# Nobuyuki Umetani

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Project Lecturer
The University of Tokyo
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## PERSONAL SUMMARY

Currently, I am a project lecturer (non-tenure track faculty) in the University of Tokyo. Before joining the position, I worked at Autodesk Research in Toronto as a research scientist leading the Design and Fabrication group. Before that, I worked for Disney Research Zürich (with Bernd Bickel) and Autodesk Research (with Ryan Schmidt) as a postdoctoral researcher for one year each. I am interested in computer graphics, physics-based simulation, interactive design interface and mechanical engineering, especially:

- Integrated Design, Simulation and Interaction
- Interactive Simulation
- Computational Fabrication
- Finite Element Methods
- Data-driven Aerodynamics Modeling
- Biomechanical Simulation
- Geometry Processing for Machine Learning

I finished my Ph.D. in September 2012 under the supervision of Prof. Takeo Igarashi. When I was a master's student, I visited the applied mathematics department in TU Delft (the Netherlands) and worked with Prof. Scott MacLachlan and Prof. Kees Oosterlee. After I started my Ph.D, I visited Columbia University in New York and work with Danny Kaufman and Prof. Eitan Grinspun. In another research visit for my Ph.D., I collaborated with Prof. Niloy Mitra at the University College London. In addition, I won an internship at Microsoft Research Asia (working with Weiwei Xu and Xin Tong) in February 2012.

## WORK EXPERIENCE

Project Lecturer (July 2018-present)
The University of Tokyo, Tokyo, Japan

Research Scientist (March 2015-June 2018)
Autodesk Research, Toronto, Canada

Postdoctoral Researcher (March 2014-February 2015)
Disney Research Zürich, Switzerland

Project Researcher (December 2013-Februrary 2014)
The University of Tokyo/JST ERATO, Japan

Fix-term Research Scientist (November 2012-November 2013)
Autodesk Research, Toronto, Canada

Internship Researcher (February 2012-May 2012)
Microsoft Research Asia, Beijing, China
Supervisor: Dr. Weiwei Xu

Research Fellow (April 2010-October 2012)
Japan Society for the Promotion of Science

Research Assistant (2008 - 2010)

JST ERATO Igarashi Design Interface Project, Japan
Supervisor: Dr. Takeo Igarashi

Chief Developer (2008)
Information – technology Promotion Agency (IPA) Exploratory Software Project, Japan
Supervisor: Dr. Ikuo Takeuchi

**EDUCATION**

Ph.D., Computer Science (October 2009 – September 2012)
The University of Tokyo, Japan
Thesis: Interactive Design Exploration of Physically Valid Shapes
Adviser: Takeo Igarashi

M.S., Frontier Science (April 2006 – September 2009)
The University of Tokyo, Japan
Thesis: Coupling analysis of skeletal muscles and skeletal system using Lagrange multiplier
Adviser: Toshiaki Hisada

B.S., Mechanical Engineering (April 2002 – March 2006)
The University of Tokyo, Japan
Thesis: Analysis of open and close phase of heart valve by changing connectivity in time step
Adviser: Toshiaki Hisada

**AWARDS**

Young Researcher Award, Asia Graphics (2018)

Microsoft Research Asia Fellowship (2011)

Best Paper Award (2010)
WISS 2010(Japanese UIST), 18th Workshop on Interactive Systems and Software

Yamanouchi Award (2009)
IPSJ(Japanese ACM), Japanese Symposium on Programming

SUPER CREATER (2008)
Information-technology Promotion Agency (IPA) Exploratory Software

**TEACHING**

Nihon University, Multimedia Expression (part-time lecturer), Winter 2019

University of Toronto, Geometry Processing (guest lecture on 3D Printing), Winter 2017

University of Toronto, Computer Graphics (guest lecture), Fall 2017

SIGGRAPH 2015 Course, "Computational Tool for 3D printing" together with Bernd Bickel and Wojciech Matusik

**RESEARCH VISITS**

Computer Science Department, University College London, UK (August2011-November-2011)
Mentor: Niloy J. Mitra

Columbia Computer Graphics Group, Computer Science Department, Columbia University, USA (April 2010-March 2011)

Mentor: Eitan Grinspun

Numerical Analysis Group, Delft Institute of Applied Mathematics, Delft University of Technology, The Netherlands (April 2007-March 2008)
Mentor: Kees Oosterlee

## PROFESSIONAL SERVICE

### Program Committee

Euro Graphics short paper: 2017-2019
CASA: 2017, 2018
Pacific Graphics: 2015,2016,2019
Symposium on Computer Animation: 2016-2018
CAD/Graphics: 2017,2019
WSCG: 2017
ACM SIGGRAPH Technical Paper: 2015
SCM CHI Papers: 2019
ACM SIGGRAPH ASIA Brief and Poster: 2015

