

# KOKI NAGANO

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## RESEARCH INTERESTS

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Appearance Capture, Facial Capture, Computer Animation and Simulation, GPU Rendering, Autostereoscopic Display, Realistic Digital Characters, AR, VR, Deep Learning

## EDUCATION

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**University of Southern California (USC), Los Angeles, CA** 8/2012 – 8/2017

Viterbi School of Engineering, Ph.D. student, Department of Computer Science

**Tokyo Institute of Technology, Tokyo** 4/2008 - 3/2012

B.E., Environmental Design Program, Department of Social Engineering, School of Engineering

**The Film School of Tokyo Summer Program, Tokyo** 8/2009

Practical movie shooting training with a 16 mm film camera along with professional filming equipment. Learned the manipulation of lighting equipment, direction and linear film editing.

## WORK EXPERIENCE

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**Pinscreen, Inc.** 5/2017– present

*Principal Scientist*

**Graphics Lab, USC Institute for Creative Technologies** 5/2017– 1/2019

*Research Associate*

**Graphics Lab, USC Institute for Creative Technologies** 6/2012 – 5/2017

*Graduate Research Assistant*

Advisor: Dr. Paul Debevec

**Oculus Research / Facebook Pittsburgh** 8/2016 – 1/2017

*Research Intern*

Director: Dr. Yaser Sheikh

**Weta Digital** 5/2016 – 7/2016

*Research Intern*

Manager: Dr. Antoine Bouthors

**Institut de recherche en informatique et systèmes aléatoires (IRISA), Rennes 4, 5/2012**

*Visiting Research Assistant*

Advisors: Dr. Sumanta Pattanaik, Dr. Kadi Bouatouch

**Scritter Project, Tokyo Institute of Technology**

10/2009 - 3/2012

*Undergraduate Student Researcher*

Advisors: Dr. Akihiko Shirai, Dr. Masayuki Nakajima

## PEER-REVIEWED PUBLICATIONS

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- 18. High-Fidelity Facial Reflectance and Geometry Inference from an Unconstrained Image**  
Yamaguchi S, Saito S, Nagano K, Zhao Y, Chen W, Olszewski K, Morishima S, Li H, In *ACM Transactions on Graphics, Proceedings of the 45<sup>th</sup> ACM SIGGRAPH Conference and Exhibition*. (SIGGRAPH 2018)
- 17. Mesoscopic Facial Geometry Inference using Deep Neural Networks**  
Huynh L, Chen W, Saito S, Xing J, Nagano K, Jones A, Debevec P, Li H, In *Proceedings of the 31<sup>st</sup> IEEE International Conference on Computer Vision and Pattern Recognition*. (CVPR 2018 Spotlight Presentation)
- 16. Avatar Digitization from A Single Image for Real-time Rendering**  
Hu L, Saito S, Wei L, Nagano K, Seo J, Sadeghi I, Fursund J, Chen Y, Li H, In *ACM Transactions on Graphics, Proceedings of the 10<sup>th</sup> ACM SIGGRAPH Conference and Exhibition in Asia 2017*. (SIGGRAPH ASIA 2017)
- 15. Multi-view Stereo on Consistent Face Topology**  
Fyffe G\*, Nagano K\*, Huynh L, Saito S, Busch J, Jones A, Debevec P, and Li H (\*joint first authors). In *Computer Graphics Forum Vol. 36, Issue 2*, (Eurographics 2017 Full Papers)
- 14. Photorealistic Facial Texture Inference Using Deep Neural Networks**  
Saito S, Wei L, Hu L, Nagano K, and Li H. In *Proceedings of the 30<sup>th</sup> IEEE International Conference on Computer Vision and Pattern Recognition 2017*. (CVPR 2017 Spotlight Presentation)
- 13. Time-Offset Conversations on a Life-Sized Automultiscopic Projector Array**  
Jones A, Unger J, Nagano K, Busch J, Yu X, Peng H, Barreto J, Alexander O, Bolas M, and Debevec P. In *CVPR Workshop on Computational Cameras and Displays 2016*
- 12. Massively Parallel Inverse Rendering Using Multi-Objective Particle Swarm Optimization**  
Nagano K, Collins T, Chen C, and Nakano A. In *Journal of Visualization 2016*
- 11. GPU-Based Inverse Rendering with Multi-Objective Particle Swarm Optimization**  
Nagano K, Collins T, Chen C, and Nakano A. In *ACM SIGGRAPH ASIA 2015 Symposium on Visualization in High Performance Computing*. (SIGGRAPH ASIA 2015)
- 10. Skin Microstructure Deformation with Displacement Map Convolution**  
Nagano K, Fyffe G, Alexander O, Barbic J, Li H, Ghosh A, and Debevec P, In *ACM Transactions on Graphics, Proceedings of the 42<sup>nd</sup> ACM SIGGRAPH Conference and Exhibition 2015*. (SIGGRAPH 2015)
- 9. Building a Life-Size Automultiscopic Display Using Consumer Hardware**  
Jones A, Unger J, Nagano K, Busch J, Yu X, Peng H, Alexander O, and Debevec P. In *GPU Technology Conference 2015 Presentation*
- 8. Measurement and modeling of microfacet distributions under deformation**  
Nagano K, Alexander O, Barbic J, Li H, and Debevec P. In *ACM SIGGRAPH 2014 Conference and Exhibition Talks* (SIGGRAPH 2014)

