

# Curriculum Vitae

January, 2020

## **Tadamasa Sawada**

National Research University – Higher School of Economics

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### **Education**

2003-2006: Doctor of Science in Information Processing. Department of Information Processing, Tokyo Institute of Technology Graduate School, Ph.D. dissertation: “Human perception of shape from shading,” 2006.

2001-2003: Department of Information Processing, Tokyo Institute of Technology Graduate School, M.Sc. thesis: “The role of priors in shape perception from shading,” 2003.

1997-2001: Department of Electrical and Electronic Engineering, Faculty of Engineering, Tokyo Institute of Technology, Bachelor Degree of Engineering.

### **Professional Affiliations**

Vision Science Society

Society for Mathematical Psychology

### **Professional Experience**

Sep/01/2014-Current: Assistant Professor, School of Psychology, National Research University – Higher School of Economics, Moscow, Russia.

Apr/11/2014-Aug/31/2014: Postdoctoral Research Assistant (H1B), Graduate Center for Vision Research, SUNY College of Optometry, New York, NY.

Jan/19/2013-Apr/10/2014: Postdoctoral Research Assistant (H1B), Department of Psychology, the Ohio State University, Columbus, OH.

Oct/19/2011-Jan/18/2013: Postdoctoral Research Assistant (H1B), Department of Psychological Sciences, Purdue University, West Lafayette, IN.

Apr/04/2006-Mar/31/2011: Postdoctoral Research Fellow (J1), Department of Psychological Sciences, Purdue University, West Lafayette, IN.

## **Editorial work**

Guest editor for a special issue of “Symmetry of Perception and Behaviour” in *MDPI Symmetry* (2019-2020). [https://www.mdpi.com/journal/symmetry/special\\_issues/symmetry\\_animal\\_vision](https://www.mdpi.com/journal/symmetry/special_issues/symmetry_animal_vision)

## **Ad hoc reviewer for**

*Attention, Perception, & Psychophysics*

*Behavior Research Methods*

*Cognition*

*Cognitive Systems Research*

*IEEE Transactions on Industrial Informatics*

*Journal of Experimental Psychology: Human Perception and Performance*

*Journal of Imaging Science and Technology*

*Journal of Mathematical Psychology*

*Journal of Vision*

*MDPI Robotics*

*MDPI Sensors*

*MDPI Symmetry*

*MDPI Vision*

*NeuroImage*

*Open Geosciences*

*Pattern Recognition*

*Perception*

*Perceptual and Motor Skills*

*Quarterly Journal of Experimental Psychology*

*Vision Research*

*Journal of the Vision Society of Japan*

*The Conference on Behavior Representation in Modeling and Simulation (BRiMS)*

*The European Conference on Visual Perception (ECVP)*

*The Iberoamerican Congress on Pattern Recognition (ICPR)*

## **Grants**

Sawada, T. (2018) Visual perception in our everyday life (19-04-006). Research Team Project Competition (HYT) at National Research University Higher School of Economics.

## **Awards**

Best Academic Supervisors, HSE, 2019. <https://www.hse.ru/en/best/2019nirs/>

Letter of recognition for major contributions to the department of cognitive research at the school of Psychology, HSE, 2019.

Fred Brown Research Award for Sawada & Petrov (2017, Journal of Neurophysiology) at the Ohio State University.

Dr. A. Louis Medin award (third place poster paper) for The 13th NDIA Annual Science & Engineering Technology Conference/Defense Tech Exposition, 2012.

### **To students supervised by me**

Sergeev, N. D. & Ckuratov, A. V. (2018). *Development of a Gamified mixed reality system: towards an exposure therapy for animal phobia*. The 1st place of "the best research work on technical sciences and applied mathematics for graduate students and graduates of 2018" in NIRS (НИРС) competition, HSE. <https://www.hse.ru/mirror/pubs/share/303943618>; [https://www.hse.ru/nirs/lastyear\\_NIRS](https://www.hse.ru/nirs/lastyear_NIRS)

### **Patents**

Pizlo, Z., Sawada, T., & Li, Y. (Granted). Reconstruction of shapes of near symmetric and asymmetric objects. US8406567 B2 (<https://www.google.us/patents/US8406567>).

Pizlo, Z., Sawada, T., & Li, Y. (Filed). Figure-ground organization of 3D scenes. US20140049613 A1 (<https://www.google.us/patents/US20140049613>), WO2012116350 A3 (<https://www.google.us/patents/WO2012116350A3>).

