

Minjoon Kouh

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Drew University, 36 Madison Avenue, Madison, NJ 07940

Education

Massachusetts Institute of Technology: Ph.D. in Physics (2007)

Thesis: Toward a more biologically plausible model of object recognition.

University of California at Berkeley: M.S. in Physics (1999)

Massachusetts Institute of Technology: B.S. in Physics (1997)

Thesis: Arrays of quantum dots as semiconductors.

Academic Positions

Drew University: 2009 – Present

Assistant Professor (Physics Department and Neuroscience Program)

The Salk Institute for Biological Studies: 2007 – 2009

Post-doctoral Research Associate (Computational Neurobiology Laboratory)

California University at San Marcos: Fall, 2008

Adjunct Professor (Physics Department)

Publications

- M. Eickenberg, R. Rowekamp, M. Kouh, and T. Sharpee. "Characterizing responses of translation-invariant neurons to natural stimuli." *Neural Comp.* (in press)
- Kawam, M. Lamont, D. Holz, and M. Kouh. "Wiimote experiments: Coupled oscillators and circular motion." *The Physics Teacher*, (Under review, 2012)
- Kawam and M. Kouh. "Wiimote experiments: 3D inclined plane problem for reinforcing vector concepts." *The Physics Teacher*, 49: 508-209 (2011)
- M. Kouh and T. Sharpee. "Estimating linear-nonlinear models using Renyi divergences." *Network*, 20(2): 49-68 (2009).
- M. Kouh and T. Poggio. "A canonical neural circuit for cortical nonlinear operations." *Neural Comp.* 20(6): 1427-1451 (2008).
- T. Serre, G. Kreiman, M. Kouh, C. Cadieu, U. Knoblich and T. Poggio. "A quantitative theory of immediate visual recognition." *Prog. Brain Research*, 165: 33-56 (2007).
- D. Zoccolan, M. Kouh, J. DiCarlo and T. Poggio. "Trade-off between object selectivity and tolerance in monkey inferotemporal cortex." *J. Neurosci.*, 27(45): 12292-307 (2007).
- Cadieu, M. Kouh, A. Pasupathy, C. Connor, M. Riesenhuber and T. Poggio. "A model of V4 shape selectivity and invariance." *J. Neurophys.*, 98(3): 1733-50 (2007).

Teaching

Drew University (Madison, NJ)

- PHYS-1: Introductory Physics 1 (2009F)
- PHYS-2: Introductory Physics 2 (2010S)
- PHYS-3: General Physics Laboratory (2009F, 2010F, 2011F)
- PHYS-4: General Physics Laboratory (2010S, 2011S, 2012S)
- PHYS-10: Robotics Engineering (2012J)
- PHYS-103: Modern Physics (2010F, 2011F)
- PHYS-111 / NEURO-111: Computational Modeling of Neural Systems (2010S, 2011S)
- NEURO-168: Theories about Vision (2012S)
- CSCI-8: Dynamic Data in a Wired World (2011J)
- College (Freshmen) Seminar: Computers and Brains (2010F, 2011F)
- Honors Seminar: Light, Brain, Action! Optogenetic Technique in Neuroscience (2012S)

California State University (San Marcos, CA)

- GES-100: Physical Science Around Us (2008F)

NJ Governor's School in Sciences

- Team project in computational neuroscience (Summers, 2011 and 2012)

Research Experiences

Drew University, Physics Department and Neuroscience Program (Madison, NJ): *2009 – Present*

- Investigates information-processing mechanisms of the neural systems, using computational and theoretical methods.
- Studies neural plasticity, neural coding, and object recognition process in the brain.
- Uses simple robotics to investigate the interaction between sensory and motor systems.
- Applies accelerometer technology to perform physics experiments.

Salk Institute for Biological Studies (La Jolla, CA): *2007 – 2009*

Advisor: Prof. T. Sharpee

- Implemented algorithms for finding maximally informative dimensions of neural responses.
- Conducted extracellular electrophysiology experiments on primate visual cortical area V4, in collaboration with Reynolds' laboratory.