7. **Creating a life-sized automultiscopic Morgan Spurlock for CNNs "Inside Man"**  
Jones A, Unger J, [Nagano K](#), Busch J, Yu X, Peng H, Alexander O, and Debevec P. In *ACM SIGGRAPH 2014 Conference and Exhibition Talks*. (SIGGRAPH 2014)
6. **Interpolating vertical parallax for an autostereoscopic 3D projector array**  
Jones A, [Nagano K](#), Liu J, Busch J, Yu X, Bolas M, Debevec P. *SPIE Stereoscopic Displays and Applications XXV* 2014.
5. **Interpolating vertical parallax for an autostereoscopic 3D projector array**  
Jones A, [Nagano K](#), Liu J, Busch J, Yu X, Bolas M, Debevec P. *the Journal of Electronic Imaging* Vol. 23(1) 2014.
4. **Driving high-resolution facial blendshapes with video performance capture**  
Fyffe G, Jones A, Alexander O, Ichikari, R, Graham P, [Nagano K](#), Busch J, Debevec P. In *ACM SIGGRAPH 2013 Conference and Exhibition Talks*. (SIGGRAPH 2013)
3. **ScritterHDR: Multiplex-Hidden Imaging on High Dynamic Range Projection**  
[Nagano K](#), Utsugi T, Yanaka K, Shirai A, Nakajima M. In *ACM SIGGRAPH ASIA 2011 Conference and Exhibition Technical Sketches & Posters*. (SIGGRAPH ASIA 2011)
2. **A new 'multiplex content' displaying system compatible with current 3D projection technology**  
[Nagano K](#), Utsugi T, Hirano M, Hamada T, Shirai A, Nakajima M. In *ACM SIGGRAPH 2010 Conference and Exhibition Posters*. (SIGGRAPH 2010)
1. **Scritter: A multiplexed image system for a public screen**  
Hamada T, [Nagano K](#), Utsugi T, Shirai A. *Proceedings of Virtual Reality International Conference Laval Virtual*, 2010, pp. 321–323.

#### OTHER REPORTS, ARTICLES AND PATENT

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- **SIGGRAPH 2015 Technical Papers report (in Japanese)**  
Virtual Reality Society of Japan Journal Vol. 20 (3), 2015
- **Understanding Skin Roughness**  
Web article at Wikihuman.org, 2015
- **Information Display**  
Shirai A, [Nagano K](#), Utsugi T, Hamada T, Hirano M. Japan patent application, filed No. 2010-088213, 6th April 2010.