### **Press Releases**

Standardizing the divisive-normalization model of V1 neurons. (2017). *Journal of Neurophysiology Podcast* (<https://www.youtube.com/watch?v=n5276Nlp16Q>)

Robot Vision Goes 3-D. (2013). *NSF Highlight* (<http://go.usa.gov/bm5F>)

Purdue researcher helps robots 'see' in 3-D like humans. (May 2, 2012). *Purdue News Room* ([http://www.purdue.edu/newsroom/research\\_park\\_foundation/2012/120502PizloRobotVision.html](http://www.purdue.edu/newsroom/research_park_foundation/2012/120502PizloRobotVision.html)) followed by: e.g. *Reuters, Chicago Daily Herald, Wall Street Select, Los Angeles Daily News, Genetic Engineering News, IT News, Yahoo Finance, Marketwatch, BusinessInsider.com, CBS Money Watch*.

Зарубежные учёные - о Российской науке и жизни в Москве (Foreign scientists – science in Russia and life in Moscow). (2015). *The Village* (<http://www.the-village.ru/village/people/people/227157-scientists>)

### **Public Talks**

Problems in Psychology: Replication crisis and publication bias. At Kocherga club (<https://kocherga-club.ru/>), <https://kocherga.timepad.ru/event/1234730/>, 25/Jan/2020.

Seeing Impossible. At Kocherga club (<https://kocherga-club.ru/>), <https://kocherga.timepad.ru/event/1097488/>, Moscow, Russia, 02/Nov/2019.

Virtual Reality: Its Mechanism, Problems, and Future. At Smart place "INBOX" (<http://inbox-mos.ru/>), <https://www.facebook.com/events/180971979058067/>, 18/Apr/2017.

## Publications

### Monograph

Pizlo, Z., Li, Y., Sawada, T. & Steinman, R.M. (2014) *Making a Machine That Sees Like Us*. New York, NY: Oxford University Press.

### Journals

Mischenko, E., Negishi, I., Gorbunova, E. S., & Sawada, T. (under review). Examining the role of familiarity in the perception of depth.

Minkov, V. & Sawada, T. (under review). Seeing a triangle in a 3D scene.

Sawada, T. (under-revision after the decision of “major-revision”). A computational model that recovers depth from stereo-input without using any oculomotor information. *Journal of Mathematical Psychology*.

Sawada, T., Rozhkova, G. I. (accepted) Two re-discoveries of the autostereogram in the 1960s. *i-Perception*.

Koshmanova, E. & Sawada, T. (2019) Perceiving Perpendicular and Parallel Contours in the Frontoparallel Plane. *Vision Research*, 154, 97-104.

Sawada, T. & Zaidi, Q. (2018) Rotational-symmetry in a 3D scene and its 2D image. *Journal of Mathematical Psychology*, 87, 108-125.

Jayadevan, V. T., Sawada, T., Delp, E., & Pizlo, Z. (2018) Perception of 3D symmetrical and nearly symmetrical shapes. *Symmetry*, 10, 8:344, 1-24.

Sawada, T., & Petrov, A.A. (2017) The Divisive-Normalization Model of V1 Neurons: A Comprehensive Comparison of Physiological Data and Model Predictions. *Journal of Neurophysiology*, 118, 3051-3091.

Kwon, T., Li, Y., Sawada, T., & Pizlo, Z. (2016) Gestalt-like constraints produce veridical (Euclidean) percepts of 3D indoor scenes. *Vision Research*, 126, 264-277.

Sawada, T., Li, Y., & Pizlo, Z. (2014) Detecting 3D Mirror-Symmetry in a 2D Camera Image. *Proceedings of IEEE*, 102(10), 1588-1606.

Li, Y., Sawada, T., Latecki, L.M., Steinman, R.M., & Pizlo, Z. (2012) Visual recovery of the shapes and sizes of objects, as well as distances among them, in a natural 3D scene. *Journal of Mathematical Psychology*, 56(4), 217-231.

Li, Y., Sawada, T., Shi, Y., Kwon, T., & Pizlo, Z. (2011) A Bayesian model of binocular perception of 3D mirror symmetric polyhedra. *Journal of Vision*, 11(4):11, 1-20.

