보이는 국제적인 행사. 전 세계 미술계를 리드하는 유수의 화랑 **3**백여 곳과 그 화랑들을 대표하는 예술가 **4**천여명이 참여."* -세계의 축제, 기념일 백과

http://terms.naver.com/entry.nhn?docId=2076173&cid=42836&categoryId=42836

DCGAN

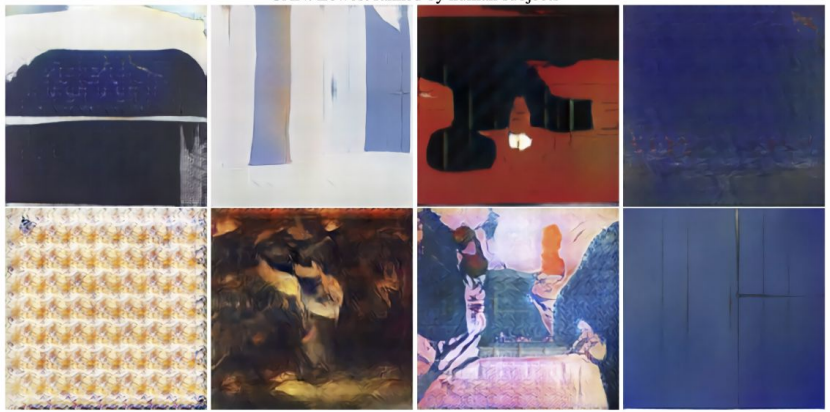


https://medium.com/@awjuliani/generative-adversarial-networks-explained-with-a-classic-spongebob-squarepants-episode-54deab2fce39

설문자들이 높게, 낮게 평가한 CAN 작품들

CAN: Top ranked by human subjects

CAN: Lowest ranked by human subjects



실험 1 - Turing Test를 통과할수 있나?

Q1: 화가가 만들었나 아니면 컴퓨터가 생성 했나?

Q2: 사용자가 이 그림이 마음에 드는가: 1-너무 싫다, 5-너무 좋다

Painting set	Q1 (std)	Q2 (std)
CAN	53% (18%)†	3.2 (1.5) ‡
DCGAN [18] (64x64)	35% (15%) †	2.8 (0.54) ‡
Abstract Expressionist	85% (16%)	3.3 (0.43)
Art Basel 2016	41% (29%)	2.8 (0.68)
Artist sets combined	62% (32%)	3.1 (0.63)
All images are resized to 512x512 resolution † Q1*t*-test (CAN vs. DCGAN) p-value = $1.9932e-15$ ‡ Q2 *t*-test (CAN vs. DCGAN) p-value = $9.3634e-06$		

실험 2 - 여러 질문들 이후 Turing Test

Q1: 당신은 이미지를 얼마나 좋아하는가: 1-정말 싫다, 5-정말 좋다.

Q2: 독창적인가: 1-정말 진부하다, 5-정말 독창적이다.

Q3: 놀라운가: 1-하나도 놀랍지 않다, 5-정말 놀랍다.

Q4: 모호한가: 1-정말 명확하다, 5-정말 모호하다.

Q5: 복잡한가: 1-정말 간단하다, 5-정말 복잡하다.

Q6: 화가가 만들었나 아니면 컴퓨터가 생성 했나?

Image set	Q1 (std) Likeness	Q2 (std) Novelty	Q3 (std) Surprising	Q4 (std) Ambiguity	Q5 (std) Complexity	Q6 (std) human/computer
DCGAN [18] (256x256)	3.23 (0.53)	3.08 (0.50)	3.21 (0.59)	3.37 (0.48)	3.18 (0.63)	0.65 (0.17)
CAN	3.30 (0.43)	3.27 (0.44)	3.13 (0.46)	3.54 (0.45)	3.34 (0.50)	0.75 (0.14)
Abstract Expresionist	3.38 (0.43)	3.03 (0.38)	2.95 (0.50)	3.17 (0.35)	2.90 (0.35)	0.85 (0.11)
Art Basel 2016	2.95 (0.70)	2.69 (0.59)	2.36 (0.66)	2.79 (0.59)	2.46 (0.68)	0.48 (0.23)

실험 3 - CAN으로 생성된 이미지들이 예술이 될수 있나?

Q1: 이 작품에서 화가의 의도를 알수있다: 이 작품은 명확한 의도를 그렸다: 1-정말 동의하지 않는다 ,5-정말 동의한다.

Q2: 이 작품속에 어떠한 구조가 보인다.

Q3: 이 작품이 나와 소통을 한다.

Q4: 이 작품은 나에게 영감을 준다

Painting set	Q1 (std) Intentionality	Q2 (std) Visual Structure	Q3 (std) Communication	Q4 (std) Inspiration
CAN	3.3 (0.47)	3.2 (0.47)	2.7 (0.46)	2.5 (0.41)
Abstract Expressionist	2.8 (0.43)	2.6 (0.35)	2.4 (0.41)	2.3 (0.27)
Art Basel 2016	2.5 (0.72)	2.4 (0.64)	2.1 (0.59)	1.9(0.54)
Artist sets combined	2.7 (0.6)	2.5 (0.52)	2.2 (0.54)	2.1 (0.45)

실험 4 - ambiguity loss가 도움이 되나?

Q1: 어떤 작품이 더 독창적인가?

Q2: 어떤 작품이 미적으로 더 뛰어난가?

결과: 설문자의 59.47%가 CAN으로 만들어진 작품이 더 독창적이고 60%가 미적으로 더 뛰어나다고 답변하였음.

실험 1 (Turing Test)와 실험 3 (예술이 될수 있나?)에서 높이 평가된 CAN 작품들

Colton, Creativity versus the perception of creativity in Computational Systems, 2008

어떠한 시스템이 창조적인 특성들을 갖기 위해서 3가지가 필요하다: 새로운 것을 만들어내는 능력 (상상력), 완성도가 높은것을 만들어내는 능력 (기술력), 자신이 만든것을 평가하는 능력.

CAN은 이 3가지를 다 충족. 심지어 실제 작가들보다 더 높은 평점을 받았음.

그러나 작품에서 의미적인 이해는 갖고 있지 않음. 스타일과 예술의 겉부분을 바탕으로 학습.

사람들이 미적인 평가에 편향되었는가? 만약 그러면 결과는 창의적이지 않은가?

Elgammal et al., Picasso, Matisse, or a Fake? Automated Analysis of Drawings at the Stroke Level for Attribution and Authentication, 2017

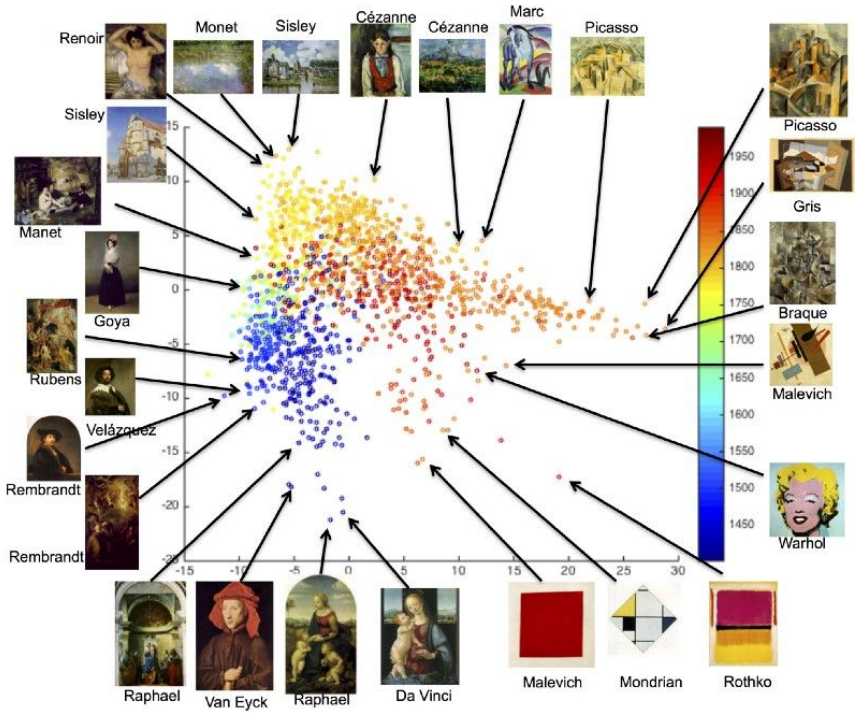
화가들의 작품에서의 선들을 분석

Elgammal et al., The Shape of Art History in the Eyes of the Machine, 2018

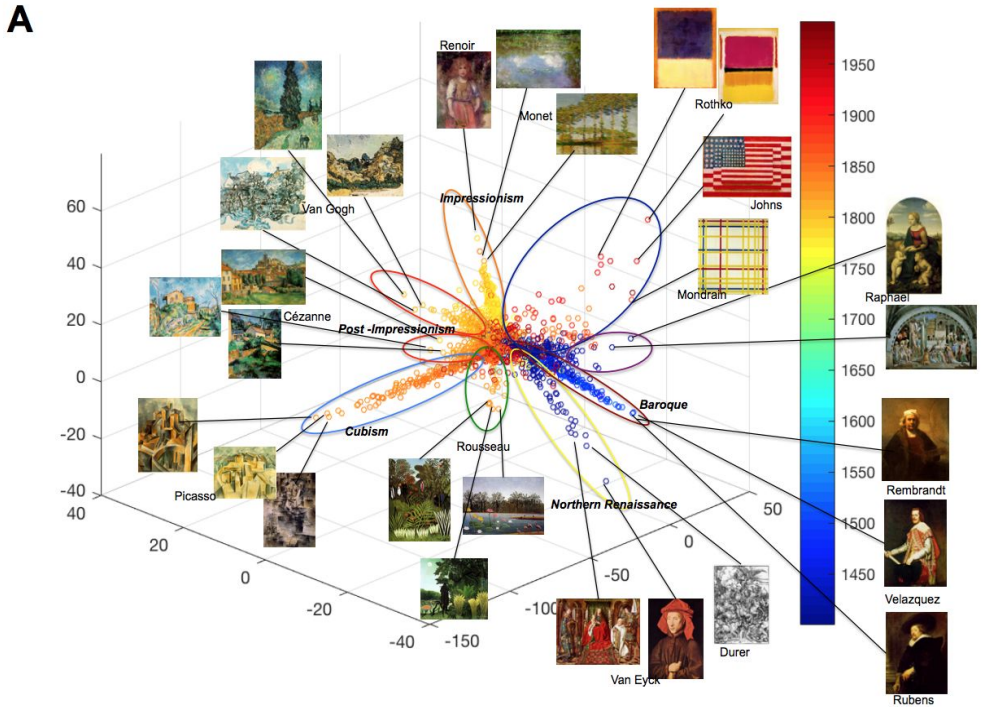
예술 작품의 역사를 머신러닝의 눈으로 본다면?

머신러닝을 이용해서 77000 여개의 예술작품들의 스타일을 분류하고 분석

특별한 지식을 주지 않았음에도 예쁘게 역사적 연대와 스타일, 그리고 이들의 관계등을 잘 보여줌.



Elgammal et al., The Shape of Art History in the Eyes of the Machine, 2018



Towards the High-quality Anime Characters Generation with Generative Adversarial Networks

Yanghua Jin[1] Jiakai Zhang[2] Minjun Li[1] Yingtao Tian[3] Huachun Zhu[4]
[1]School of Computer Science, Fudan University
[2]School of Computer Science, Carnegie Mellon University
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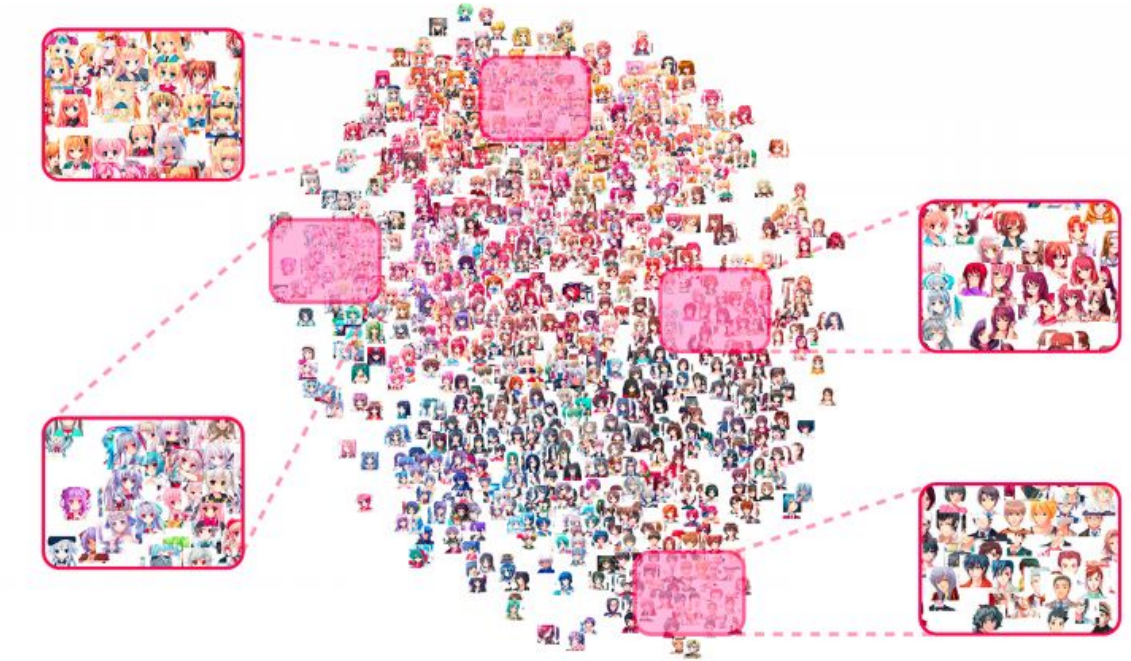
[3]yittian@cs.stonybrook.edu

MakeGirlsMoe

GAN을 써서 고화질의 애니메이션 캐릭터 이미지를 생성

데이터셋 - Getchu.com

t-SNE Visualization of 1500 dataset images



Interpolation
(보간)

