

Mark L. Homer, Ph.D.

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Education

Harvard University, Medical School

2014-present

- Pursuing a Master of Medical Sciences in Biomedical Informatics (expected graduation 5/2016)
- Awarded the National Library of Medicine's fellowship program (www.informaticstraining.hms.harvard.edu)
- **Thesis:** *Predicting falls in people over 65 from insurance claims*
- **Committee:** Isaac Kohane, Ken Mandl, Adam Wright

Brown University

2009-2014

- Ph.D. in Biomedical Engineering
- Member of the BrainGate team, under the advisorship of Dr. Leigh Hochberg (www.braingate2.org)
- **Thesis:** *Novel algorithms for better decoding neural signals (machine learning, signal processing)*
- **Committee:** Leigh Hochberg, John Donoghue, Matthew Harrison, Michael Black, Arto Nurmikko

Massachusetts Institute of Technology

1990-1995

- Accelerated B.S. and M.S. in Mechanical Engineering with a concentration in Economics (GPA: 4.8/5.0)
- **Thesis:** *Software to optimize a radar amplifier's design (nonlinear optimization)*

Experience

Research Fellow

2014-present

Boston Children's Hospital, Boston, MA

- Focusing on predictive analytics for healthcare in the Computational Health Informatics Program (www.chip.org)

Technical Director, Sr. Member of Technical Staff

2006-2009

C.S. Draper Laboratory, Cambridge, MA

- Principal investigator researching how a person can guide pattern recognition algorithms
- Lead developer of software to estimate a person's arousal state for Department of Homeland Security
- Invented software that classifies people based on their electrocardiogram
- Technical Director for a study that explored anti-missile design alternatives for Missile Defense Agency
- Designed hazard avoidance system for a NASA Mars lander

Software Systems Engineering Group Manager

2005-2006

BAE Systems Advanced Information Technologies, Burlington, MA

- Line manager of a team of five technical staff members
- Led and co-led the capture of new business; one proposal netted ~\$4M
- Oversaw systems integration of aerial drone battle management software for DARPA, Boeing, and Air Force

Project Leader, Sr. Member of Technical Staff

2000-2005

C.S. Draper Laboratory, Cambridge, MA

- Built trajectory planning software for an autonomous rotorcraft for DARPA and Army
- Developed fault-tolerant, real-time operating system (RTOS) for prototype avionics system
- Participated in systems design of a rocket guidance system for Navy

Process and Controls Engineer, Operations Analyst

1996-2000

Biogen, Cambridge, MA

- Developed and integrated software for the company's manufacturing systems (control system algorithms)
- Managed the specification/ construction of pharmaceutical production equipment
- Scheduled international supply chain to insure timely and efficient delivery of pharmaceuticals
- Conducted raw material risk assessment, including briefing CEO & his team

Decision Support Analyst

1995-1996

Alphatech, Burlington, MA

- Built operations research & artificial intelligence algorithms for military planning & scheduling

Skills

- **Management:** personnel, algorithm & software projects, supply chains, production equipment design & delivery
- **Algorithms:** machine learning, artificial intelligence, data mining, signal processing, operations research, bioprocess control systems, vehicle guidance/trajectory/mission planning
- **Software:** C/C++, JAVA, SQL, R, MATLAB, industrial controllers (PLCs & SCADAs), embedded C, HP microcontrollers
- **Design, Data Analysis, Simulation:** electronic health records & insurance claims, intracortical brain computer interfaces, ECG and other noninvasive sensors, Mars landers, unmanned rotorcraft, bioreactors, supply chains

Publications

Homer ML, Palmer NP, Bodenreider O, Cami A, Chadwick L, Mandl KD, "The Drug Data to Knowledge Pipeline: Large-Scale Claims Data Classification for Pharmacologic Insight," 2016 AMIA Joint Summits. (submitted)

Homer ML, Harrison MT, Black MJ, Hochberg LR, "A Nonlinear Hierarchical Decoder for Intracortical Brain Computer Interfaces," Journal of Neural Engineering. (submitted)

Perge JA, Zhang S, Malik WQ, **Homer ML**, Cash SS, Friehs G, Eskandar EN, Donoghue JP, Hochberg LR, **"Reliability of Directional Information in Unsorted Spikes and Local Field Potentials Recorded in Human Motor Cortex,"** Journal of Neural Engineering, vol. 11, no. 4, 2014.

