Michael Slugocki

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Research Interests

Machine vision, Visual Psychophysics, Computer vision, Bayesian inference, Predictive modeling

Education

Vision Researcher - McMaster University, Hamilton, ON

Ph.D. Candidate, Psychology, Neuroscience & Behaviour *Expected:* Winter 2017

- Advisors:
  Dr. Allison B. Sekuler - VP Research, Baycrest Health Sciences
  Dr. Patrick J. Bennett - Professor, McMaster University
- Relevant Coursework: *Statistics and research design, Computational models and machine learning, Signal detection theory, Psychometrics*

B.Sc.(Hons), Psychology, Neuroscience & Behaviour Apr 2008

- Advisors: Dr. Terri L. Lewis and Dr. Daphne M. Maurer

Certifications

Microsoft Technology Associate: Database Fundamentals Certified 2017

- Knowledge of and skills with relational databases, with emphasis on Microsoft SQL Server.

Distinguished Projects

Software detection system for dental carries 2017–present
In collaboration with Faculty of Dentistry, University of Toronto

- Designing Convolutional Neural Networks (CNNs) using Python and OpenCV to assist dental radiologists in detecting and diagnosing oral diseases from radiographs.

Object perception with Microsoft HoloLens 2017–present

- Examining human perception of geometric features of objects using holographic stimuli designed in Unity game creation software and deployed with Microsoft HoloLens.

Research Experience

Researcher,
Department of PNB, McMaster University 2013–present

- Thesis examines what features neural populations use to encode shape, and how these representations can be applied to improving object detection algorithms.
- Developed probabilistic computational model in Python and C++ of how human visual cortex can generate representations of shape.
- Developed psychometric curve fitting algorithms in R to model human performance on visual tasks.
- Developed and managed research design and methods used to collect data
- Applied advanced hierarchical regression models to data to drive novel research directions.
- Programmed Eyelink 1000 eye-tracker to measure pupil dilation and eye-movements while human observers performed vision based tasks.
- Communicated findings through formal peer-reviewed reports generated in LaTeX, Jupyter Notebook, and RMarkdown.
- Generated publication quality figures in Python and R to illustrate findings.
- Trained and mentored undergraduate thesis students on data collection and analysis.

Teaching Experience

Teaching Assistant,
Department of PNB, McMaster University 2013–present

- Coordinate instructional efforts to help students conceptualize course materials.
- Prepare and lead lectures, tutorials, review sessions, and small group discussions of relevant topics.
- Provide constructive written and oral feedback on student assessments, such as formal reports and in-class presentations; grading of student work.
- Responsible for invigilating course examinations and enforcing administrative policies as needed.

Undergraduate thesis supervisor (3QQ3/4D09)
Department of PNB, McMaster University 2013–2016

- Helped students with: research design, data collection, statistical analysis, and providing feedback on written reports

Technical Skills

Software

- Programming languages: Python, R, C#, C++, Matlab, HTML, Julia
- Database management: SQL, MongoDB
- Cloud computing: AWS EC2
- Game development: Unity
- Document generation: LaTeX, Jupyter Notebook, RMarkdown, Sweave
- Version control: GIT
- Web based: Jekyll, Wordpress
- Other: GNU Make, Adobe Photoshop, MS Office Suite

Hardware/Apparatuses

- Microsoft HoloLens
- Mirror stereoscope
- EyeLink 1000 Eye-tracker
- Microcontrollers: Arduino Uno, Arduino Mega 2560
- Shutter glasses with IR transmitter (VPixx Technologies)
- Pupillary distance meter (PDM Digital PD Meter)
- Photometer (SpectraScan PhotoResearch 650)

Statistics and Machine Learning

- Regression: Linear and Non-Linear, Lasso, Ridge, Stepwise, Loess
- Bayesian inference: Hierarchical Bayesian models, Monte Carlo
- Deep Learning: Convolutional Neural Networks (CNNs), Recurrent Neural-Networks (RNNs), Multi-layer Perceptrons
- Dimensionality Reduction: Principal component analysis, Factor analysis

Publications

1. **Slugocki, M.**, Sekuler, A.B., & Bennett, P.J. (submitted, 2017) BayesFit: A tool for modeling psychophysical data using Bayesian inference. *Journal of Open Research Software*

Pre-Publications

1. **Slugocki, M.**, Sekuler, A.B., & Bennett, P.J. (2017). BayesFit: A tool for modeling psychophysical data using Bayesian inference. DOI: https://psyarxiv.com/fnp28/

Conference Proceedings

1. **Slugocki, M.**, Duong, C., Sekuler, A.B., & Bennett, P.J. (2016). Evaluating Temporal Interactions Between Pairs of Shapes. *Journal of Vision*, *16*(12), 796-796.
2. **Slugocki, M.**, Sekuler, A.B., & Bennett, P.J. (2015). Evaluating Phase Dependent Masking with Radial Frequency Contours. *Journal of Vision*, *15*(12), 1026-1026.

3. Beers, A., **Slugocki, M.**, Sekuler, A.B., & Bennett, P.J. (2015). Evaluating Phase Dependent Masking with Radial Frequency Contours. *Journal of Vision*, *15*(12), 1026-1026.

4. **Slugocki, M.**, Sekuler, A., & Bennett, P. (2014). Local Perturbations to a Global Radial Frequency Masker Alleviate Lateral Masking Effects. *Journal of Vision*, *14*(10), 243-243.

5. **Slugocki, M.**, Maurer, M., Peterson, M.A., & Lewis, T.L. (2013). The effect of convexity in biasing childrens perception of figures., *Child Vision Research Society*

6. **Slugocki, M.**, Maurer, M., Peterson, M.A., & Lewis, T.L. (2013). Convexity as a cue to figure-ground segmentation in childre. *Journal of Vision*, *13*(9), 718-718.

Awards/ Scholarships

Travel Awards

- PNB Departmental travel award — May 2013–2016

Scholarships — McMaster University, PNB

- McMaster Senate Scholarship — Sept 2012
- Norampac Inc. Undergraduate Scholarship — Sept 2008–2012
- McMaster Undergraduate Scholarship — Sept 2008–2011

Additional Activities

Reviewer,
The Journal of Open Research Software (JORS) — 2017–present

- Peer-review articles to ensure that content and software provided adhere to the quality standards of the Journal of Open Research Software (JORS).

Colloquium Committee Member,
Department of PNB, McMaster University — 2017–present

- Responsible for scheduling speakers, their accommodations, and relevant dealings in giving a colloquium talk to the Department of PNB at McMaster University about current research in their field of study.

Undergraduate Thesis Poster Judge,
Department of PNB, McMaster University — 2013–2016

- Assessed undergraduate posters presentations for student theses based on the quality of their research and ability to answer relevant questions about their projects.

Undergraduate Tutor, — 2013–present

- Assisted undergraduate students in understanding lecture materials from courses ranging from statistics and research design to sheep-brain neuroanatomy.

References

Dr. Allison B. Sekuler
Vice-President Research
Baycrest Heath Sciences
University of Toronto

Dr. Patrick J. Bennett
Professor
Psychology, Neuroscience & Behaviour
McMaster University

Donna Waxman
Lab Coordinator
Psychology, Neuroscience & Behaviour
McMaster University