MIT Center for Biological and Computational Learning (Cambridge, MA): *2001 – 2007*

Advisor: Prof. T. Poggio

- Investigated computational mechanisms for object recognition.
- Analyzed neural data from primate cortex (visual areas V1, V4 and IT) in collaboration with physiologists from MIT, Johns Hopkins University and Harvard Medical School.
- Implemented computer software that simulates large-scale hierarchical neural network of primate visual cortex.

Other Projects

- **Ford Research Laboratory** (Dearborn, MI): *Summers 1997 and 1998*
Investigated binding and catalytic interactions between metal surface and oxygen atoms, and optimized computational model of oxygen gas sensor, by solving a set of coupled differential equations.
- **MIT Center for Theoretical Physics** with Prof. L. Randall: *1996 – 1997*
Analyzed theoretical model of quantum dot array, by calculating dependence of energy bands on various parameters such as size and spacing of quantum-dots.

- **MIT Biology Department** with Prof. V. Ingram: 1995 – 1996
Conducted voltage-clamp experiments, and investigated biophysical impact of beta-Amyloid peptides, implicated in Alzheimer’s disease, on cultured neurons.

Work Experiences

State Street Associates (Cambridge, MA): *Summer, 2007*

- Developed Matlab-based software for collecting daily financial market data from Oracle database and web.
- Analyzed correlations between stock prices and proprietary market indices.
- Optimized software for simulating performance of asset allocation models.

PeopleSoft, Inc. (Pleasanton, CA): *1999 - 2001*

- Installed, customized, and integrated various components of enterprise e-business applications (HR, ERP, CRM, Employee Portal) for international clients (banking, insurance, consulting, and manufacturing firms).
- Worked with database (Oracle and SQL Server), web, and application servers on UNIX and Microsoft platforms.

Presentations

Talks

- “Learning about what drives a neuron to spike.” Sentience Undergraduate Neuroscience Symposium at Drew University (Madison, NJ. 2011)
- “Computational neuroscience course in a liberal-arts college setting.” American Association of Physics Teachers (Jacksonville, FL. 2011).
- “Computations in the brains: Recognizing patterns.” NJ Governor’s School of Sciences at Drew University (Madison, NJ. 2010)
- “Computations in the visual cortex.” Frontiers in Science Seminar at California State University (San Marcos, CA. 2008).
- “Toward a more biologically plausible model of object recognition.” Sandia National Laboratory (Albuquerque, NM. 2007), Princeton University (Princeton, NJ. 2007), Albert Einstein College of Medicine (Bronx, NY. 2007).
- “Object recognition in clutter: selectivity and invariance properties in a model of object recognition.” McGovern Institute Retreat (New Port, RI. 2006), NIH-Conte Meeting (Cambridge, MA. 2006).

Posters

- M. Kouh, M. Eickenberg, R. Rowekamp, and T. Sharpee. "Analyzing neural feature selectivity and invariance properties by finding maximally informative invariant dimensions." Gordon Research Conference on Eye Movements (Biddeford, ME. 2011).
- Kawam and M. Kouh. "Wiimote experiments for reinforcing vector concepts in introductory physics." American Association of Physics Teachers (Jacksonville, FL. 2011).
- Cadieu, M. Kouh, M. Riesenhuber and T. Poggio. “Shape Representation in V4: Investigating Position-Specific Tuning for Boundary Conformation with the Standard Model of Object Recognition.” Vision Sciences Society (Sarasota, FL. 2005).
- M. Kouh and T. Poggio. “Gain Control Circuits Underlie Tuning of Cortical Neurons.” COSYNE (Salt Lake City, UT. 2005).
- M. Kouh, C. Cadieu, M. Riesenhuber and T. Poggio. “Investigating Shape Representation in V4 with a Computational Model.” Society for Neuroscience (San Diego, CA. 2004).

Workshops

NEURON Workshop at UCSD (San Diego, CA): *Summer, 2011*
“NEURON Simulation Environment”

Marine Biological Laboratory (Woods Hole, MA): *Summer, 2007*
“Methods in Computational Neuroscience”

Santa Fe Institute (Santa Fe, NM): *Summer, 2003*
“From Neuron to Network: Biologically-based functional models”

PROMYS at Boston University (Boston, MA): *Summers, 1991 – 1993*
“Number Theory”