Matthew Russell

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Summary

Computer scientist with a diverse skill set. Experienced in designing and implementing complex user studies as well as analyzing neural and physiological data using advanced statistics and machine learning techniques. Fluent in multiple programming languages including `Python`, `C++`, and `R`, and have expertise in git, CI/CD infrastructure, Docker, and cloud deployments. Adept at communicating complex technical concepts to both novice and expert audiences. Technical expertise is complemented by a double major in English Literature and three years of training as a Zen monk.

Education

2020–Present **PhD in Computer Science**, *Tufts University*
2017–2020 **MS in Computer Science**, *Tufts University*
2007–2011 **BA Computer Science**, *Hamilton College*
2007–2011 **BA English Literature**, *Hamilton College*

Work Experience

2023–Present **PhD Candidate**, *Tufts HCI Lab & Microsoft Research*

- Designed and conducted experiments measuring human response while using LLMs; measures included brain activity using Functional Near-Infrared Spectroscopy (fNIRS), physiological data using the Empatica E4 device, self-reported mental workload with NASA-TLX, and participant interviews.
- Analyzed complex neurological, physiological, and self-report data data using Python and R to uncover nuanced insights into human-AI interaction.

2020–Present **PhD Researcher**, *Tufts HCI Lab*

- Designed and implemented human subject studies towards the next-generation brain-computer interfaces, using both fNIRS and EEG systems. Specifically
  - A real-time fNIRS-based interface using machine learning to differentiate across user states during tasks which engaged different brain networks.
  - Explored the capabilities of low-cost EEG systems for the differentiation of within-task mental workload and cross-task neurophysiological states.
- Utilized Python and R for interface design, data analysis, statistics, machine learning and visualization.

2020, 2023 **Lecturer**, *Tufts University*

- Taught Data Structures in `C++`.

2017–2022 **Teaching Assistant**, *Tufts University*

- Supported courses including Human-Computer Interaction, Computer Graphics, Cybersecurity, Introduction to Computer Science, and Concurrent Programming.
- Extensively overhauled course infrastructure for the Data Structures course, including:
  - Design, implementation, and maintenance of a CI/CD pipeline responsible for day-to-day course management.
  - Development of a comprehensive and extensible autograding framework in Python used by the course, a variant of which is used by students for unit testing their code.
  - Utilization of Docker to engineer custom integration between the course CI/CD pipeline, the autograding framework, and Gradescope's infrastructure.
  - Rewriting student-facing course material for clarity.

2015–2017 **Research and Teaching Assistant**, *Syracuse University*

- Developed code for the Center for Autism Research in Electrophysiology (CARE) Lab.
- Taught programming fundamentals to PhD candidates in the lab.

2011–2015 **Resident Monk**, *Dai Bosatsu Zendo, Rinzai Zen Monastery*

- Served as meditation and hatha yoga instructor (200-hour yoga certified).
- Managed structured meditation atmosphere during retreats as Zendo monitor (Jikijitsu).
- Led work teams to maintain zendo cleanliness as Monastery assistant (Jisha).

2007–2011 **Research and Teaching Assistant**, *Hamilton College*

- Worked as a TA in fall/spring semesters.
- Conducted human-subject research during summers, resulting in multiple publications.

Technical Skills

Languages Python, C++, R, JS Javascript, Matlab

DevOps Docker, Gitlab CI/CD, GitHub Actions, Digital Ocean

Frameworks Pandas, Numpy, Seaborn, scikit-learn, Flask, Three.js

Tools Git, Bash, Linux, Slurm

Statistics ANOVA, Mixed Effects Models (LMER, GLMER), Aligned Rank Transform (ART), Monte Carlo / Permutation Testing

ML Classification and Regression (Random Forest, SVM, KNN, Neural Networks, etc.), Dimensionality Reduction (PCA, t-SNE, etc.), Cross-Validation (LOO, stratified, grouped, etc.),

Publications

Russell, M., Shah, A., Blaney, G., Amores, J., Czerwinski, M., & Jacob, R. J. K. (in review). Physiological and cognitive effects of interactive large language models on human users: A multimodal analysis.

Russell, M., Hincks, S., Wang, L., Babar, A., White, Z., & Jacob, R. J. K. (in review). Visualization and workload with implicit fNIRS-based BCI: Towards a real-time memory prosthesis with fNIRS.