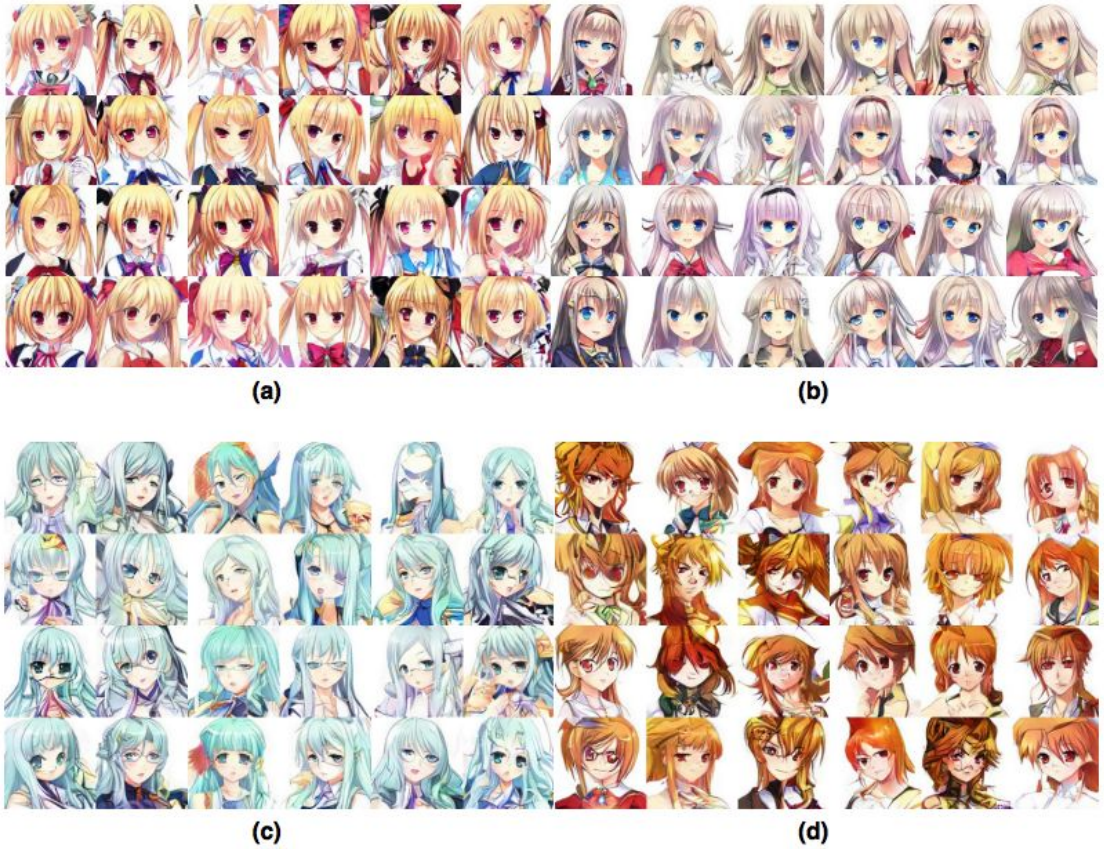
Conditioned Style

(a) blonde hair, twintails, blush, smile, ribbon, red eyes

(b) silver hair, long hair, blush, smile, open mouth, blue eyes

(c) aqua hair, long hair, drill hair, open mouth, glasses, aqua eyes

(d) orange hair, ponytail, hat, glasses, red eyes, orange eyes



각 라벨의 정확도

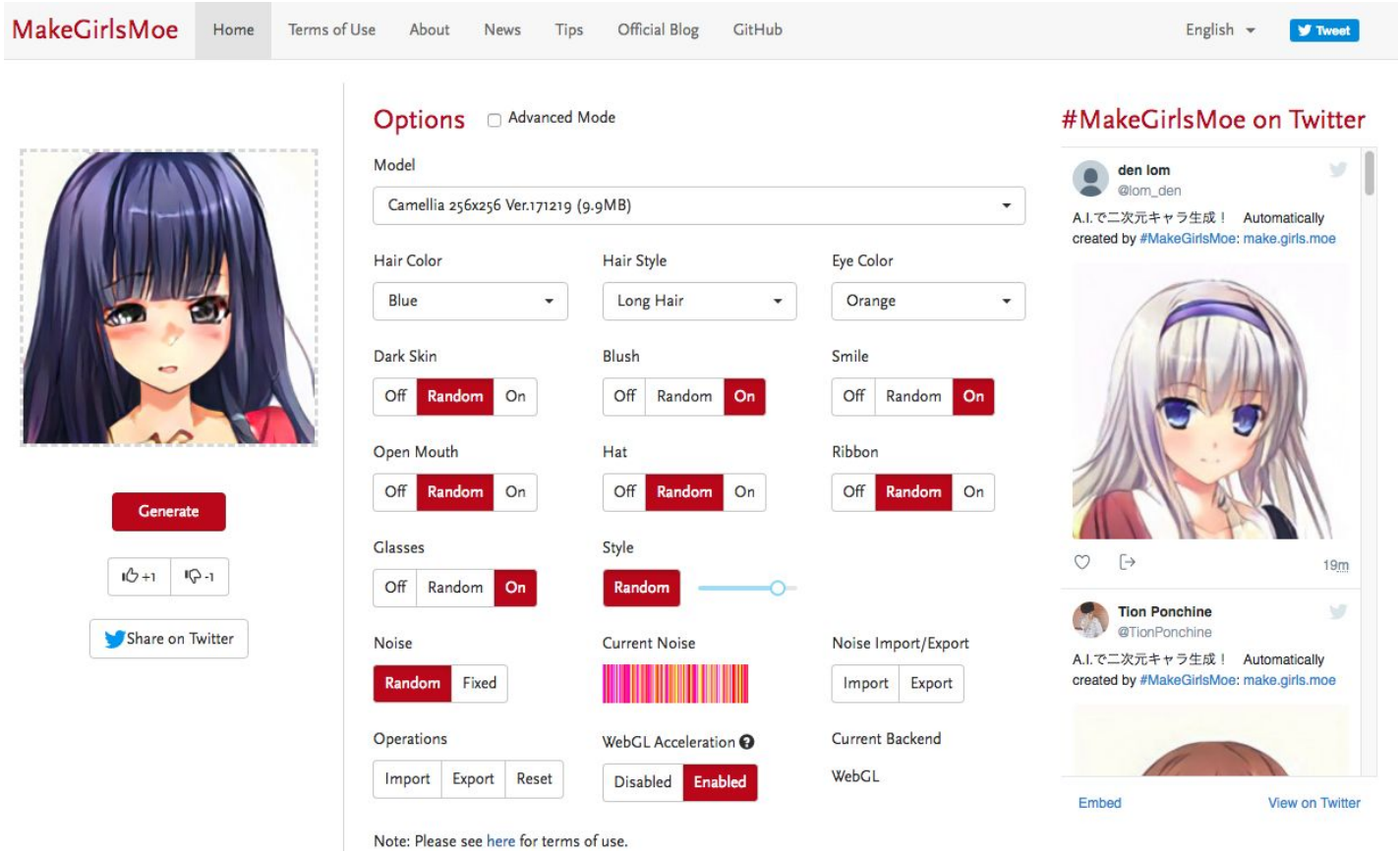
blonde hair 1.00	brown hair 1.00	black hair 1.00	blue hair 0.70	pink hair 0.80	purple hair 0.75	green hair 0.90
red hair 0.95	silver hair 0.85	white hair 0.60	orange hair 0.65	aqua hair 1.00	gray hair 0.35	long hair 1.00
short hair 1.00	twintails 0.60	drill hair 0.20	ponytail 0.45	blush 1.00	smile 0.95	open mouth 0.95
hat 0.15	ribbon 0.85	glasses 0.45	blue eyes 1.00	red eyes 1.00	brown eyes 1.00	green eyes 1.00
purple eyes 0.95	yellow eyes 1.00	pink eyes 0.60	aqua eyes 1.00	black eyes 0.80	orange eyes 0.85	

생성된 캐릭터들과 가장
가까운 학습 데이터 캐릭터

가장 왼쪽의 생성 캐릭터들은 2003년을 condition으로 주었고 가장 오른쪽 캐릭터들은 2017년을 condition으로 주었음.

웹브라우저 데모

(https://make.girls.moe/)



여러 환경에서의 Inference하는데 걸리는 시간

Processor	Operation System	Web Browser	Execution Time (s)
I7-6700HQ	macOS Sierra	Chrome 59.0	5.55
I7-6700HQ	macOS Sierra	Safari 10.1	5.60
I5-5250U	macOS Sierra	Chrome 60.0	7.86
I5-5250U	macOS Sierra	Safari 10.1	8.68
I5-5250U	macOS Sierra	Firefox 34	6.01
Intel HD Graphics 6000	macOS Sierra	Safari 11.0(WebGPU)	<0.10
Intel HD Graphics 6000	macOS Sierra	Chrome 60.0 (WebGL)	0.42
I3-3320	Ubuntu 16.04	Chromium 59.0	53.61
I3-3320	Ubuntu 16.04	Firefox 54.0	4.36
iPhone 7 Plus	iOS 10	Chrome	4.82
iPhone 7 Plus	iOS 10	Safari	3.33
iPhone 6s Plus	iOS 10	Chrome	6.47
iPhone 6s Plus	iOS 10	Safari	6.23
iPhone 6 Plus	iOS 10	Safari	11.55

Table 4: Approximate inference time on several different environments.

GANosaic: Mosaic Creation with Generative Texture Manifolds

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GANosaic

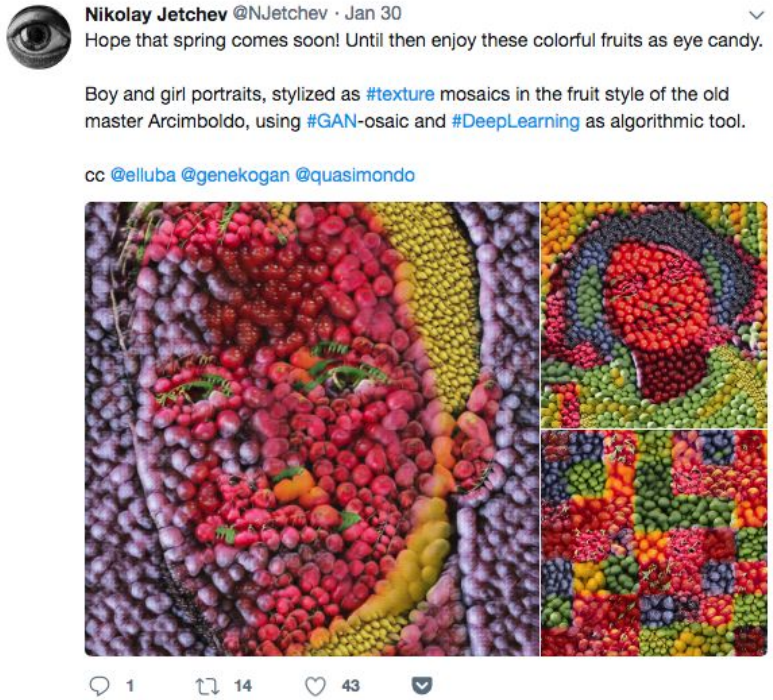
Convolutional Neural Networks (CNN)으로 질감 모자이크를 표현.

GANosaic

(a) No Z^l optimisation. (b) No regularization. (c) Regularization, $\alpha_l = 5$.

(a) Texture style image. (b) Style transfer image.

GANosaic 작품



https://twitter.com/NJetchev

TopoSketch: Drawing in Latent Space

Ian Loh* **and Tom White***
School of Design
Victoria University of Wellington
Wellington, New Zealand
{lohjun@myvuw.ac.nz, tom.white@vuw.ac.nz}

Use Case

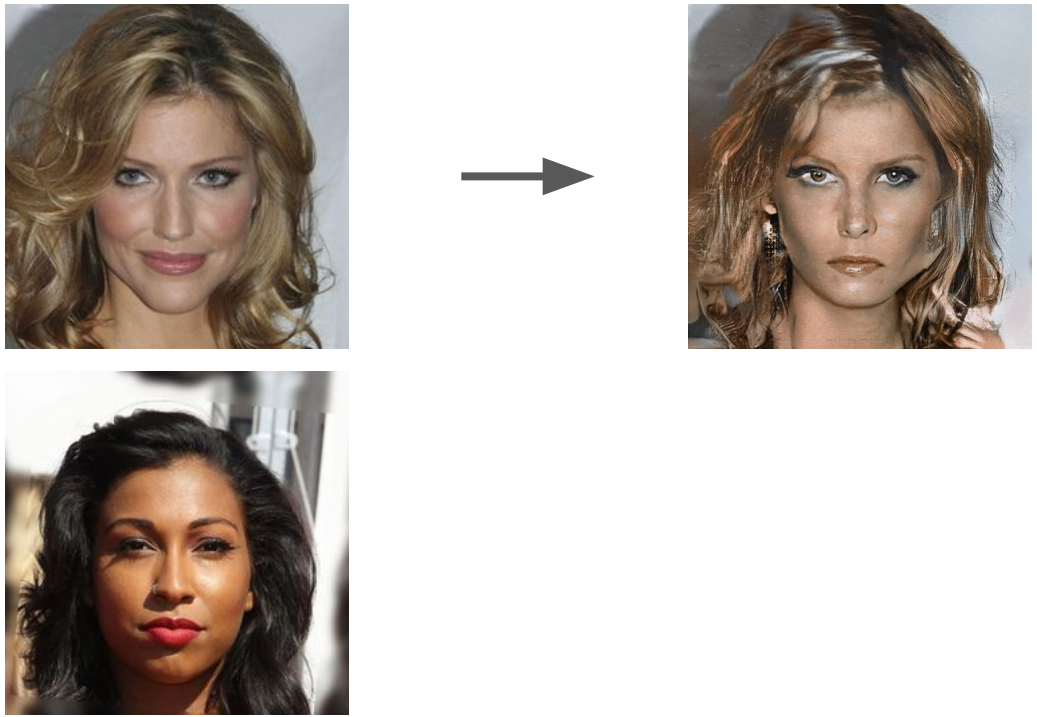
이미지에 얼굴 애니메이션을 추가

Modified from Tom White's Slide

Sample Output

Modified from Tom White's Slide

Repeatable Process

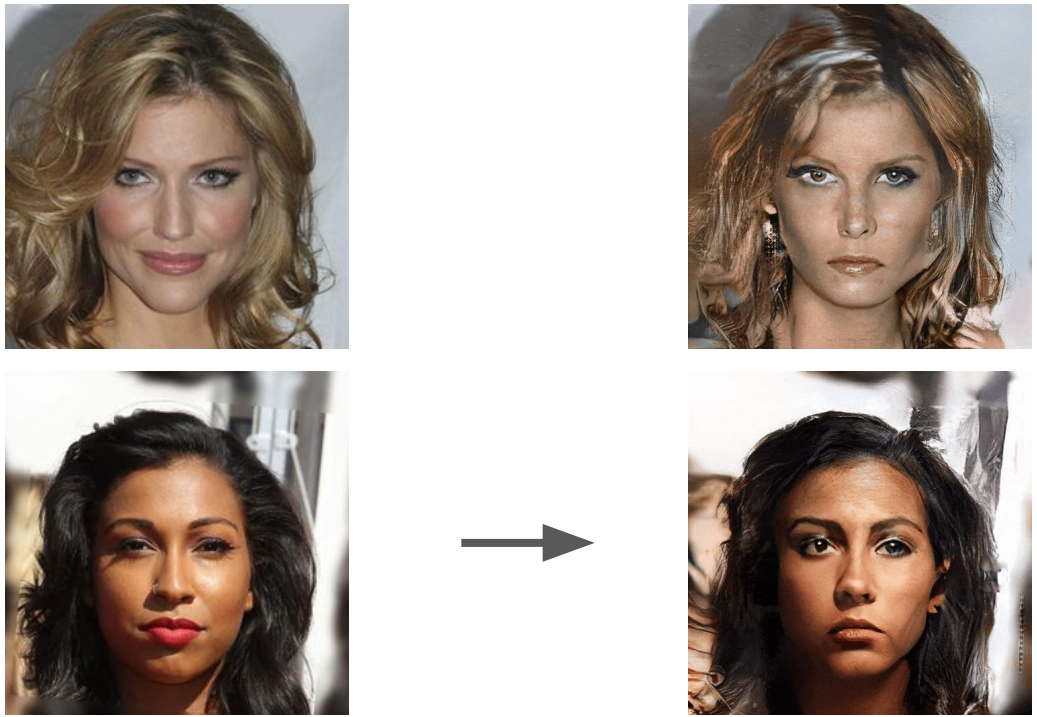


Modified from Tom White's Slide

Repeatable Process

Modified from Tom White's Slide

Repeatable Process



Modified from Tom White's Slide

TopoSketch

Generating Animations by Sketching in Conceptual Space

Ian Loh
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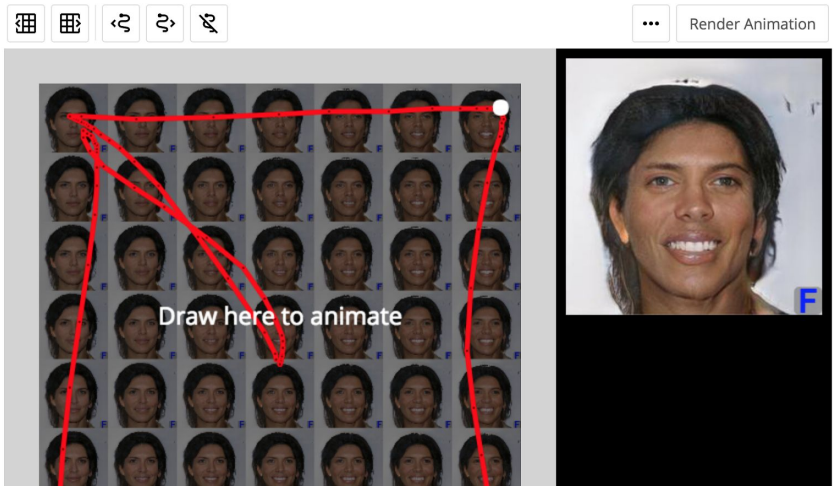
Tom White
tom.white@vuw.ac.nz