#### FEATURE FILMS

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- **"Ready Player One"** for Facial Reflectance Capture (uncredited), 2018
- **"Blade Runner 2049"** for Facial Reflectance Capture Light Stage Technicians, 2017
- **"Thor Ragnarok"** for Facial Reflectance Capture, 2017
- **"War for the Planet of the Apes"**, R&D internship at Weta Digital (uncredited), 2017
- **"Valerian and the City of a Thousand Planets"** for Facial Reflectance Capture Light Stage Engineer, 2017
- **"Logan"** for Facial Reflectance Capture Light Stage Technicians (uncredited), 2017
- **"Underworld: Blood Wars"** for Facial Reflectance Capture (uncredited), 2016
- **"The BFG"** for Facial Reflectance Capture (uncredited), 2015
- **"Central Intelligence"** for Facial Reflectance Capture (uncredited), 2015

## INSTALLATIONS, FILMS AND DEMOS

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- **Deep Learning-Based Photoreal Avatars for Online Virtual Worlds in iOS**  
[Nagano K](#), Seo J, San K, Hong A, Goldwhite M, Xing J, Rastogi S, Kuang J, Agarwal A, Kung H, Arthur C, Sun C, Chen S, Fursund J, Li H, In *ACM SIGGRAPH Conference and Exhibition Real Time Live!* (SIGGRAPH 2018)
- **Pinscreen: creating performance-driven avatars in seconds**  
Li H, Hu L, [Nagano K](#), Seo J, Saito S, Wei L, Sadeghi I, Fursund J, Chen Y, Chen S, Sun C, In *ACM SIGGRAPH Conference and Exhibition in 2017 Real Time Live!* (SIGGRAPH 2017)
- **Skin Stretch: Simulating Dynamic Skin Microgeometry**  
[Nagano K](#), Fyffe, G, Huang J, Alexander O, Busch J, Nichols C, Koylazov V, Ruskov R, Aerni M, Danny Y, and Debevec P. In *ACM SIGGRAPH Conference and Exhibition 2015 Computer Animation Festival*. (SIGGRAPH 2015)
- **An Automultiscopic Projector Array for Interactive Digital Humans**  
Jones A, Unger J, [Nagano K](#), Busch J, Yu X, Peng H, Alexander O, and Debevec P. In *ACM SIGGRAPH 2015 Conference and Exhibition Emerging Technologies*. (SIGGRAPH 2015)
- **An autostereoscopic projector array optimized for 3D facial display**  
[Nagano K](#), Jones A, Liu J, Busch J, Yu X, Bolas M, Debevec P. In *ACM SIGGRAPH 2013 Conference and Exhibition Emerging Technologies*. (SIGGRAPH 2013)
- **Digital Ira: High-Resolution Facial Performance Playback**  
USC Institute for Creative Technologies, Jao Alter, Inc., Activision, Inc., In *ACM SIGGRAPH Conference and Exhibition Real Time Live!* (SIGGRAPH 2013)
- **“Lifelike Human Face Rendering”**, NVidia Demo, May 2013 [[demo](#)]
- **“Activision R&D Real-time Character Demo”**, Demo Movie, March 2013 [[demo](#)]

## TEACHING

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### Guest Lectures

- **Capturing Photorealistic Digital Humans**  
CSCI 621 Digital Geometry Processing, USC
- **Capturing Photorealistic Digital Humans**  
CSCI 576 Multimedia Systems Design, USC

### Teaching Assistant

Tokyo Tech CSWC 0856: Media Art Technological Method

10/2011 - 11/2011

## AWARDS AND HONORS

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- **Google PhD Fellowship 2016** (Human Computer Interaction); one of 15 awardees selected from US/Canada PhD students
- **Dean’s Fellowship from the USC Viterbi School of Engineering** for Spring 2016, Jan 2016
- **DC EXPO 2015 Special Prize** by Japanese Ministry of Economy, Trade and Industry’s (METI) Digital Content Expo 2015 (chosen from SIGGRAPH 2015 E-Tech exhibits) for “An Automultiscopic Projector Array for Interactive Digital Humans”, Oct 2015

- **Best Final Project Prize in CSCI 596 “Scientific Computing and Visualization”**  
for the final project “GPU-Accelerated Inverse Rendering Using Multi-Objective Particle Swarm Optimization”, Dec 2014
- **Best “Audience Choice” prize (First prize) in CSCI 599 “Digital Geometry Processing”**  
for the final project “As-Rigid-As Possible Surface Modeling for Heterogeneous Deformable Surfaces”, May 2014
- **Funai Overseas Scholarship** includes my full tuition, full medical insurance and living costs \$2,500/month for two years from 2012 and round-trip expense and preparation expense about \$6,500 (¥500,000).
- **First Academic Prize** in the JASSO’s Student of the Year 2011 with a prize of about \$6,500 (¥500,000) from the Japan Student Services Organization, December 2011
- **Best Media Art Award** from the Center for the Study of World Civilizations, March 2011
- **VRSJ Young Researchers Award** from the Virtual Reality Society of Japan, March 2011
- **Tokyo Tech Award for Student Leadership 2010** from the President of Tokyo Tech, October 2010
- **Tokyo Tech 130<sup>th</sup> Anniversary Memorial Fund** for academic presentations, July-September 2010
- **Excellent Contents Award** from the Society for Art and Science, March 2010