### Associate Editor

The Visual Computer: 2016-2017

### Reviewer

SIGGRAPH: 2012 - 2012
SIGGRAPH Asia: 2011 - 2019
TOG: 2015, 2016, 2019
Eurographics: 2012 - 2019
CGF: 2015 – 2019
CHI: 2017,2018
UIST: 2016 - 2019
GrapdiFab: 2016, 2017
3DUI: 2014
IEICE: 2014
Pacific Graphics: 2014-2019
TVCG: 2014 - 2019
WSCG: 2017
CAD: 2016

## INVITED TALK

"Machine Learning CFD for Interactive Aerodynamic Design", University of Toronto, Computational Science and Engineering Symposium 2019, May 2019

Interactive Design Optimization in Computational Fabrication, CAD/Graphics 2019, Keynote talk, May 2019

"Making 3D Prints more Functional using Electronics and Machine Learning", Host: Dagstuhl Seminar "Computational Aspects of Fabrication", September 2018

"Robust Shape Parameterization for Machine Learning, Host", Workshop on Robust Geometric Algorithms for Computational Fabrication, May 2018

Interactive design optimization for computational fluid dynamics, Host Bellairs Workshop on on Computer Animation: Inverse modeling problems for physics-based animation, February 2017

"Simulation-guided Interactive Exploration of Functional Design", September 2016, Host: Stelian Coros: VASC Seminar at Carngie Mellon University

"Simulation-guided Interactive Exploration of Functional Design", McGill university, Host: Paul Kry, May 2016,

"Simulation-guided Interactive Exploration of Functional Design", Host: Kun Xu, Pacific Graphics 2015 Invited Talk, October 2015

"Simulation-Guided Creation: Interactive Simulation to Animate and Fabricate your Own Idea", Host: Marie-Paule Cani:"Expressive modeling : New advances towards the seamless creation of 3D content", June 2015

"Interactive Design of Functional Shapes", Schloss Dagstuhl, Germany, September 2014,
Host: Dagstuhl Seminar: "Computational Aspects of Fabrication"

"Interactive Authoring for Designing Physically Valid Shapes", University of Manitoba, May 2013,
Host: Jim Young

"Interactive Exploration of Physically Valid Shapes", Disney Research Zurich, February 2013,
Host: Bernd Bickel

"Integration of Design, Simulation and Interaction", Max Planck Institute Infomatik, October 2011,
Host: Michael Wand

"Interactive integration of design and real-time simulation", New York University, September 2010
Host: Kenshi Takayama

**SOFTWARE**

DelFEM2: https://github.com/nobuyuki83/delfem2
This is a C++/Python toolkit for solving various partial differential equations (PDE) using finite element method (FEM). The user can run FEM simulation on a shape with just ~20 lines of Python code. The library provides end-to-end solution and equips with all the component requires for digital engineering such as CAD system, mesh generator, FEM solver, linear solver, and their visualizer all implemented by the author. DelFEM2 is aiming for interactive digital engineering and authoring tool.

Structural weakness detection for Autodesk MeshMixer®: http://www.meshmixer.com/
During my post-doc in Autodesk, I developed weak structure detection function for Autodesk MeshMixer. This function detects breakable location in a complicated 3D structure in a fraction of a second. This function is used for computational vilification of design for 3D printing. This technology was newly developed and described in a paper "Cross-sectional Structural Analysis for 3D printing".

Hair simulation for Autodesk Maya, Nucleus®: http://www.autodeskresearch.com/projects/nucleus
During my post-doc in Autodesk, I developed new version of hair simulation component for Nucleus. Nucleus is a simulation library for Maya, which is visual computing widely used design software in the computer animation industry.

**Technical Skills**

- C++ Coding
  - Expert level. More than 10 years of experience. I can develop and maintain large scale (over 100 thousands lines) cross-platform software. I am familiar with modern style C++11 coding.
  - I can write a C++ python binding with PyBind11
  - I have in depth knowledge of OpenGL and familiar with modern version of OpenGL. I can write shaders with GLSL.
  - I have few years experience of CUDA-based GPGPU programming.
- Python Coding

    - Expert level. Three years of experience. I am familiar with many packages (numpy,scipy,pytorch,tensorflow,PyQt)
- Other program languages
    - Though not as good as C++ and Python, I can code JavaScript, C#, Fortran, Java well.
- I have experience with collaborative development using git. I'm familiar with continuous integration tools like travis.ci and wercker.
- Software: MAYA, Blender, Houdini, Paraview, Fusion 360

**Language Proficiency**

- Japanese: Native
- English: Fluent
- Chinese: Intermediate
- French: Elementary