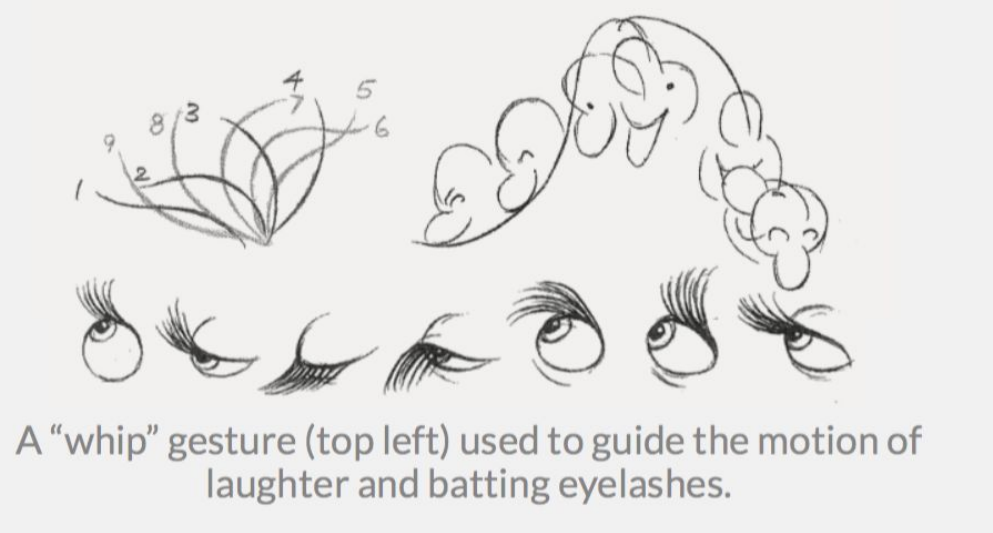
View on GitHub

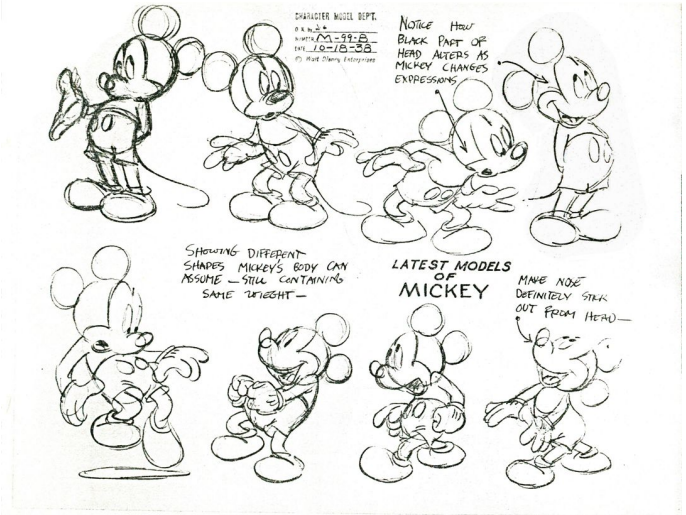


https://vusd.github.io/toposketch/

Modified from Tom White's Slide

TopoSketch



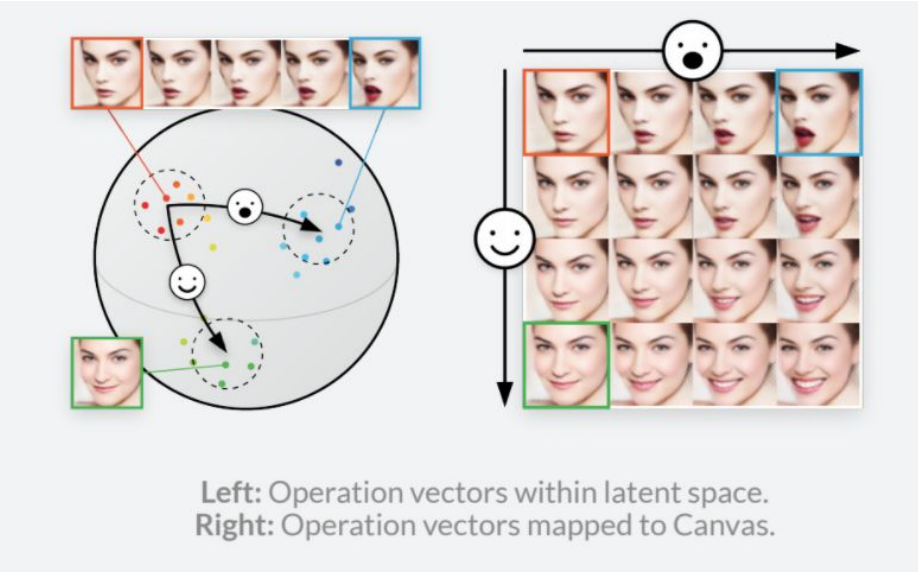


1. Animation Sketching is an important tool for animation study and planning.

Modified from Tom White’s Slide

https://www.joshuanava.biz/disney-animation/marc-davis.html

TopoSketch

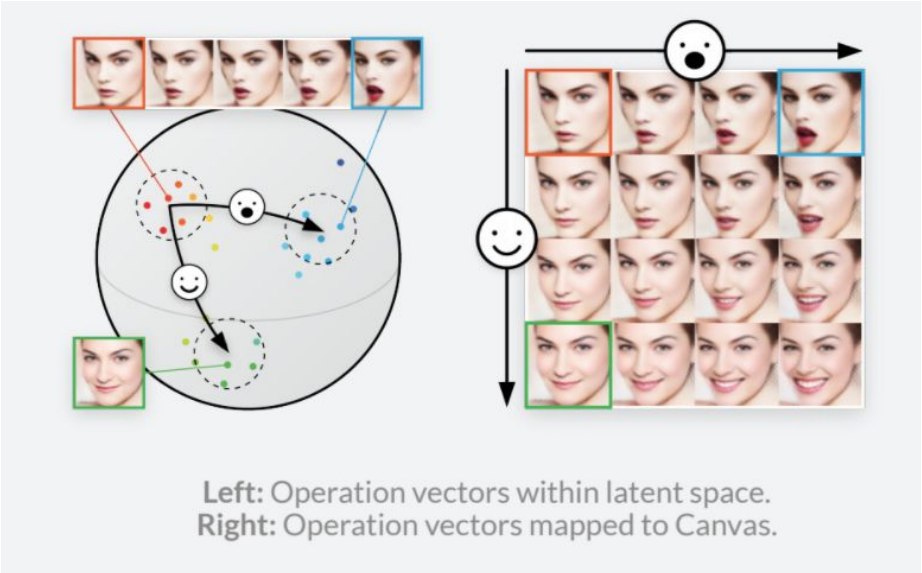


Left: Operation vectors within latent space.
Right: Operation vectors mapped to Canvas.

2. Latent spaces represent high level facial expressions.

Modified from Tom White's Slide

TopoSketch

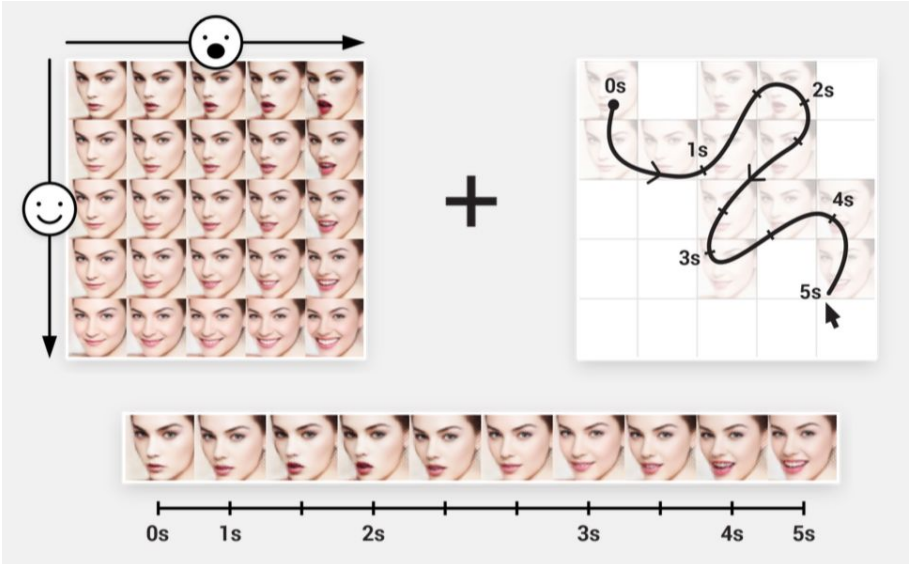


Left: Operation vectors within latent space.
Right: Operation vectors mapped to Canvas.

3. A Control Canvas is used to represent and explore the conceptual space of facial expressions.

Modified from Tom White's Slide

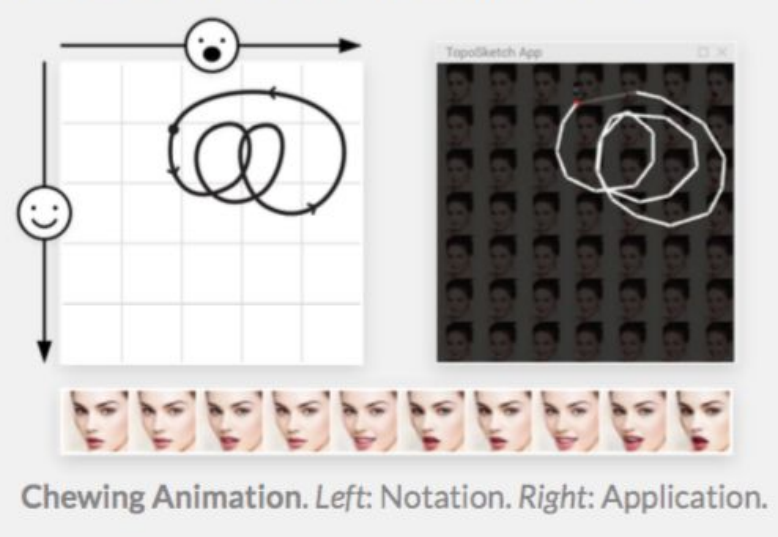
TopoSketch



4. Sketched gestures on the grid are recorded and played back to create animations.

Modified from Tom White's Slide

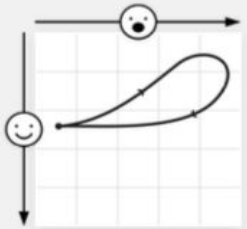
TopoSketch



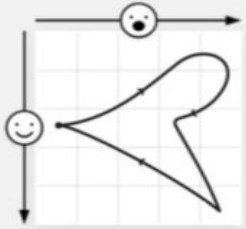
Chewing Animation. *Left*: Notation. *Right*: Application.

A **Surprised** animation applied to a male and female face.

A "Tanning" expression.



"Kiss"

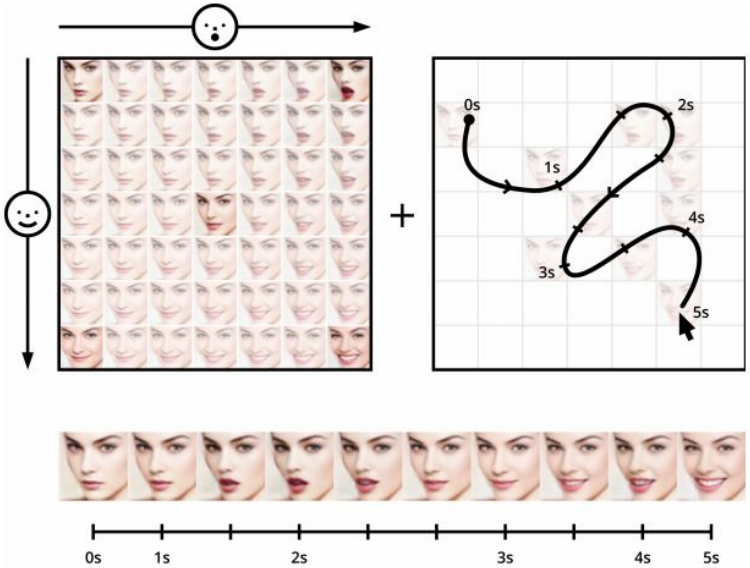


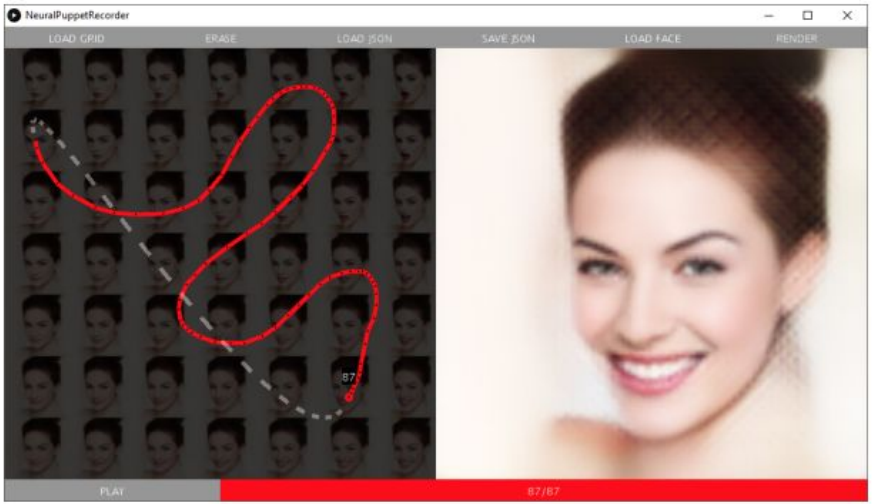
"Kiss with a smile"

5. Abstraction allows for fast prototyping, animation transfer and different styles

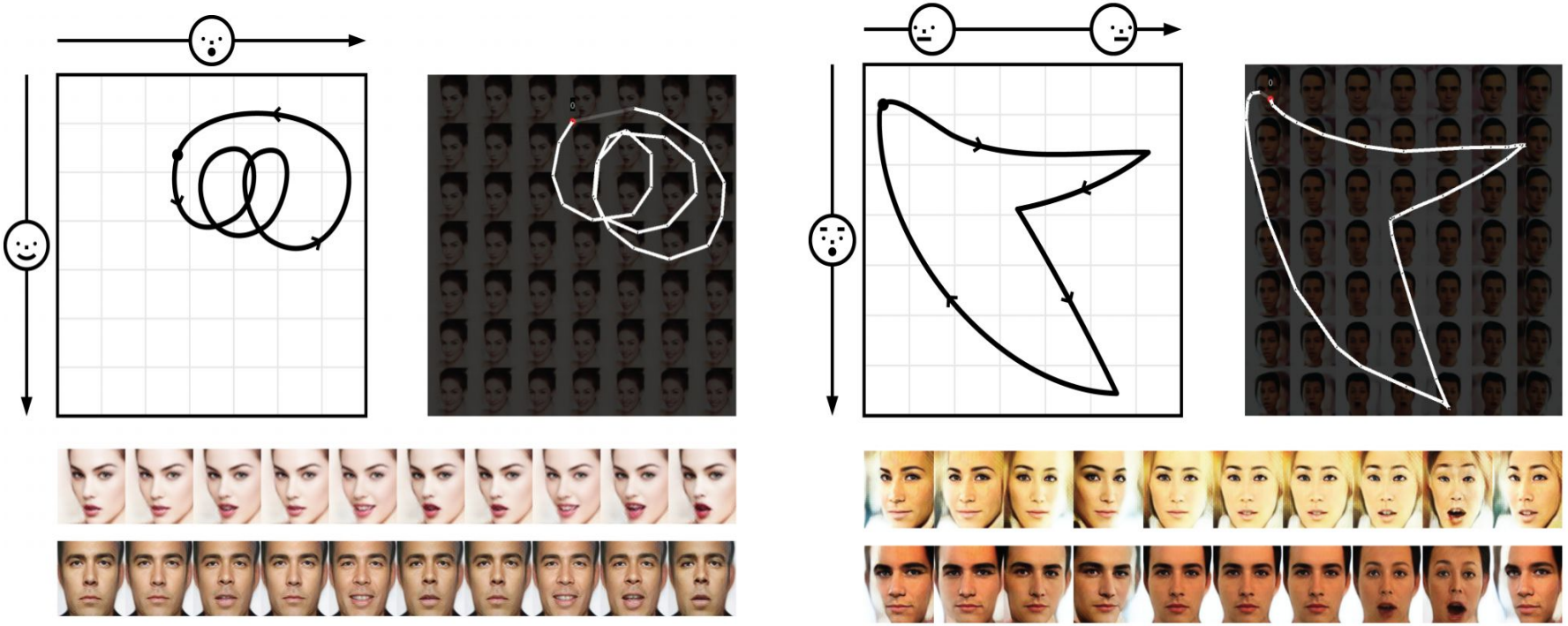
Modified from Tom White's Slide

TopoSketch


0s
1s
2s
3s
4s
5s
0s
1s
2s
3s
4s
5s


NeuralPuppetRecorder
LOAD GRID
ERASE
LOAD JSON
SAVE JSON
LOAD FACE
RENDER
87
PLAY
87/87

TopoSketch 데모



https://vusd.github.io/toposketch/

ASCII Art Synthesis with Convolutional Networks

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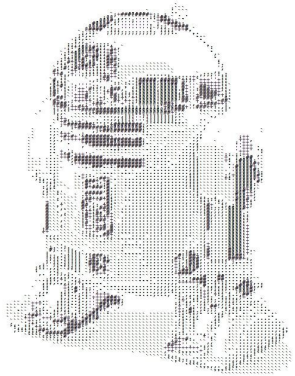
Faculty of Medicine, Osaka University
oakiyama1986@gmail.com

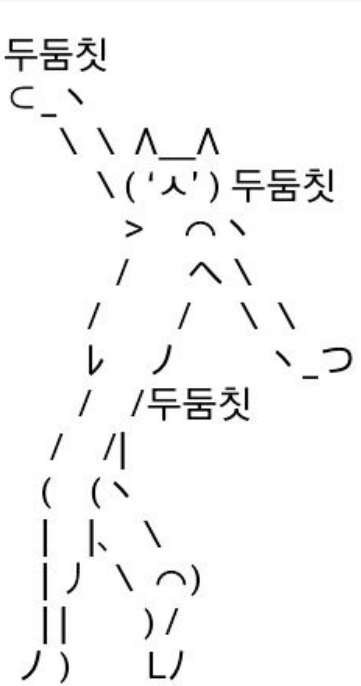
ASCII Art

"아스키코드 0x20~0x7e에 포함되는 문자, 기호를 사용한 그림을 말한다. **텍스트 아트**, **문자그림**으로도 불린다... *아스키 아트는 주로 이모티콘으로 쓰이지만, 여러 줄에 걸쳐 기호를 배열해 풍경사진·사실화 등을 모방할 수도 있다.*" -wikipedia

사실 이 논문은 아스키코드가 아닌 일본어도 사용. 그래서 원래는 아스키 아트가 아닌 텍스트 아트.