#### SELECTED INTERNATIONAL PRESS & MEDIA COVERAGE

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- Enquête | Deepfake : le vrai du faux, Radio-Canada, Jan 2019
- The Fifth Estate TV Episode on “The Deepfake”, CBC Nov 2018
- A Netflix original show “Follow This” from BuzzFeed and Netflix, Aug 2018
- A.I. at SIGGRAPH: Part 2. Pinscreen at Real Time Live, fxguide, Aug 2018
- All it takes is a selfie to manipulate someone’s face, and literally put words in their mouth, CBS Evening News, Apr 2018
- Get Your Geek On: Image Manipulation Technology, Channel One News, Mar 2018
- What used to take a **sophisticated Hollywood production** company week could soon be accomplished in seconds by anyone with a smartphone, LA Times, Feb 2018 (Featured in front page)
- Manipulation von Videos: Was ist noch echt? ARD, Feb 2018
- All the Face-Tracking Tech Behind Apple’s Animoji, Wired, Oct 2017
- Exhibit allows virtual ‘interviews’ with Holocaust survivors, Washingtonpost, Sep 2017
- The **7 best highlights from Siggraph 2017**, Digital Arts, Aug 2017
- The CG Actors in ‘Logan’ You Never Knew Were There, Cartoon Brew, Mar 2017
- Face me part1: photorealistic facial texture from a single still, fxguide Dec 2016
- Neural Networks Can Now Turn a Single Photo into a Creepy 3D Face Render, GIZMODO Dec 2016
- Featuring articles in the “Lighthouse” magazine Los Angeles in April 2016, and Portland/Seattle in November 2016
- How USC’s Automultiscopic 3D Display Works, Tested, Sep 2016
- Hot Stuff! Guncy’s Eye (special feature on my recent paper and work at USC), CGWORLD Magazine (Japan), December 2015
- ACM Digital Library Selection with “Skin Microstructure Deformation with Displacement Map Convolution”, ACM, Sep 2015

- Creating **Perfect Skin**, Imperial College London ([image](#)), Aug 2015
- **A Graphics Breakthrough** Makes Perfect CGI Skin, GIZMODO, Aug 2015
- Finally, A Convincing 3D Display That Doesn't Require Glasses, GIZMODO, Aug 2015
- An Automultiscopic Projector Array for Interactive Digital Humans, Creative Applications, Aug 2015
- Digital Faces Are Looking More Human Than Ever, The Verge, Aug 2015
- Will This New Development in CGI Skin Overcome the Uncanny Valley?, Mental floss, Aug 2015
- CGI Skin Just Got a Whole Lot More Realistic, MOTHERBOARD, Aug 2015
- This **Graphical Breakthrough** Will Allow Lifelike Skin Texture in Future Games, UNILAD, Aug 2015
- Convincing computer-generated people take one step closer, BT, Aug 2015
- SIGGRAPH technical papers highlight, fxguide, Aug 2015
- Videos: **the best of Siggraph 2015's** technical papers, CG Channel.com, Jun 2015
- USC dazzles with new technology that enhances CG skin dramatically, CNET Tomorrow Daily, Jun 2015
- Advances in Skin Rendering Technology Are A Little Gross but Mostly Fascinating, digg, Jun 2015
- It Feels Like These CGI Skin Designers Are Just Trying to Scare Us Now, GIZMODO, Jun 2015
- Skin Microstructure Deformation, CG Society, Jun 2015
- This Is **the Most Realistic CGI Skin** We've Ever Seen, Fast Company, Jun 2015
- Researchers create creepy, hyper realistic CGI skin, Slash Gear, Jun 2015
- Skin Rendering Technology: How to Make Animated Skin Look **Incredibly Real**, Medical Daily, Jun 2015
- Skin Microstructure Deformation with Displacement Map Convolution ,CG Record, Jun 2015
- Skin Stretch, Prosthetic Knowledge, Jun 2015
- Automultiscopic Projector Array for Interactive Digital Humans, Prosthetic Knowledge, Jun 2015
- Skin Microstructure Deformation with Displacement Map Convolution, CG Everything, Jun 2015
- Holograms add new dimension to Holocaust survivor's story, NBC Today, May 2015
- How to live forever, Morgan Spurlock's CNN Inside Man Episode 2, Apr 2014
- 3-D Projector Blurs Lines Between Fantasy, Reality, Wall Street Journal, 2013
- Highlights of SIGGRAPH 2013 Emerging Technologies, SIGGRAPHITTI, May 2013

