Ruth Catherine Fong

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Education

University of Oxford – D.Phil. in Engineering Science, advised by Dr. Andrea Vedaldi   **Oct. 2016-present**

University of Oxford – M.Sc. in Neuroscience, *distinction*   **Sept. 2015-Sept. 2016**
    Completed two computational neuroscience research rotations with Professor Rafal Bogacz as well as Professor Andy King, Dr. Ben Willmore, and Dr. Nicol Harper in the Oxford Auditory Neuroscience group.

Harvard University – A.B. in Computer Science, *magna cum laude with Highest Honors*   **Sept. 2011-May 2015**
    Relevant coursework in machine learning, computer vision, computational linguistics, discrete math, cryptography, differential privacy, algorithms, programming languages, neuroscience, and biology. GPA: 3.8.

Research Papers

Fong, R. and Vedaldi, A. "Interpretable Explanations of Black Boxes by Meaningful Perturbation." *Proceedings of the IEEE International Conference on Computer Vision* (2017).

Fong, R., Scheirer, W., and Cox, D. "Using Human Brain Activity to Guide Machine Learning." *Scientific Reports* (2017, in press).

Research Projects

"Net2Vec: Quantifying and Explaining how Concepts are Encoded by Filters in Deep Neural Networks."*
        Summer 2017-present
    Investigating how human-interpretable visual concepts (i.e., textures, objects, etc.) are encoded across hidden units of a convolutional neural network (CNN) layer as well as across CNN layers (paper under review).

"Interpretable Explanations of Black Box Algorithms by Meaningful Perturbation."   **Fall 2016-Summer 2017**
    Developed a theoretical framework for learning "explanations" of black box functions like CNNs as well as saliency methods for identifying "where" a computer vision algorithm is looking (Fong and Vedaldi, 2017).

"Modeling Blind Single Channel Sound Separation Using Predictive Neural Networks."*   **Summer 2016**
    M.Sc. Dissertation #2. Developed an unsupervised learning paradigm for sound separation using fully connected and recurrent neural networks to predict the future from past cochleagram data.

"Optimizing Deep Brain Stimulation to Dampen Tremor."*   **Spring 2016**
    M.Sc. Dissertation #1. Developed a computational oscillator model that modeled the tremor-dampening effects of phasic deep brain stimulation and analyzed it on experimental data.

 "Leveraging Human Brain Activity to Improve Object Classification."   **Spring 2014-Summer 2015**
    A.B. Thesis. Introduced a biologically-informed machine learning paradigm for object classification that biases models to better match the learned, internal representations of the visual cortex (Fong et al., 2017).

"Applying Differential Privacy to Complex Genomics Data" with Louis Li.   **Fall 2014**
    Generalized private data-release mechanisms for genomics data linked to K possible disease categories.

*Working towards publication.

Research Talks

Mutual Benefits of Cognitive and Computer Vision (MBCC) Workshop – Venice, Italy   **October 2017**
    Contributing talk on "Using Human Brain Activity to Guide Machine Learning" (MBCC is co-located at the International Conference on Computer Vision [ICCV]).

Girls Advancing in STEM (GAINS) Network Conference – Cambridge, MA   **April 2015**
    Invited technical talk on "Leveraging Human Brain Activity to Improve Object Classification" (GAINS conference was hosted by MIT's Broad Institute).

Research Media Coverage

New Scientist – "MRI brains scans train machines to see the world more like us"   **March 2017**

Work Experience

D.E. Shaw, Co.: Quantitative Software Engineer Intern – New York, NY   **June 2014-Aug. 2014**
   Worked on a proprietary software engineering project and a quantitative financial research project.

Apple: Software Engineer Intern – Cupertino, CA   **May 2013-Aug. 2013**
   Implemented HTML5 features and improved developer tools in the open-source WebKit project.

Microsoft: Software Engineer Intern – Redmond, WA   **May 2012-Aug. 2012**
   Worked for the Windows 8 Device Drivers team on a diagnostic tool for Windows 8-style device apps.

Technical Projects

CrimsonCommunity with Annie Ryu, Styliani Pantella, and Victoria Gu.   **Jan. 2013-Dec. 2014**
   Developed an SMS-based service that provides students easy access to Harvard's mental health services.

Health Data Collection & Visualization Project as a 2014 Tech in the World Fellow.   **Dec. 2013-Jan. 2014**
   Partnered with Ifakara Health Institute to build centralized web platform that collects vital health statistics from throughout Tanzania and taught seminars at Dar es Salaam Institute of Technology.

BagIt with Eric Lu.   **Dec. 2012-May 2013**
   Developed an iOS & mobile app that allowed Harvard students to order take-away meals from dining halls.

Leadership and Service Activities

NJ Governor's School in Engineering & Technology: Course Instructor – Piscataway, NJ   **Summer 2015**
   Designed and taught "Mathematics in the World", an introductory course on discrete math, probability, and their real-world applications to gifted 3rd year high school students in New Jersey, USA.

Harvard Women in CS: Webmaster, Board Member, & Mentor – Cambridge, MA   **2012-2015**

Harvard Course Assistant & Teaching Fellow – Cambridge, MA   **2012, 2014**
   Held office hours, taught sections, and authored and graded assignments for CS50: "Intro. to Comp. Sci. I" (Fall '12), CS20: "Intro. to Discrete Math" (Spring '14), CS121: "Intro. to the Theory of Computation" (Fall '14).

Honors

Women in Computer Vision CVPR Travel Grant ('17), International Computer Vision Summer School Best Poster Award ('17), Murray Speight Research Grant ('17), Women in Machine Learning NIPS Travel Grant ('16; '17 declined), Rhodes Scholar ('15), National Science Foundation (NSF) Graduate Research Fellowship ('15, declined), Fulbright Scholar to Tanzania ('15, declined), Hoopes Prize (for outstanding undergraduate thesis) ('15), Derek Bok Certificate of Distinction (for outstanding CS121 teaching evaluations) ('15), Tech in the World Fellowship ('14), Apple iOS Scholarship ('13)

Reviewing

IEEE Conference on Computer Vision & Pattern Recognition (CVPR), IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Signal Processing Letters

Skills

Proficient in the following programming languages and deep learning frameworks: Python, MATLAB, Java, C#, C; PyTorch, Tensorflow, MatConvNet, PyCaffe. Experience with HTML, CSS, Javascript, MySQL, Objective-C.