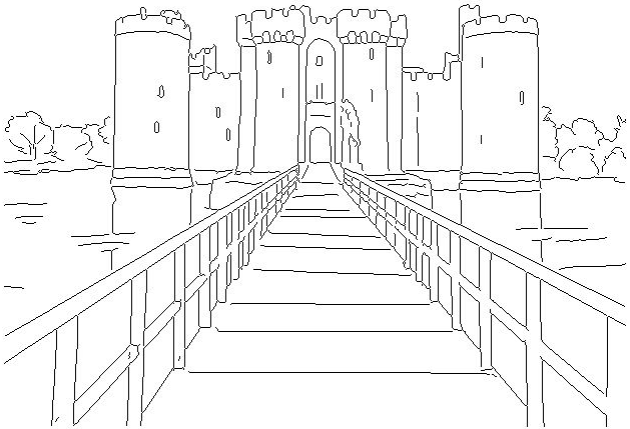
:-) 또는 :) 스마일
:-(찡그린 얼굴
;-) 윙크
:-p 야유

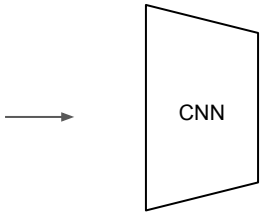


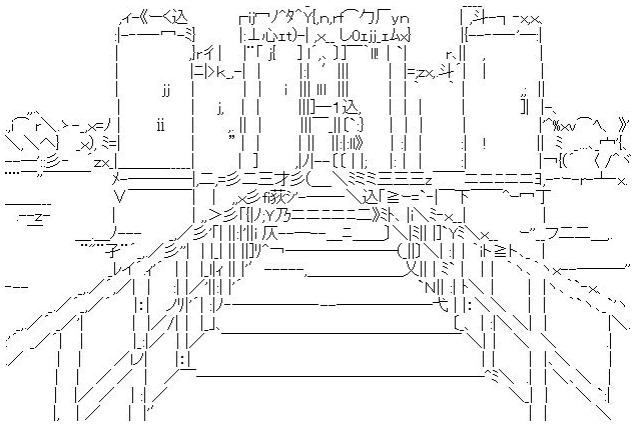


https://ko.wikipedia.org/wiki/%EC%95%84%EC%8A%A4%ED%82%A4_%EC%95%84%ED%8A%B8
http://infosnacks.com/img/2014/ascii-art.jpg
https://upload.tgd.kr/20171016/ae1af614430fe8c258c42c36b95efde0.png

ASCII Art Synthesis with Convolutional Networks







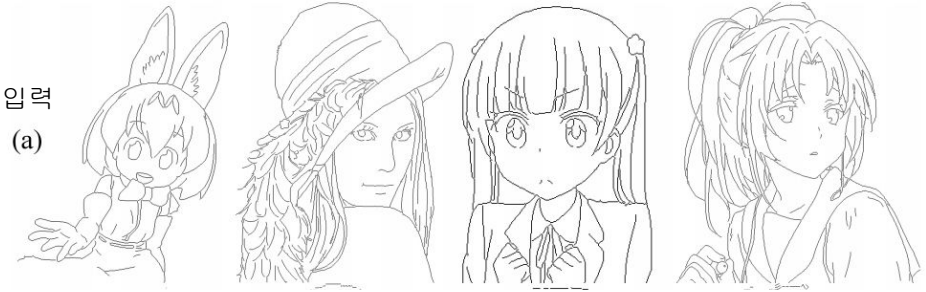
작가들이 만드는 ASCII Art 데이터로 학습. 선을 문자들로 변환.

ASCII Art Synthesis with Convolutional Networks

다른 ASCII Art와 비교

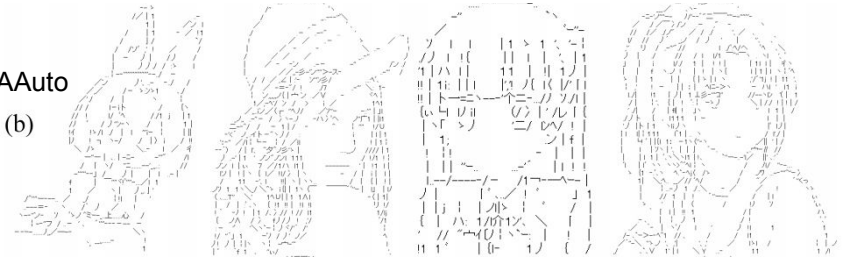
입력

(a)



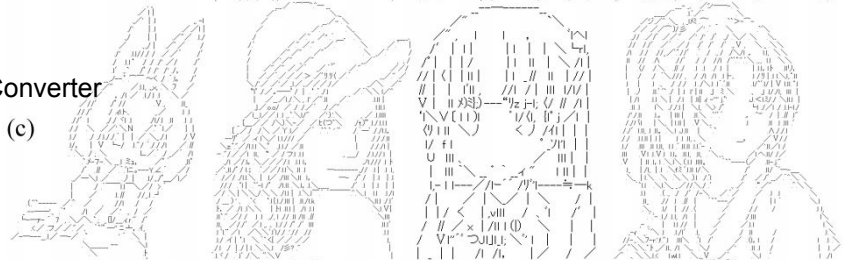
AAAuto

(b)



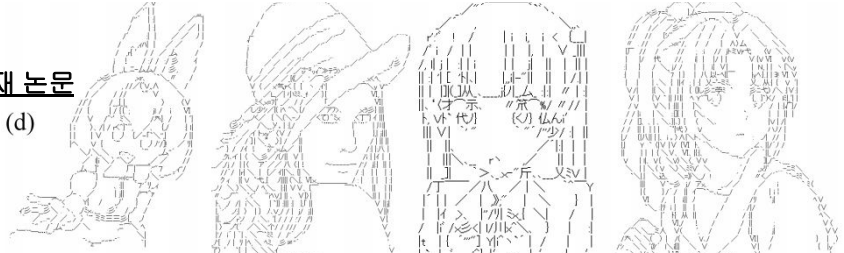
AAConverter

(c)



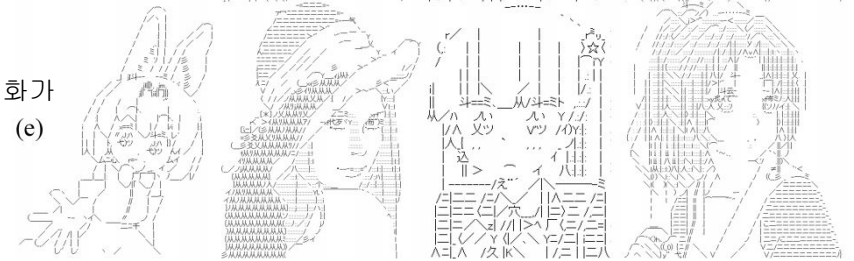
현재 논문

(d)

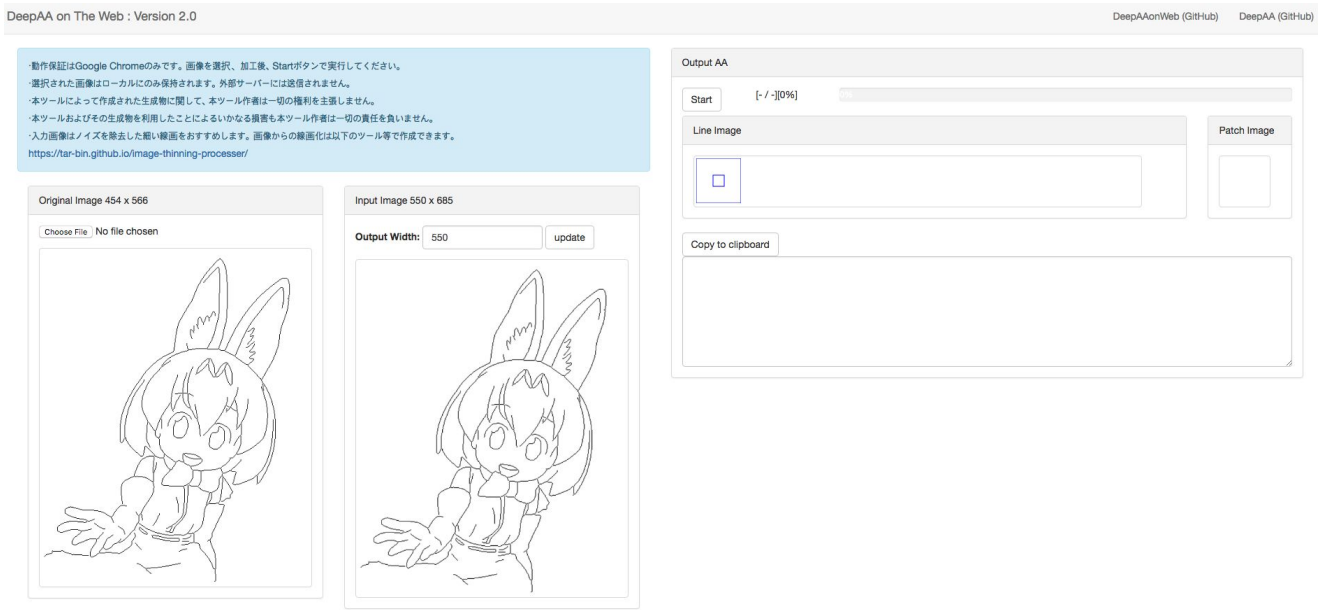


화가

(e)

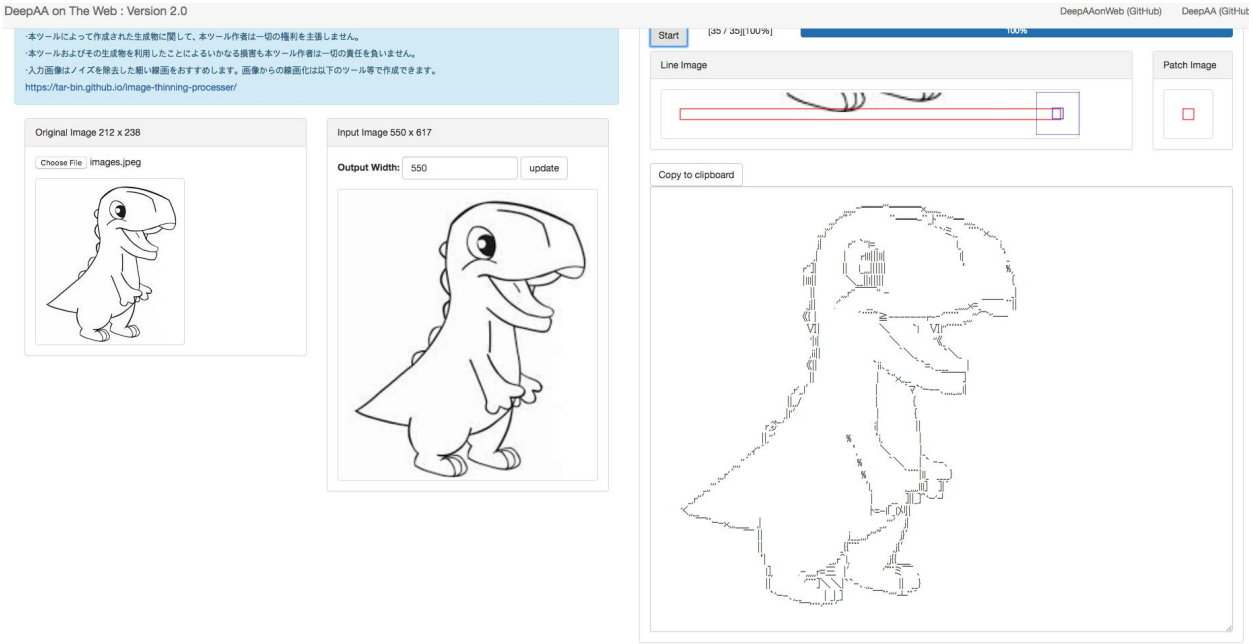


Web Application



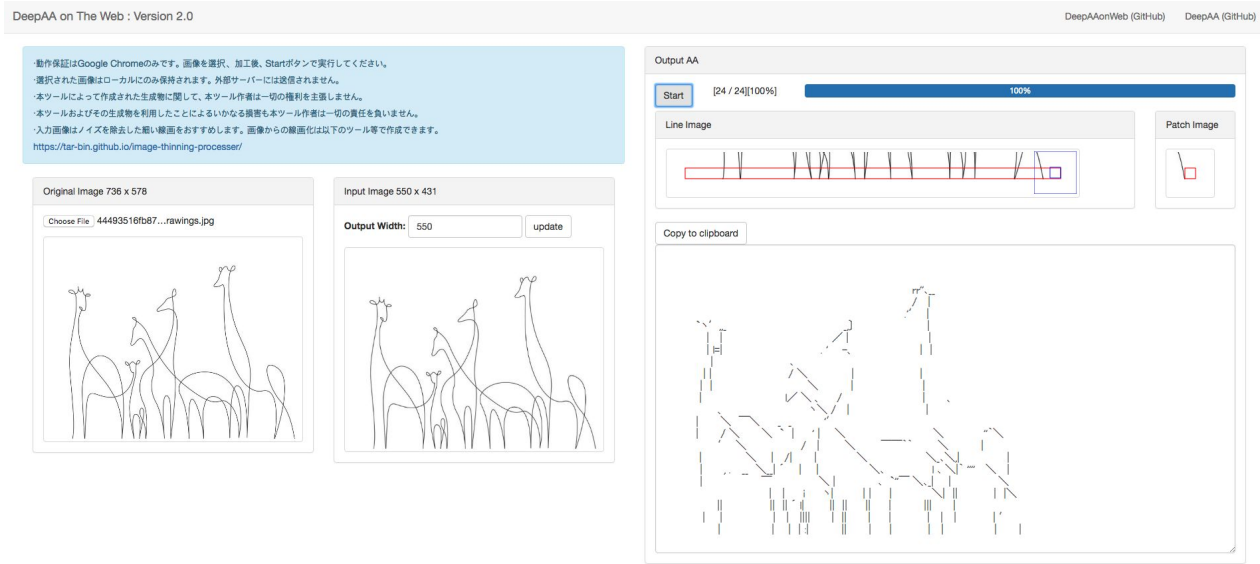
https://tar-bin.github.io/DeepAAonWeb/

Web Application



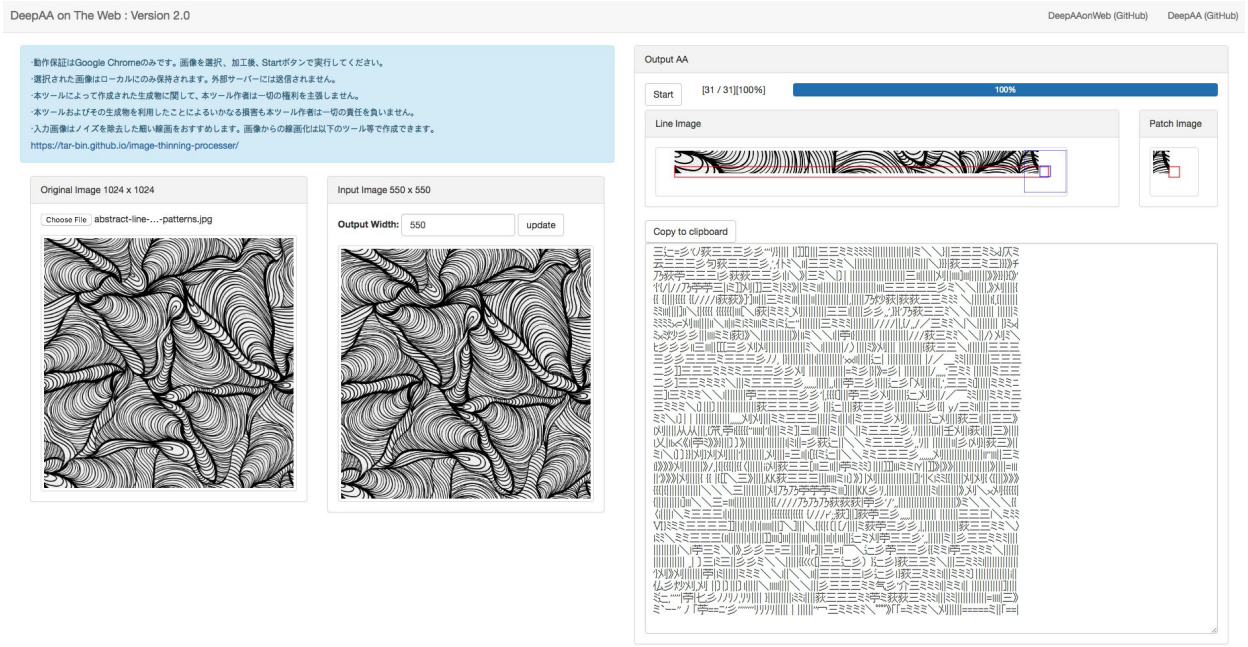
https://tar-bin.github.io/DeepAAonWeb/

Web Application



https://tar-bin.github.io/DeepAAonWeb/

Web Application



https://tar-bin.github.io/DeepAAonWeb/

Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks

Natsumi Kato **Hiroyuki Osone*** **Daitetsu Sato** **Naoya Muramatsu**

Yoichi Ochiai
University of Tsukuba
Pixie Dust Technologies, Inc.