#### INVITED TALKS AND SEMINARS

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- **Will AI change the future? Case study in digital humans**  
Japanese Educational Resource Center, Jan 2018
- **State-of-the-art in Digital Performance Capture**  
45<sup>th</sup> forum by the Southern California Japanese Scholars Forum & Japan America Business Association, Mar 2017
- **Capturing High Resolution Photorealistic Faces and Performance**  
Waseda University, Toei Company, LTD., Feb 2017
- **Capturing High Resolution Photorealistic Faces**  
Waseda University, Oct 2015  
Digital Frontier Inc, Oct 2015  
Toppan Printing Inc, Oct 2015
- **Skin Microstructure Deformation Using Displacement Map Convolution**  
Weta Digital, Jul 2016  
Department of Computing, Imperial College London, Jul 2015

Digital Domain Chalk Talk, Sep 2015

Visual Computing/GCAD Symposium 2015, Jun 2015

- **Career Forum**

Lighthouse Career Forum, Aug 2015

- **Study Abroad Career Forum**

Tokyo Institute for Technology, Japanese Graduate Student Association in the United States, Jun 2014

Osaka University, Japanese Graduate Student Association in the United States, Dec 2012

Kyoto University, Japanese Graduate Student Association in the United States, Dec 2012

## SOFTWARE, LIBRARIES AND DATASET

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- **Pinscreen: Instant 3D Avatars**

<http://pinscreen.com/>

- **Vega FEM Library**

<http://run.usc.edu/vega/> (contributed to the ARAP surface deformation code)

- **The Wikihuman Project (Digital Emily 2.0)**

<http://vgl.ict.usc.edu/Data/DigitalEmily2/>

- **Skin Microstructure Deformation Shaders**

<http://vgl.ict.usc.edu/Software/SkinStretchShaderGLSL/>

## GRADUATE COURSES

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- CS580: 3D Graphics and Rendering
- CS596: Scientific Computing and Visualization
- CS599: Digital Geometry Processing
- CS520: Computer Animation and Simulation
- CS582: Geometric Modeling
- Math501: Numerical Analysis and Computation
- CS570: Analysis of Algorithms
- CS571: Web Technologies
- CTAN502a: Experiments in Stereoscopic Imaging
- CS545: Introduction to Robotics

## PROFESSIONAL SERVICE

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- Reviewer:
  - ACM SIGGRAPH 2016/2018
  - ACM SIGGRAPH ASIA 2017/2015
  - IEEE Transactions on Visualization and Computer Graphics 2017
  - Eurographics 2018
  - Computer Graphics Forum 2016
  - Pacific Graphics 2016, 2014
  - GCAD 2014
- Program Committee

## TECHNICAL SKILLS

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- Programming: C/C++/C#/OpenGL/GLSL/OpenCV/Java/Vega FEM/CUDA/Python/Matlab/Mathematica/MPI/OpenMP/LaTeX/JavaScript/HTML/
- Professional Tools: Unity3D, Nuke, Maya, V-Ray, Mudbox; Premiere Pro, Photoshop, Dreamweaver, After Effects;
- CG Engineering/Creation: Expert grade at Computer Graphic Certificate, CG-ARTS Society
- Calligraphy; drawing and painting (Japanese ink)
- Languages: Japanese (native), English (fluent), French (conversational)

## WEB

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Personal: <http://www.luminohope.org/>

ICT Vision and Graphics Lab: <http://vgl.ict.usc.edu/>

Pinscreen : <http://pinscreen.com/>