Homer ML, Perge JA, Black MJ, Harrison MT, Cash SS, Hochberg LR, "Adaptive offset correction for intracortical brain computer interfaces," IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2014.

Homer ML, Harrison MT, Black MJ, Perge JA, Cash SS, Friehs G, Hochberg LR, "Mixing decoded cursor velocity and position from an offline Kalman filter improves cursor control in people with tetraplegia," 6th International IEEE EMBS Conference on Neural Engineering, 2013.

Homer ML, Nurmikko AV, Donoghue JP, Hochberg LR, "Sensors and decoding for intracortical brain computer interfaces," Annual Review of Biomedical Engineering, vol. 15, 2013.

Perge JA, **Homer ML**, Malik WQ, Friehs G, Donoghue JP, Hochberg LR, **"Intra-day signal instabilities affect decoding performance in an intracortical neural interface system,"** Journal of Neural Engineering, vol. 10, no. 3, 2013.

Homer ML, Irvine JM; Wendelken S; "A model-based approach to human identification using ECG," SPIE, Optics and Photonics in Global Homeland Security V and Biometric Technology for Human Identification VI, 2009.

Homer ML, Lim S, Lopez J, Corbett M, "Machine-aided design of an air launched missile defense system," AIAA Missile Sciences Conference, 2008.

Forest F, Kessler L, **Homer ML, "Design of a human-interactive autonomous flight manager (AFM) for crewed lunar landing,"** Infotech@Aerospace, 2007.

Pettit R, **Homer M, "An autonomous threat evasion response algorithm for unmanned air vehicles during low altitude flight,"** AIAA 1st Intelligent Systems Technical Conference, 2004.

Homer M, "A quantitative approach for determining the level and sophistication of automation in unmanned vehicles," Proceedings of the AUVSI, 2003.

Homer M, "Handling event driven messaging in distributed flight critical systems," Proceedings of the Digital Avionics Systems Conference, 2002.

Bertsekas D, **Homer M, Logan D, Patek S, Sandell N, "Missile defense and interceptor allocation by neuro-dynamic programming,"** IEEE Transactions on Systems, Man and Cybernetics, Part A, Vol. 30 Issue: 1, 2000.

Presentations

Homer ML, Harrison MT, Perge JA, Simeral JD, Hochberg LR, "Decoding of target proximity improves estimation of attempted movement in people with tetraplegia," Society for Neuroscience Annual Meeting (SfN), 2013.

Homer ML, Perge JA, Harrison MT, Black MJ, Hochberg LR, "A method for determining neural signal contributions to Kalman filter based decoding in intracortical brain computer interfaces," BMES Annual Meeting, 2012.

Homer ML, Perge JA, Harrison MT, Black MJ, Hochberg LR, "Characterizing neural signal nonstationarities during operation of an intracortical brain computer interface by people with tetraplegia," SfN, 2012.

Homer ML, Perge JA, Harrison MT, Black MJ, Hochberg LR, "Detecting neural signal nonstationarities in intracortical brain computer interfaces using a model selection method," 6th Workshop on Statistical Analysis of Neuronal Data, 2012.

Homer ML, Perge JA, Hochberg LR, "Mitigating nonstationarities during neural cursor control with noise offset correction," SfN, 2011.

Awards

- Awarded Biomedical Informatics Research Training Fellowship from the National Library of Medicine, 2014
- Levi Fellowship, 2009
- Top paper in Draper Technology Digest, 2008
- Selected to serve on Draper Laboratory's innovation committee, 2007
- Best paper in session at AIAA 1st Intelligent Systems Technical Conference, 2004
- Team recognized as top Lockheed Martin contractor, 2004

Other Interests

- Practicing 7th degree black belt in Kenpo Karate & Taiho-Jitsu; Sensei teaching children and adults
- Active sailor with ASA 101 (Basic Keelboat Sailing) Certification
- Meditation, skiing, hiking, and travel