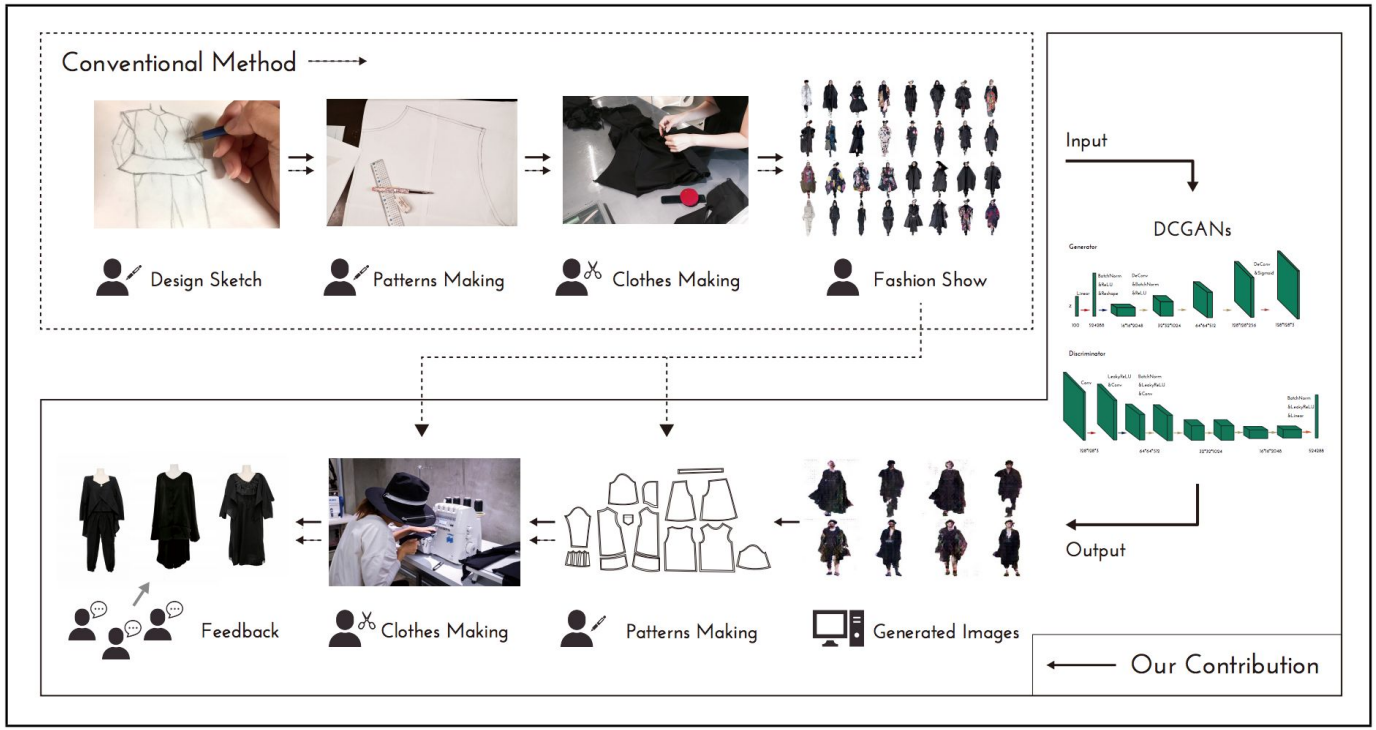
Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks

영감을 찾는 일은 힘들다.

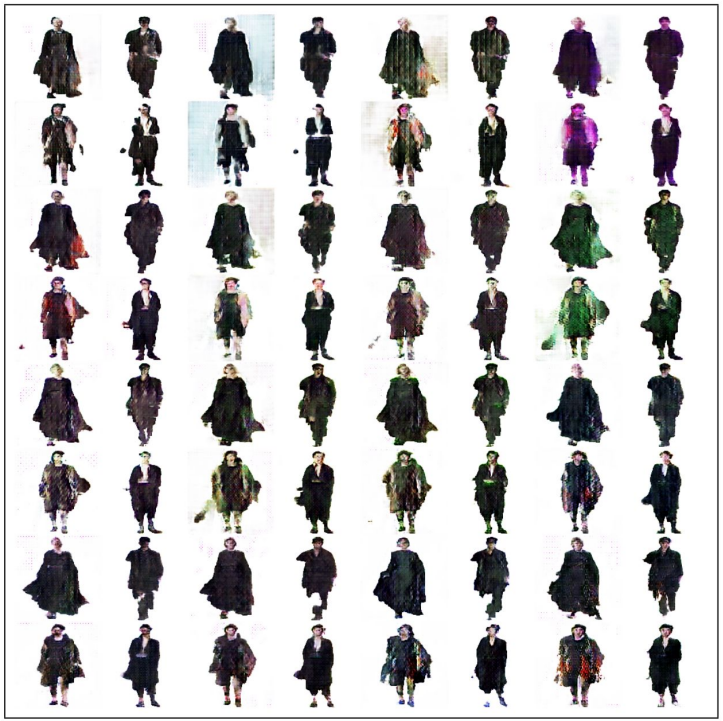
DCGANs를 사용해서 생성된 이미지들로 부터 영감을 얻어서 디자이너들이 디자인.

1100개의 특정 브랜드의 옷 이미지들을 모음.

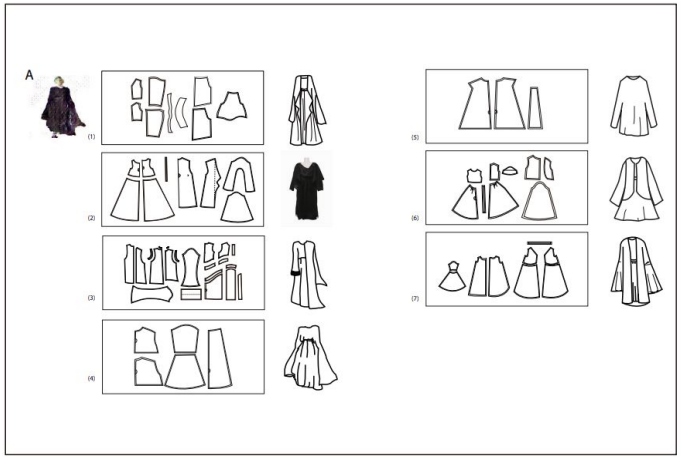
Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks



Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks



Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks



생성된 옷 이미지들을 통해
디자이너들이 만든 패턴들

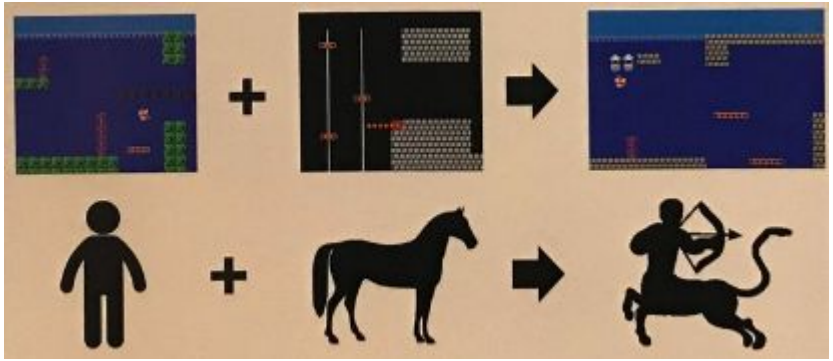
Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks

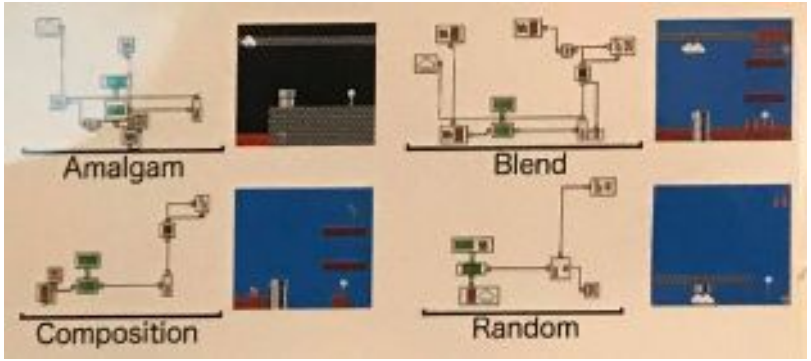
https://www.youtube.com/watch?v=-HdNm3V7Ro0

Combinatorial Meta Search

Matthew Guzdial and Mark O. Riedl
Georgia Institute of Technology
{mguzdial3;riedl}@gatech.edu

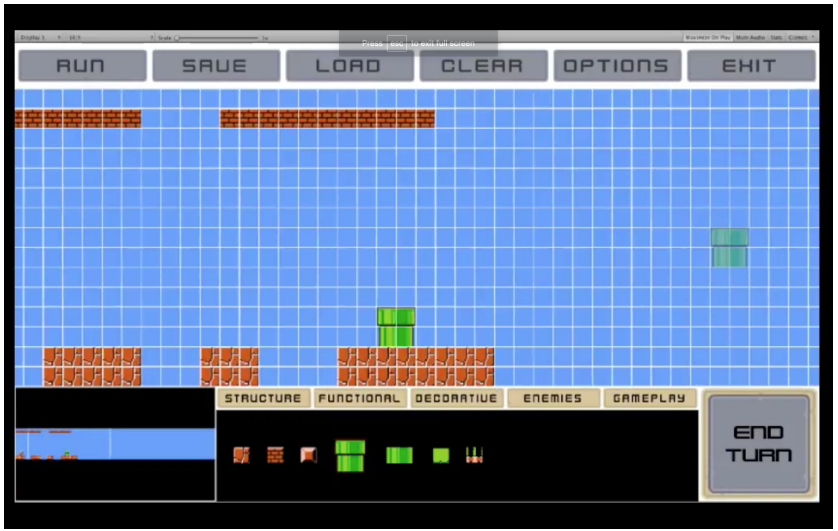
Combinatorial Meta Search





사람들은 새로 학습하는것 보다 다양한 지식과 창의성을 조합해서 가능한 범위내에서 찾음.

Combinatorial Meta Search



https://www.youtube.com/watch?time_continue=86&v=6Ska6Y9Wnvo

Paper Cubes: Evolving 3D characters in Augmented Reality using Recurrent Neural Networks

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David Ha
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Jonas Jongejan
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Amit Pitaru
Google Creative Lab
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Paper Cubes

증강현실(Augmented Reality)을
사용해서 프로그래밍을 가르치는 도구.

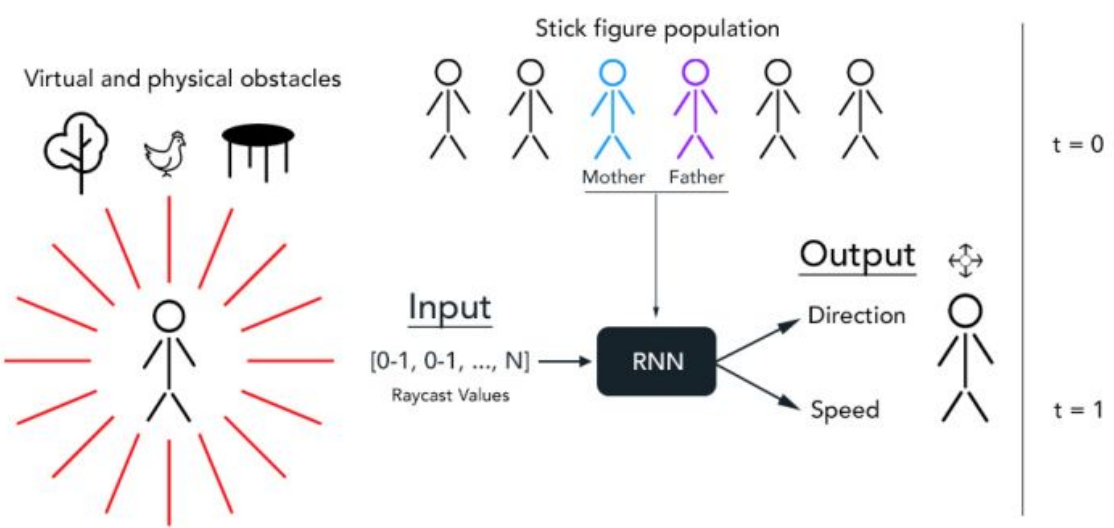
교육, 게임, 그리고 헬스케어에 적용.

Paper Cubes

Paper cube는 AR을 생성하고 캐릭터들의 동작(점프, 우회, 멈춤)들을 컨트롤하는데 사용. 각 큐브는 다른 패턴들이 있고 폰 카메라로 인식

AI Cube는 캐릭터들에게 지능을 주고 시간이 지날수록 똑똑해짐.

Paper Cubes


Virtual and physical obstacles
Stick figure population
Mother
Father
Input
[0-1, 0-1, ..., N]
Raycast Values
RNN
Output
Direction
Speed
t = 0
t = 1

Paper Cubes

https://www.youtube.com/watch?time_continue=5&v=arOEUVO1rIw

Improvised Comedy as a Turing Test

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Department of Computing Science
University of Alberta
Edmonton, Alberta, Canada
korymath@gmail.com

Piotr Mirowski *
HumanMachine
London, UK
piotr.mirowski@computer.org

Improvised Comedy (즉흥 코미디)

배우들이 대사와 계획 없이
즉흥적으로 진행하는 코미디.

고도의 집중력, 상황판단, 동작,
관찰, 상대방의 액션에 대한
재빠른 리액션, 팀웍, 팀빌딩,
커뮤니케이션, 콜라보레이션
등등을 요구함.

https://www.youtube.com/watch?v=d3TsyT_EDBc&t=293s

Cast

HumanMachine라는 이름으로 활동

Piotr Mirowski(좌): Deepmind 연구자. London, UK에서 거주.

Kory Mathewson(우): University of Alberta 박사과정. Edmonton, Canada에 거주.

SNS로 서로 알게되어서 시차 7시간 차이 나지만 2016년부터 같이 활동을 시작함. 둘 다 강화학습 연구자.