Russell, M., Youkeles, S., Xia, W., Zheng, K., Shah, A., & Jacob, R. J. K. (in review). Decoding chess puzzle play and standard cognitive tasks for BCI: A low-cost EEG study.

Bosworth, A., **Russell, M.**, & Jacob, R. J. K. (2019). fNIRS as an input to brain computer interfaces: A review of research from the Tufts Human Computer Interaction Laboratory. *Photonics*.

Shibata, T., Borisenko, A., Hakone, A., August, T., Deligiannidis, L., Yu, C. H., **Russell, M.**, Olwal, A., & Jacob, R. J. K. (2019). An implicit dialogue injection system for interruption management. In *Proceedings of the Tenth Augmented Human International Conference*.

Hirshfield, L., Bergen-Cico, D., Costa, M., Jacob, R. J. K., Hincks, S., & **Russell, M.** (2018). Measuring the neural correlates of mindfulness with functional near-infrared spectroscopy. In *Empirical Studies of Contemplative Practices*.

Hirshfield, L., Gulotta, R., Hirshfield, S., Hincks, S., **Russell, M.**, Ward, R., Williams, T., & Jacob, R. (2011). This is your brain on interfaces: Enhancing usability testing with functional near-infrared spectroscopy. In *Proceedings of the ACM CHI 2011 Human Factors in Computing Systems Conference*. ACM Press.

Hirshfield, L., Hirshfield, S., Hincks, S., **Russell, M.**, Ward, R., & Williams, T. (2011). Trust in human-computer interactions as measured by frustration, surprise, and workload. In *Foundations of Augmented Cognition. Directing the Future of Adaptive Systems*.

Extended Abstracts

Russell, M., Zhong, Q., Zheng, K., Hu, K., Santaniello, J., & Jacob, R. J. K. (2025). LLM-Tools' effects on users during complex decision-making with FNIRS. In *Neuroadaptive Technology Conference* (NAT-2025).

Russell, M., Xia, W., Youkeles, S., & Jacob, R. J. K. (2025). Neural correlates of move quality during chess games: A low-cost EEG study. In *Neuroadaptive Technology Conference* (NAT-2025).

Russell, M., & Jacob, R. J. K. (2025). Very-low frequency oscillations as a correlate of neural activation. In *Neuroadaptive Technology Conference* (NAT-2025).

Santaniello, J., Sinapov, J., **Russell, M.**, Jiang, B., Sassaroli, D., & Jacob, R. (2025). NEUR-LOOP: Mapping neural signals to agent performance, a step towards reinforcement learning from neural feedback. In *International Joint Conference on Artificial Intelligence* (IJCAI-25).

Russell, M., Hincks, S., Wang, L., Babar, A., Chen, Z., White, Z., & Jacob, R. J. K. (2024). Visualization and workload with implicit fNIRS-based BCI. In *Proceedings of the Fifth International Neuroergonomics Conference*.

Mentorship

2020-Present **Research Mentorship**

- Provided technical and methodological support to multiple PhD candidates in the design and implementation of complex HCI studies involving neural metrics (fNIRS/EEG).
- Guided early-career researchers through experimental design, data collection, and statistical analyses.

2020-Present **Teaching Excellence**

- Developed accessible and comprehensive course materials for undergraduates.
- Maintained regular open office hours and additional support sessions for students requiring assistance.
- Received consistently positive evaluations for clarity of instruction and approachability.

2020-2023 **Teaching Assistant Leadership**

- Mentored and supervised over undergraduate teaching fellows, selected from the top-performing TAs.
- Provided guidance and mentorship to graduate teaching assistants.

Projects

CI/CD Course Infrastructure and Gradescope Autograder

- The course CI/CD infrastructure, autograder, and Gradescope integration are in use by multiple courses at Tufts. The Docker container to run the autograder has been pulled by gradescope over 25k times.
- URL: `https://rb.gy/t9r14h`

VSCode Extension for `C++` Unit Testing

- Intuitive user-interface to unit-test `C++` code.
- URL: `https://rb.gy/tex0so`

Interactive Heap Visualization

- Heap visualization with interactive top-down and bottom-up heap-building for Data Structures students.
- URL: `https://rb.gy/nwio5h`