Sawada, T., Li, Y., & Pizlo, Z. (2011) Any pair of 2D curves is consistent with a 3D symmetric interpretation. *Symmetry*, 3(2), 365-388.

Pizlo, Z., Sawada, T., Li, Y., Kropatsch, W., & Steinman, R.M. (2010) New Approach to the Perception of 3D Shape Based on Veridicality, Complexity, Symmetry and Volume. *Vision Research*. 50(1), 1-11.

Sawada, T. (2010) Visual detection of symmetry of 3D shapes. *Journal of Vision*, 10(6):4, 1-22.

Tsuruhara, A., Sawada, T., Kanazawa, S., Yamaguchi, M., Corrow, S., & Yonas, A. (2010) The development of the ability of infants to utilize static cues to create and access representations of object shape. *Journal of Vision*, 10(12):2, 1-11.

Tsuruhara, A., Sawada, T., Kanazawa, S., Yamaguchi, M., & Yonas, A. (2009) Infant's sensitivity to pictorial depth cues: a transfer-across-cues study. *Infant Behavior and Development*. 32(4), 468-475.

Sawada, T., & Pizlo, Z. (2008) Detection of skewed symmetry. *Journal of Vision*, 8(5):14, 1-18.

Sawada, T., & Kaneko, H. (2007) Smooth-shape assumption for perceiving shapes from shading. *Perception*, 36(3), 403-415.

Sawada, T., & Kaneko, H. (2006) Extracting illuminant direction from visual information for perceiving shape from shading. *The Journal of the Vision Society of Japan*, 18(4), 161-172 (in Japanese).

Sawada, T., & Kaneko, H. (2003) Spatial properties of multiple cues for perceiving shape from shading. *The Journal of the Institute of Image Information and Television Engineers*, 57(5), 597-602 (in Japanese).

### **Book Chapters**

Sawada, T., Li, Y., & Pizlo, Z. (in press) Organizing a 2D image for 3D shape recovery. *The Oxford Handbook of Computational Perceptual Organization*.

Sawada, T., Li, Y., & Pizlo, Z. (2015) Shape Perception. In J. R. Busemeyer, Z. Wang, J. T. Townsend, & A. Eidels (Eds.), *The Oxford Handbook of Computational and Mathematical Psychology* (pp. 255-276). New York, NY: Oxford University Press.

Li, Y., Sawada, T., Shi, Y., Steinman, R.M., & Pizlo, Z. (2013) Symmetry is the sine qua non of shape. In S. Dickinson & Z. Pizlo (Eds.), *Shape perception in Human & Computer Vision*. New York, NY: Springer.

Sawada, T., Li, Y., & Pizlo, Z. (2011) Symmetry, shapes and surfaces. In C. W. Tyler (Ed.), *Computational Vision: From Surfaces to Objects* (pp. 113-124). Boca Raton, FL: Chapman Hall/CRC.

### **Book Review**

Sawada, T. & Pizlo, Z. (2008) There is no royal road to vision science. Review of *Seeing Spatial Form*, by Jenkin, M.R.M. & Harris, L.R. eds. *Perception*, 37(10), 1612-1616.

### **Conference Proceedings (Refereed)**

Sawada, T., & Petrov, A.A. (2015) A Study of the Role of the Maintained-Discharge Parameter in the Divisive Normalization Model of V1 Neurons. *BICT'15 Proceedings of the 9th EAI International Conference on Bio-inspired Information and Communications Technologies (BIONETICS)*, 570-573.

Li, Y., Sawada, T., & Pizlo, Z. (2012) Building a seeing machine. *The 21th Behavior Representation in Modeling & Simulation (BRiMS) Conference*, 161-168.

Pizlo, Z., Li, Y., & Sawada, T. (2012) Making a machine that sees like us. *The 13th NDIA Annual Science & Engineering Technology Conference/Defense Tech Exposition*.

Sawada, T., & Pizlo, Z. (2008) Detecting mirror-symmetry of a volumetric shape from its single 2D image. *The Sixth IEEE Computer Society Workshop on Perceptual Organization in Computer Vision in Conjunction with IEEE CVPR 2008*.

Sawada, T., & Pizlo, Z. (2007) Symmetry detection in 3D scenes. *Proceedings of SPIE*, 6498, 64980Y/1-12.

### **Preprint/Technical-report**

Mischenko, E., Negishi, I., Gorbunova, E. S., & Sawada, T. (2019). Examining the role of familiarity in the perception of depth. *PsyArXiv*.