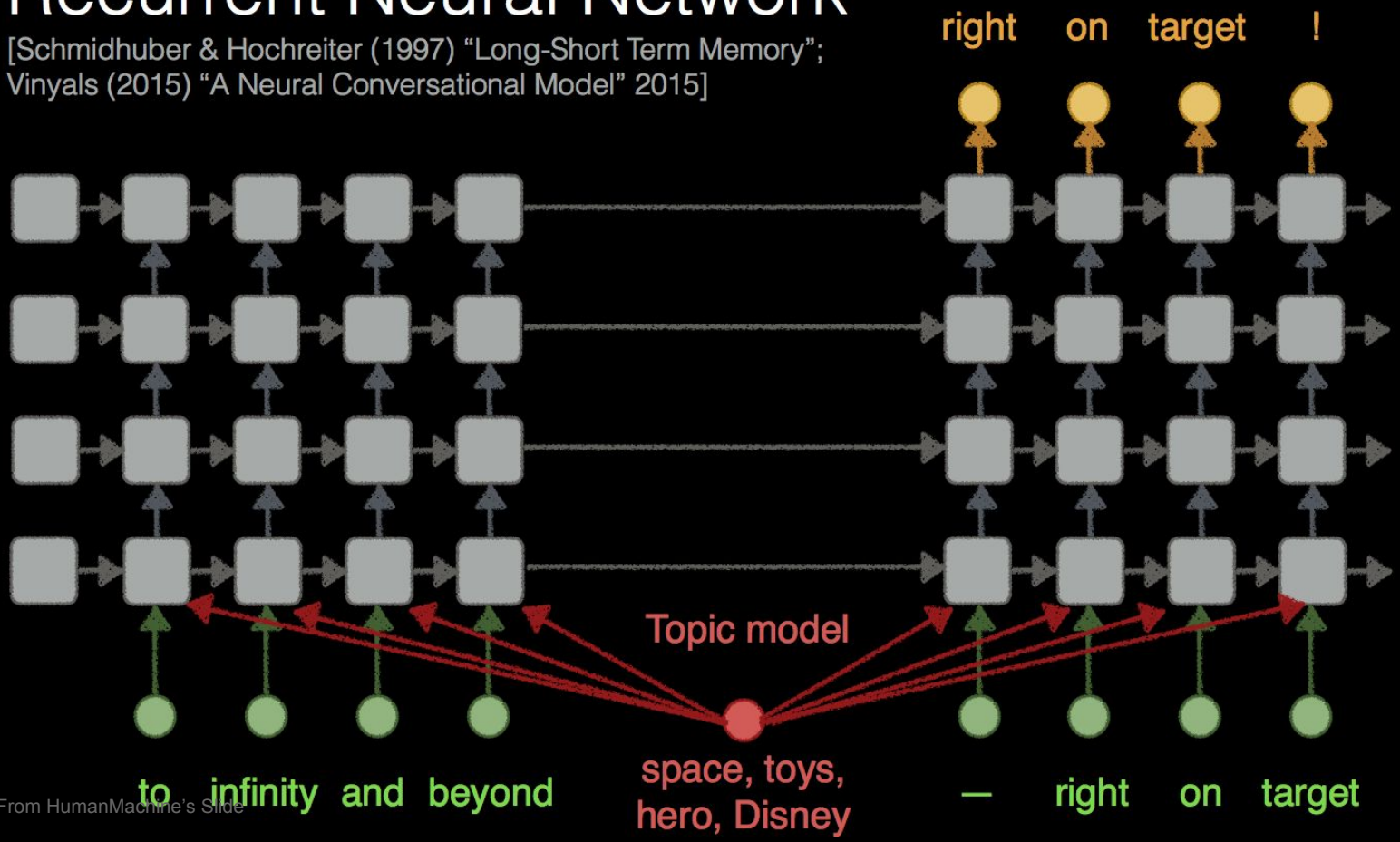
Language as sequences
"How did you come up with A.L.Ex?"

- Personal experience: learning English as a foreign language.
  Learn from **patterns of words** rather than from grammatical rules.
- **Statistical language models**:
  Learn to compute likelihood of a sentence, based on data.
- Improvised musical (Showstoppers, The Maydays):
  rhymes will come **naturally**… with some practice.

From HumanMachine's Slide

Recurrent Neural Network

[Schmidhuber & Hochreiter (1997) “Long-Short Term Memory”;
Vinyals (2015) “A Neural Conversational Model” 2015]



From HumanMachine's Slide

A.L.Ex*

*Artificial Language Experiment

LAN server
(plugging extra components)

Recurrent Neural Network
(text generation)

Speech recognition

Text-to-speech

User interface
(visualisation)

Dialogue system
(turn taking)

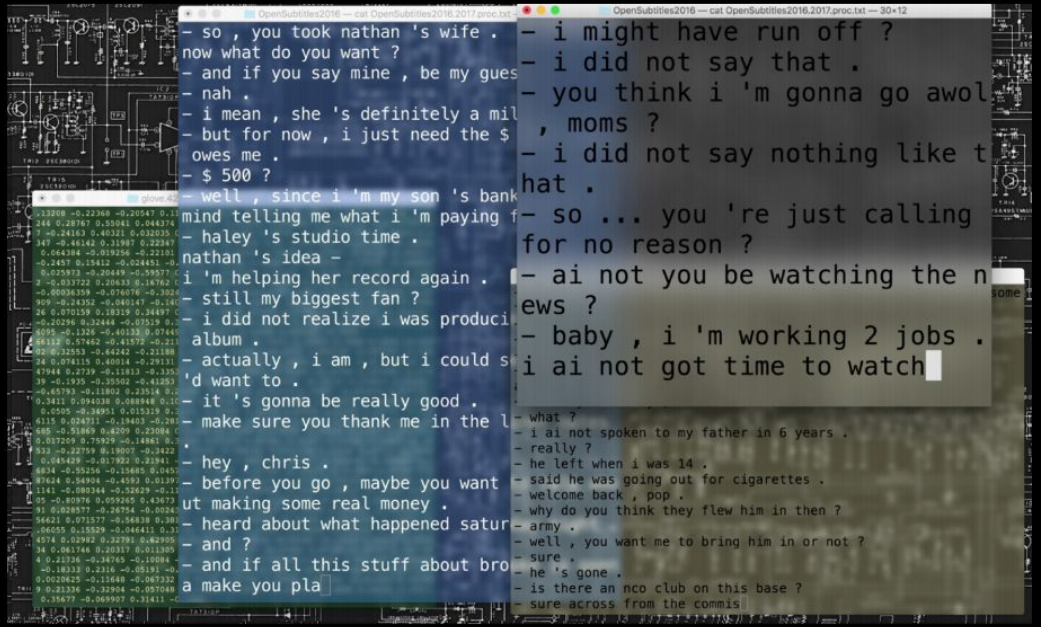
Remote control
(visualisation, camera)

Physical avatar
(stage partner)

From HumanMachine's Slide

Dataset: corpus of film dialogue

- OpenSubtitles
  http://www.opensubtitles.org
  http://opus.lingfil.uu.se/OpenSubtitles.php
- 100k movies (1902-2016)
- 880M word tokens
- Improv actors work from a huge selection of scripts
  [Martin, Harrison & Riedl (2016) “Improvisational Computational Storytelling in Open Worlds”, *ICIDS*]



From HumanMachine’s Slide

“Could A.L.Ex be rewarded for funny or successful scenes ?”

- Currently **word by word** text generation, **supervised training**
- Still thinking about proper way for **reinforcement learning…**
  - Reward structure: amount of laughs?
  - Improv and theatre in open-world setting are **more than a game**
- Reward dialogue system if it stays on track of an emotional trajectory?
  [Hernandez, Bulitko et al (2015) “Keeping the Player on an Emotional Trajectory in Interactive Storytelling”, *AAAI*]
- Reward dialogue system for informative and coherent dialogue, train on self-play?
  [Li et al (2016) “Deep Reinforcement Learning for Dialogue Generation”, *arXiv*]

Transatlantic AI show: binary2

Photo © Chris Gamble

Photo © Chris Gamble

Photo (c) David Bourn, *ImproFest UK*

From HumanMachine's Slide

TRISTAN BATES THEATRE

CURIOUS COMEDY THEATER

(c) www.tristanbatestheatre.co.uk, curiouscomedy.org

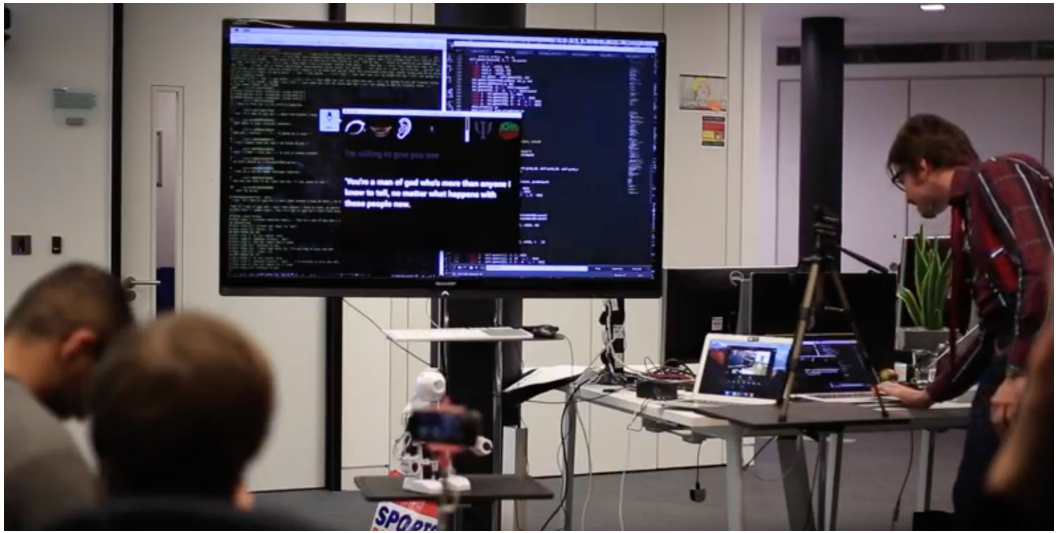
Fringe Festival shows

The Edinburgh Festival
fringe
04 – 28 August 2017

HumanMachine in NIPS Creativity Workshop

https://twitter.com/PiotrImprov

Improvised Comedy Demo



https://www.youtube.com/watch?v=DrJEk9DfGzw

Improvised Comedy Demo

https://www.youtube.com/watch?time_continue=628&v=FjxBdMRAZIE

Reviews

“Meet the smart robots with artificial irreverence. Stage debut beckons for machines programmed to learn the nuances of improvised comedy…” – The Times

Albert and A.L.Ex have been selected as “Comedians to Watch in 2017” – The Phoenix Remix.

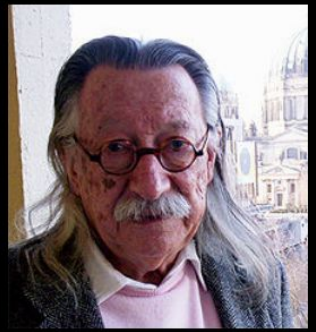
“… an immensely enjoyable trip to the future […] with Dr Piotr Mirowski doing live improv comedy with his AI system A.L.Ex. (with hilariously ominous consequences!)…” – Jugular.

Kory Mathewson has been selected to the “Top 40 Under 40” for 2016 by Avenue Edmonton: “… shared his extensive knowledge of improvisation and artificial intelligence not just in his own community, but on a global scale”.

Kory was selected as Best in the Fest at the 2015 Vancouver International Improv Festival for TEDxRFT, which also won the Insane Concept of the Year award from 12th night.

“…the implausible comic energy that Kory Mathewson and Donovan Workun bring to their Back To The Future double-act whenever they hit the stage.” – Edie Ranvier, Improvathon 2016: The Lost Theatre, London

ELIZA



Joseph Weinzenbaum (1966)

Photo (c) www.masswerk.at


```lua
-- conjugate
local conjugate = {
  [" I "] = "YOU",
  [" ARE "] = "AM",
  [" WERE "] = "WAS",
  [" YOU "] = "ME",
  [" YOUR "] = "MY",
  [" I'VE "] = "YOU'VE",
  [" I'M "] = "YOU'RE",
  [" ME "] = "YOU",
  [" AM I "] = "YOU ARE",
  [" AM "] = "ARE",
}
```

```lua
-- randomly selected replies if no keywords
local randReplies = {
  "WHAT DOES THAT SUGGEST TO YOU?",
  "I SEE...",
  "I'M NOT SURE I UNDERSTAND YOU FULLY.",
  "CAN YOU ELABORATE ON THAT?",
  "THAT IS QUITE INTERESTING!",
  "THAT'S SO... PLEASE CONTINUE...",
  "I UNDERSTAND...",
  "WELL, WELL... DO GO ON.",
  "WHY ARE YOU SAYING THAT?",
  "PLEASE EXPLAIN THE BACKGROUND TO THAT REMARK...",
  "COULD YOU SAY THAT AGAIN, IN A DIFFERENT WAY?",
}
```

```lua
-- keywords, replies
local replies = {
  [" CAN YOU"] = "PERHAPS YOU WOULD LIKE TO BE ABLE TO",
  [" DO YOU"] = "YES, I",
  [" CAN I"] = "PERHAPS YOU DON'T WANT TO BE ABLE TO",
  [" YOU ARE"] = "WHAT MAKES YOU THINK I AM",
  [" YOU'RE"] = "WHAT IS YOUR REACTION TO ME BEING",
  [" I DON'T"] = "WHY DON'T YOU",
  [" I FEEL"] = "TELL ME MORE ABOUT FEELING",
  [" WHY DON'T YOU"] = "WHY WOULD YOU WANT ME TO",
  [" WHY CAN'T I"] = "WHAT MAKES YOU THINK YOU SHOULD BE ABLE TO",
  [" ARE YOU"] = "WHY ARE YOU INTERESTED IN WHETHER OR NOT I AM",
  [" I CAN'T"] = "HOW DO YOU KNOW YOU CAN'T",
  [" SEX"] = "I FEEL YOU SHOULD DISCUSS THIS WITH A HUMAN.",
  [" I AM"] = "HOW LONG HAVE YOU BEEN",
  [" I'M"] = "WHY ARE YOU TELLING ME YOU'RE",
  [" I WANT"] = "WHY DO YOU WANT",
  [" WHAT"] = "WHAT DO YOU THINK?",
  [" HOW"] = "WHAT ANSWER WOULD PLEASE YOU THE MOST?",
  [" WHO"] = "HOW OFTEN DO YOU THINK OF SUCH QUESTIONS?",
  [" WHERE"] = "WHY DID YOU THINK OF THAT?",
  [" WHEN"] = "WHAT WOULD YOUR BEST FRIEND SAY TO THAT QUESTION?",
  [" WHY"] = "WHAT IS IT THAT YOU REALLY WANT TO KNOW?",
  [" PERHAPS"] = "YOU'RE NOT VERY FIRM ON THAT!",
  [" DRINK"] = "MODERATION IN ALL THINGS SHOULD BE THE RULE.",
  [" SORRY"] = "WHY ARE YOU APOLOGIZING?",
  [" DREAMS"] = "WHY DID YOU BRING UP THE SUBJECT OF DREAMS?",
  [" I LIKE"] = "IS IT GOOD THAT YOU LIKE",
  [" MAYBE"] = "AREN'T YOU BEING A BIT TENTATIVE?",
  [" NO"] = "WHY ARE YOU BEING NEGATIVE?",
  [" YOUR"] = "WHY ARE YOU CONCERNED ABOUT MY",
  [" ALWAYS"] = "CAN YOU THINK OF A SPECIFIC EXAMPLE?",
  [" THINK"] = "DO YOU DOUBT",
  [" YES"] = "YOU SEEM QUITE CERTAIN. WHY IS THIS SO?",
  [" FRIEND"] = "WHY DO YOU BRING UP THE SUBJECT OF FRIENDS?",
  [" COMPUTER"] = "WHY DO YOU MENTION COMPUTERS?",
  [" AM I"] = "YOU ARE",
}
```

From HumanMachine's Slide

Technology as a creative constraint

Off-the-shelf chatbot giving lines to human improvisers

"Yes Android" (2017)

Etan Muskat, Kory Mathewson

Bad Dog Theatre Company

Getting audience suggestions using AR glasses

"GlassProv" (2014)

Baratunde Thurston, Will Luera, Scott Greenwald

MIT Director's Fellows, Improv Boston, Big Bang Improv

From HumanMachine's Slide

Technology as a creative constraint

Data science and RNN lyrics generation, followed by human curation and interpretation in a musical comedy

"Beyond the Fence" (2016)
Benjamin Till, Nathan Taylor, Alex Davies
Photograph: Tristram Kenton for the Guardian

Acting and directing a nonsensical, RNN-generated script

"Sunspring" (2016)
Ross Goodwin (rossgoodwin.com), Oscar Sharp
[http://arstechnica.com/the-multiverse/2016/06/an-ai-wrote-this-movie-and-its-strangely-moving/]

From HumanMachine's Slide

AI narratives with a human in the loop

Actress interacting with a smartphone

"Siri" (2017)

Laurence Dauphinais

Photograph: Centre du Théâtre d'Aujourd'hui

Writing stories with auto-complete

@botnikstudios (2015)

Jamie Brew

From HumanMachine's Slide

Neural Translation of Musical Style

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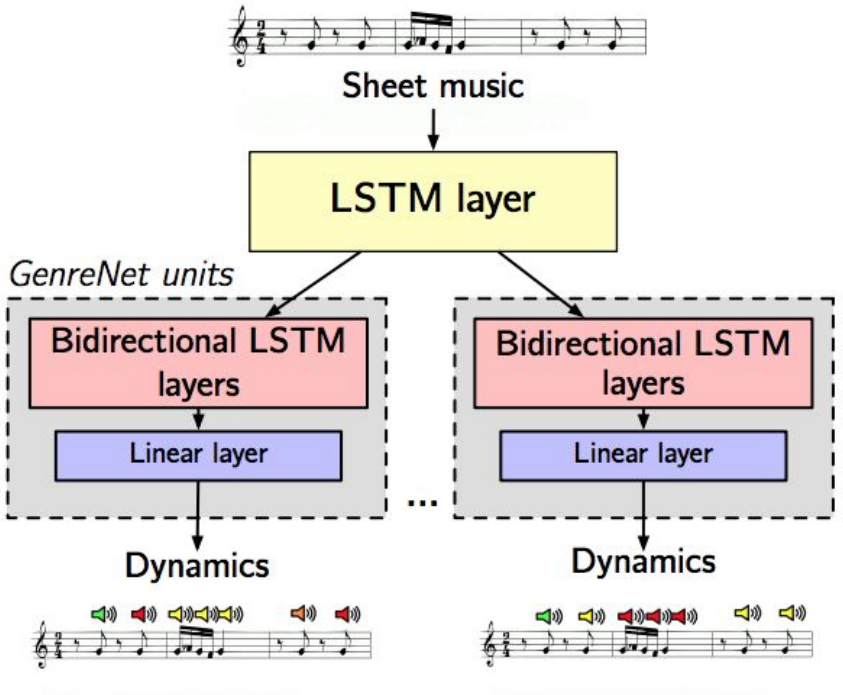
Neural Translation of Musical Style

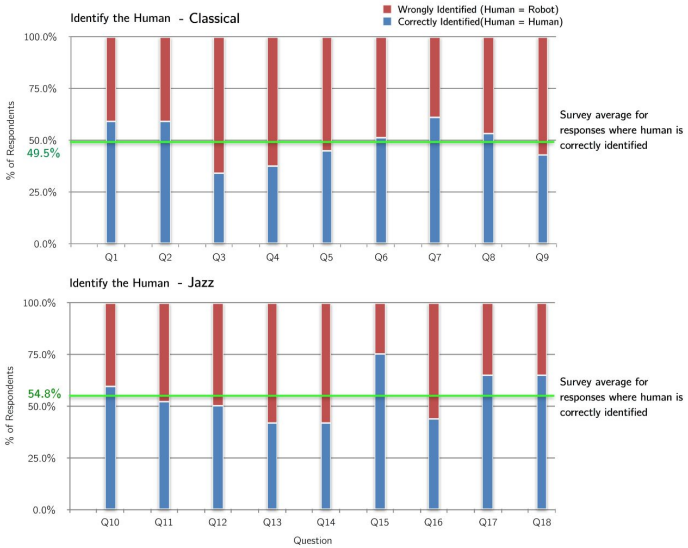
원래 악보에 인공지능만의 표현력을 넣어서 사람의 연주와 구별할수 없는 음악 연주를 생성하는 방법을 배울수 있을까?

음악에 의해 주입된 스타일의 상당 부분이 역동적인 면에서 오는것이라고 가정.

시간이 지남에 따라 음표 속도를 주입하는 방법을 배움.

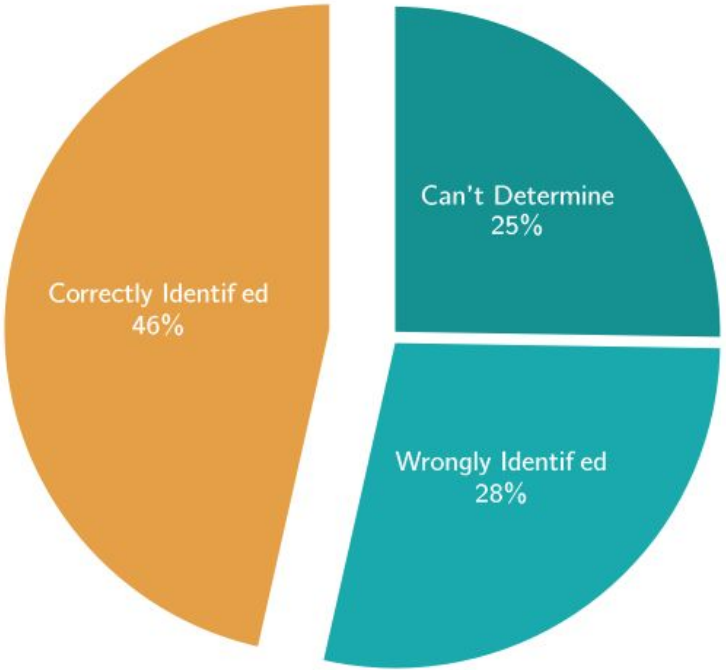


Neural Translation of Musical Style 데모



http://imanmalik.com/cs/2017/06/05/neural-style.html

설문 결과


Can't Determine
25%
Correctly Identif ed
46%
Wrongly Identif ed
28%

Learning to Create Piano Performances

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Ian Simon
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Sander Dieleman
Google DeepMind
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Douglas Eck
Google Brain
deck@google.com

Learning to Create Piano Performances

피아노 연주 생성을 학습:

음표 예측과 타이밍과 음악의 역동성 안에 있는 표현적인 다양함을 예측.

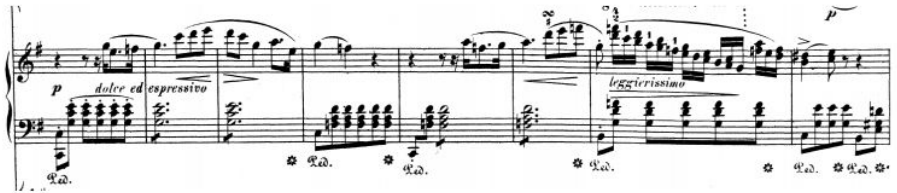
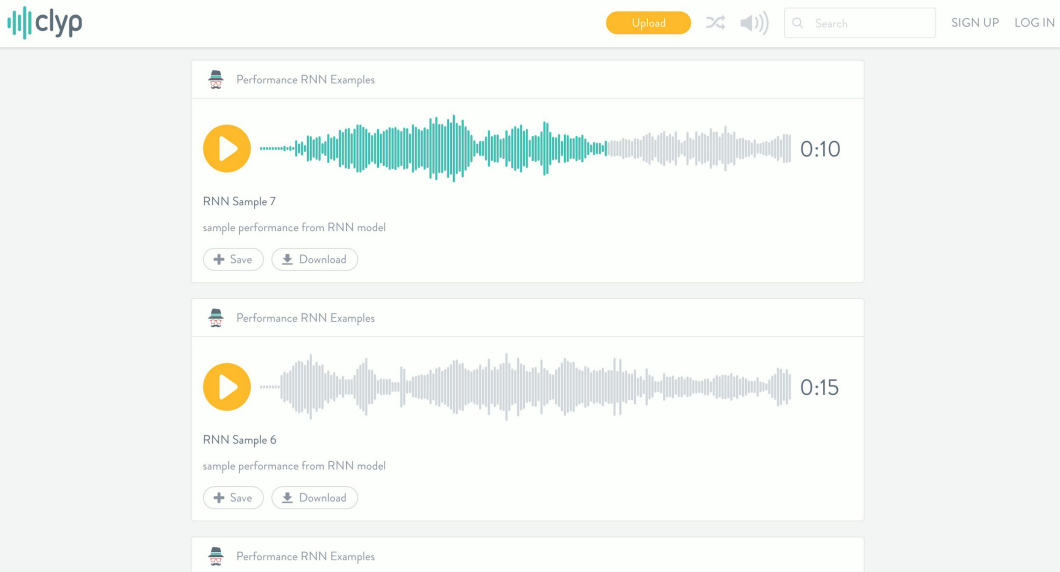


Figure 1: Excerpt from the score of Chopin's Piano Concerto No. 1.

Learning to Create Piano Performances



https://clyp.it/user/3mdslat4

연주자(피아니스트, 교사)와 작곡가(영화, 클레식, 교수등등)들의 반응

“Fantastic!!!! This [. . .] absolutely blows the stuff I’ve heard online out of the solar system. . . . The melodic sense is still foggy . . . but it’s staggering that it makes nice pauses with some arcing chord progressions [. . .] its not far from actually coming up with a worthwhile melody . . .”

“. . .sounds like you fed a bunch of Mozart, Beethoven, Schubert, and Chopin into the system ”

“. . .a very drunken Chopin, messing around a bit with psychedelics . . .something a Russian composer would’ve written under the influence of Impressionism. . . . ”

“. . . Not liking the somewhat messy run but [. . .] it seems wrong in a human way. ”

“. . . I wanted to hear more, as in longer sections, to hear how the piece would unfold from there.”

Learning to Create Piano Performances

사람이 연주처럼 들림.

생성된 샘플들은 피아노 레퍼토리를 연상케했음.

대부분의 샘플들은 스타일들은 일관되지 않았음.

흥미롭게도 일반적으로 시스템에 깊은 인상을 받은 여러 작곡가들은 멜로디에 특별히 인상받지 않았다고 함.

Hierarchical Variational Autoencoders for Music

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Jesse Engel
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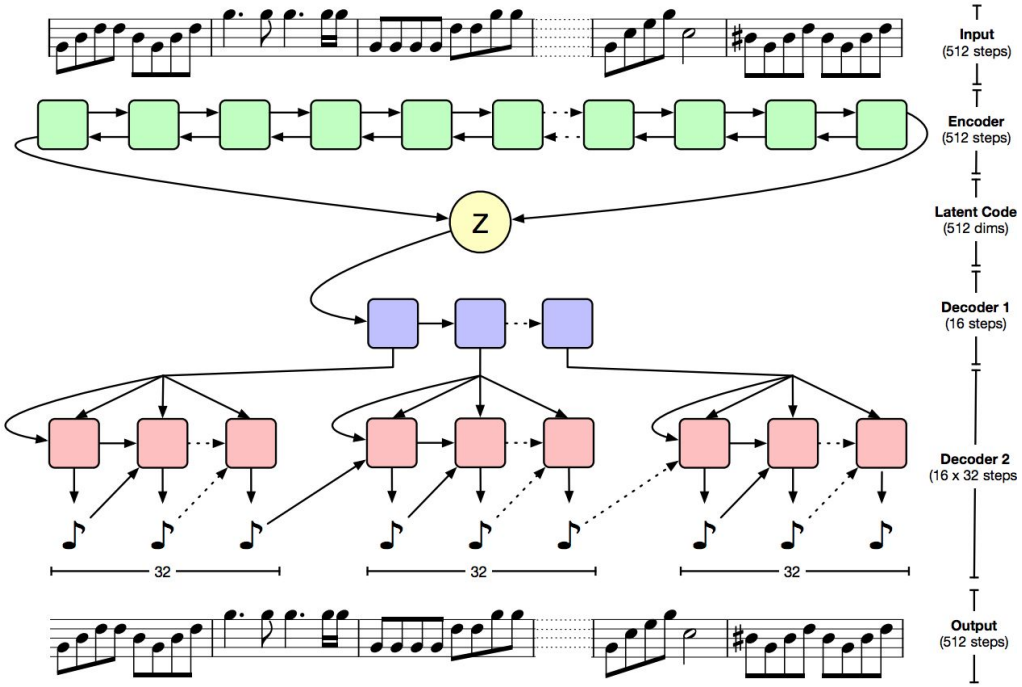
Douglas Eck
Google Brain
deck@google.com

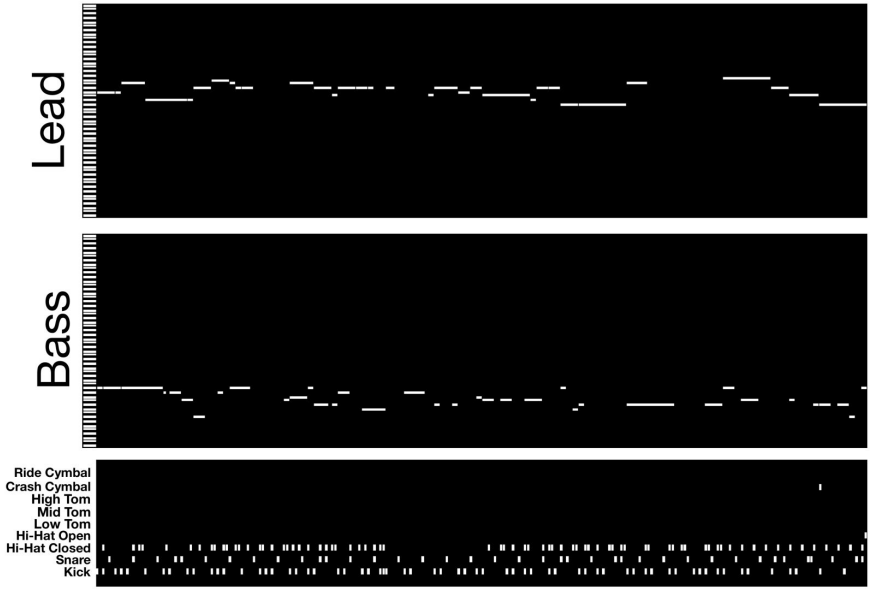
Hierarchical Variational Autoencoders for Music

짧은 음절, 긴 음절, 그리고 three piece band(lead, bass, and drums)의 조화까지 학습

1.5 million files for training



Hierarchical Variational Autoencoders for Music

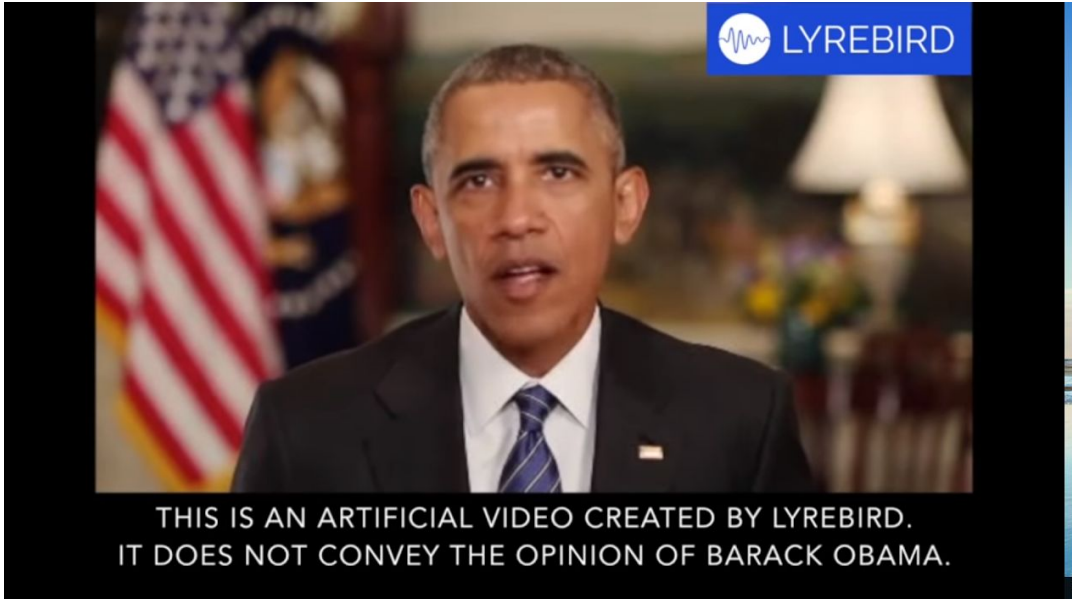


https://www.youtube.com/watch?v=G5JT16flZwM&index=1&list=PLBUMAYA6kvGU8Cgqh709o5SUvo-zHGTxr

ObamaNet: Photo-realistic lip-sync from text

Rithesh Kumar*†, Jose Sotelo*†, Kundan Kumar*†, Alexandre de Brébisson*†, Yoshua Bengio†
*Lyrebird.ai
†MILA

진짜 같은 립싱크로 누구나 어떤 말이든 하게 할수 있다!



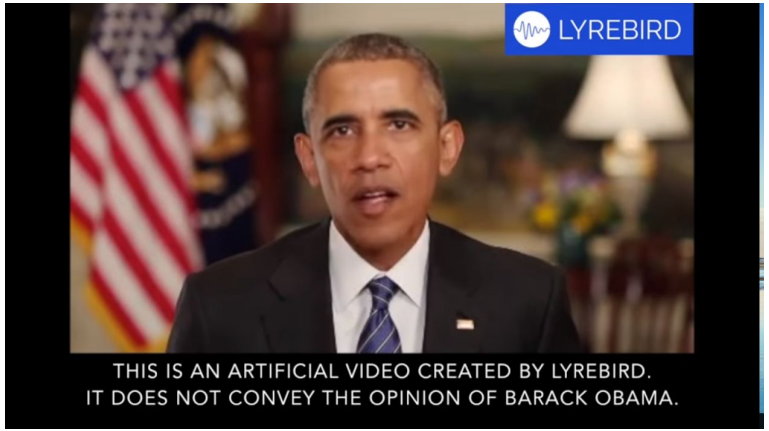
https://www.youtube.com/watch?v=YfU_sWHT8mo

Obama를 선택한 이유

Obama가 나온 비디오들이 립싱크 benchmark로 널리 사용되고 있다.

Obama가 나온 비디오 데이터는 많다.