Sawada, T. (2019) A Computational Model That Recovers Depth from Stereo-Input without Using Any Oculomotor Information. *NRU Higher School of Economics. Series PSY "Psychology"*. No. WP BRP 106/PSY/2019.

Koshmanova, E. & Sawada, T. (2018) Perceiving Perpendicular and Parallel Contours in the Frontoparallel Plane. *NRU Higher School of Economics. Series PSY "Psychology"*. No. WP BRP 90/PSY/2018.

Minkov V., Sawada T. (2018) Seeing a Triangle in a 3D Scene Monocularly and Binocularly. *NRU Higher School of Economics. Series PSY "Psychology"*. No. WP BRP 91/PSY/2018.

### **Invited Talks**

#### **Symposia**

The geometry and perception of 3D mirror- and rotational-symmetry. In *Organizational Principles of Vision, Annual Meeting of the Society for Mathematical Psychology*, Montreal, Canada, 2019.

Comparing human performance measured using different psychophysical methods and tasks. In *Psychophysics, European Congress of Psychology*, Moscow, Russia, 2019.

2D images of a 3D symmetrical shape and 3D interpretations of a 2D symmetrical image. *Symmetry: Theory and Applications, Annual Meeting of the Society for Mathematical Psychology*, Québec, Canada, 2014.

#### **Colloquia**

Developing a simple VR app using a smartphone (Android). In "Applied cognitive science" Summer School, 2019. <https://social.hse.ru/psy/appcogn>

Mathematical and computational approaches for studying veridical and illusory perception. Ritsumeikan University, Ibaraki, Osaka, Japan, 2018.

Human factors of Virtual-Reality (VR) and studying humans using VR. HSE Tikhonov Moscow Institute of Electronics and Mathematics (MIEM HSE), Moscow, Russia, 2017.

Comparing human vision with machine vision. Yamagata University, Yonezawa, Yamagata, Japan, 2016.

Modeling in vision science. Yamagata University, Yonezawa, Yamagata, Japan, 2016.

Veridical visual perception and a computer that emulates it. HSE Tikhonov Moscow Institute of Electronics and Mathematics (MIEM HSE), Moscow, Russia, 2016.

Visual perception as an inverse ill-posed problem. Tokyo Institute of Technology, Yokohama, Kanagawa, Japan, 2015.

Visual perception of 3D-mirror and 3D-rotational symmetry. Meiji University, Tokyo, Japan, 2015.

Mathematical and computational approaches to study human 3D scene perception. Faculty of Psychology, National Research University – Higher School of Economics, Moscow, Russia, 2014.

Detecting symmetry of a 3D shape from its single 2D image. Department of Psychology, Tsinghua University, Beijing, China, 2012.

Detecting symmetry of a 3D shape from its single 2D image. Department of Psychology, Tsinghua University, Beijing, China, 2012.

2D invariants of 3D symmetry. Department of Psychology, Ohio State University, Columbus, Ohio, 2012.

Detection of 3D symmetry from a single 2D image. Department of Psychology, Chuo University, Tokyo, Japan, 2011.

Detection of 3D symmetry from a single 2D image. Department of Information Processing, Tokyo Institute of Technology, Yokohama, Japan, 2011.

Detection of 3D symmetry from a single 2D image. Graduate Institute of Brain and Mind Sciences, National Taiwan University, Taipei, Taiwan, 2011.

Visual detection of symmetry of 3D shapes. Department of Vision Science, SUNY Optometry, New York, NY, 2010.

Recovering a 3D shape from a single 2D image: computational model and psychophysics. Department of Computer and Information Sciences, Temple University, Philadelphia, PA, 2009.

Effects of experience on shape perception from shading. Department of Psychology, Chuo University, Tokyo, Japan, 2005.

## **Teaching**

### **Graduate (Master)**

Visual Perception and Attention (2015, 2016, 2017, 2018, 2019)

Qualitative and Quantitative Research Methods in Psychology (2019)

Research Seminar “Cognitive science” (2014, 2015, 2016, 2017, 2018, 2019)

### **Undergraduate**

Research Seminar “Visual illusions as probes for studying the visual system” (2014, 2015)

## **Summer school**

Theoretical approach to visual perception (August 2015, Chuo university, Tokyo, Japan)