300개의 주간 대통령 연설로부터 나온 17시간의 데이터

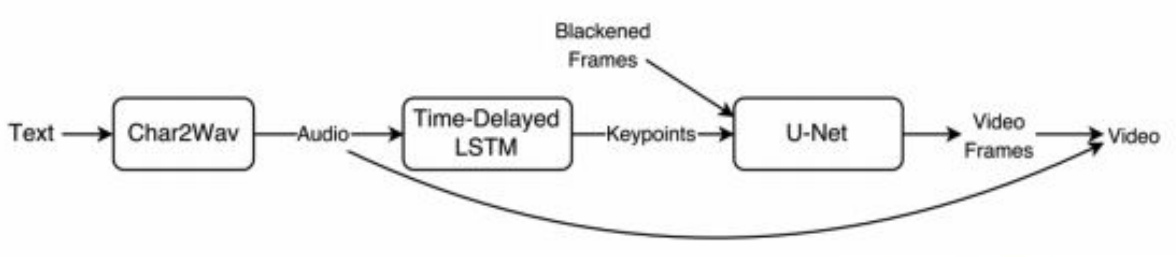


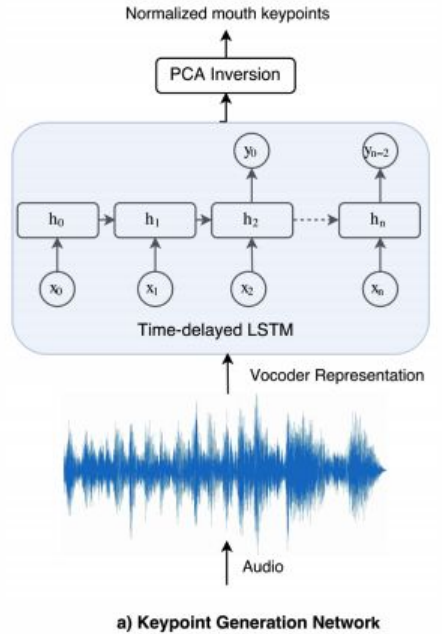
구조

Text-to-Speech (Char2Wav)

Audio-to-Keypoint

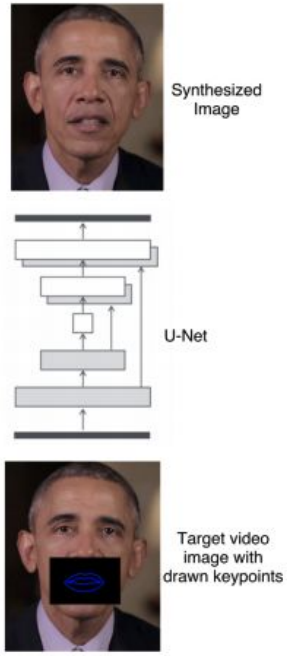
Keypoint-to-Image





a) Keypoint Generation Network

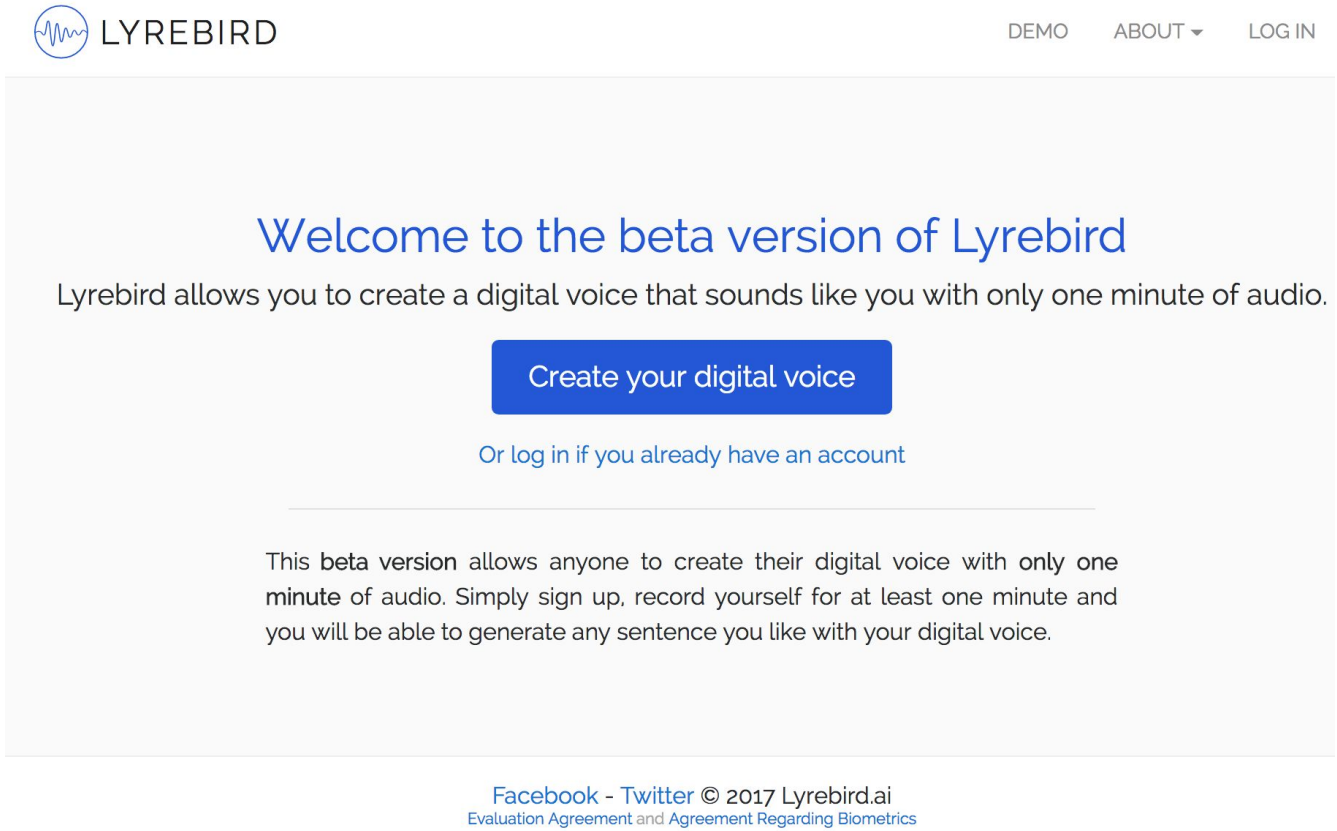
Figure 4: The 68 facial keypoints



b.) Video Generation Network

Lyrebird.ai

1분의 음성만으로
사람과 비슷한 디지털
음성을 만들수 있다.



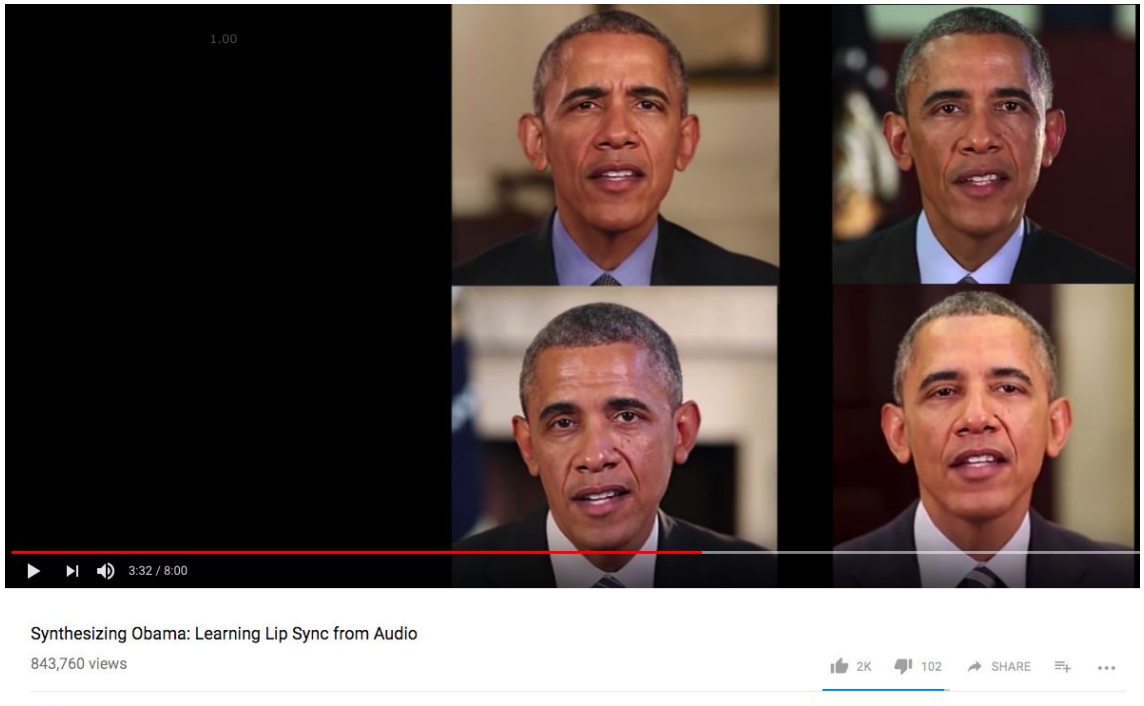
Synthesizing Obama: Learning Lip Sync from Audio, 2017

“I see the first episode of Black Mirror has begun.”

-Youtube User

“It’s better that the public is aware of such technology than being oblivious. If we were ignorant we would believe things without thinking it was tampered.”

-Youtube User



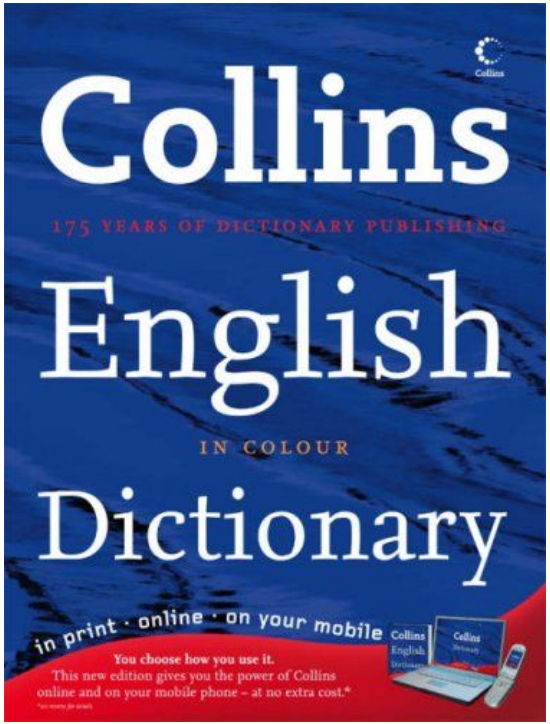
https://www.youtube.com/watch?v=9Yq67CjDqvw

Fake News

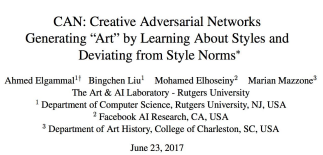
영어권에서 유명한 Collins Dictionary가 “fake news”를 2017년 올해의 단어로 선정함.

“the future of fake news. We’ve long been told not to believe everything we read, but soon we’ll have to question everything we see and hear as well.”

- Guardian



Machine Learning for Creativity and Design (NIPS 2017 Workshop) Review



CAN: Creative Adversarial Networks
Generating "Art" by Learning About Styles and
Deviating from Style Norms*

Ahmed Elgammal[1†] Bingchen Liu[1] Mohamed Elhoseiny[2] Marian Mazzone[3]
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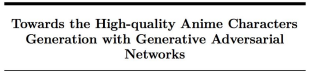
[1] Department of Computer Science, Rutgers University, NJ, USA
[2] Facebook AI Research, CA, USA
[3] Department of Art History, College of Charleston, SC, USA

June 23, 2017



Towards the High-quality Anime Characters Generation with Generative Adversarial Networks

Yanghua Jin[1] Jiakai Zhang[2] Minjun Li[1] Yingtao Tian[3] Huachun Zhu[4]
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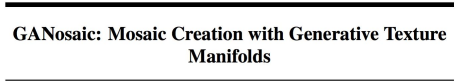
[3]yittian@cs.stonybrook.edu



GANosaic: Mosaic Creation with Generative Texture Manifolds

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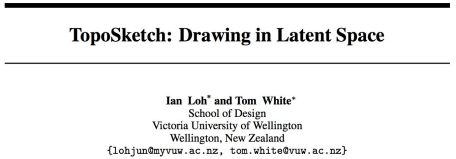
Zalando Research



TopoSketch: Drawing in Latent Space

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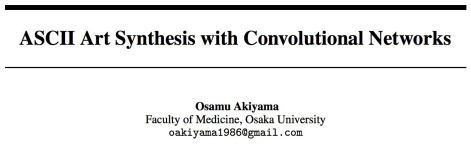

ASCII Art Synthesis with Convolutional Networks

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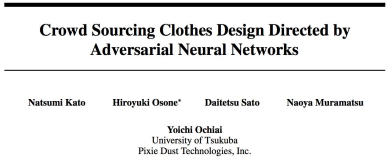

Crowd Sourcing Clothes Design Directed by Adversarial Neural Networks

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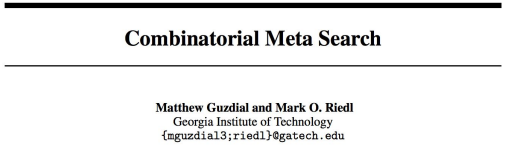
Yoichi Ochiai
University of Tsukuba
Pixie Dust Technologies, Inc.



Combinatorial Meta Search

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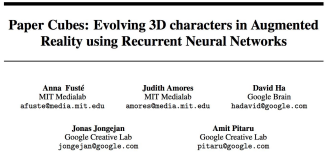

Paper Cubes: Evolving 3D characters in Augmented Reality using Recurrent Neural Networks

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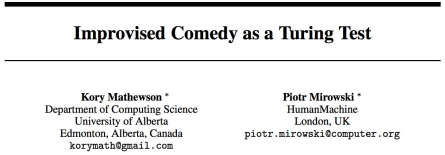

Improvised Comedy as a Turing Test

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Learning to Create Piano Performances

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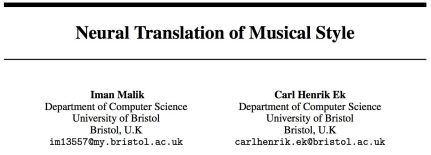

Neural Translation of Musical Style

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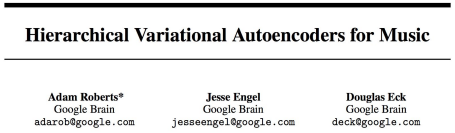

Hierarchical Variational Autoencoders for Music

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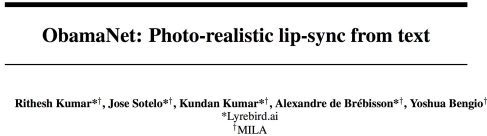


ObamaNet: Photo-realistic lip-sync from text

Rithesh Kumar*†, Jose Sotelo*†, Kundan Kumar*†, Alexandre de Brébisson*†, Yoshua Bengio†
*Lyrebird.ai
†MILA

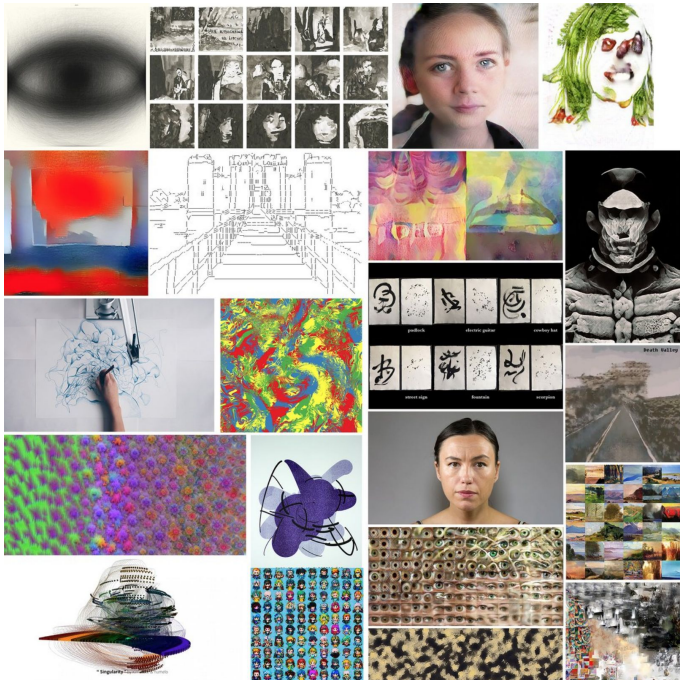
Machine Learning for Creativity and Design (NIPS 2017 Workshop) Review

미술, 음악/음성, 스토리텔링, 증강현실 등등의 다양한 분야.

시각, 청각이 많지만 후각, 촉각, 미각등도 충분히 가능성이 있음.

Magenta와 같은 지금 당장 오픈소스 프로젝트들도 많음.

인공지능으로 많은것들을 할수 있는것도 좋지만 인공지능 윤리에 대해서 계속 토론되어야함.



들어주셔서 감사합니다!