- [1] F. Jöbsis, "Noninvasive, infrared monitoring of cerebral and myocardial oxygen sufficiency and circulatory parameters.," *Science*, vol. 198 no. 4323, pp. 1264–1267, 1977.
- [2] D. T. Delpy, M. Cope, P. van der Zee, S. Arridge, S. Wray, and J. Wyatt, "Estimation of optical pathlength through tissue from direct time of flight measurement," *Physics in Medicine and Biology*, vol. 33, no. 12, p. 1433, 1988.
- [3] M. Cope and D. Delpy, "System for long-term measurement of cerebral blood and tissue oxygenation on newborn infants by near infra-red transillumination," *Medical and Biological Engineering and Computing*, vol. 26, no. 3, pp. 289–294, 1988.
- [4] A. Edwards and J. W. W. Pogue, "Cotside measurement of cerebral blood frlow in ill newborn infants by near infrared spectroscopy.," *The Lancet*, vol. 2 (8614), pp. 770–771, 1988.
- [5] J. Wyatt, Cope, and D. Delpy, "Quantification of ccerebral blood volume in human infants by near-infrared spectroscopy.," J. Appl. Physiol., vol. 68 (3), pp. 1086–1091, 1990.
- [6] M. Wolf, P. Evans, and H. Bucher, "Measurement of absolute cerebral haemoglobin concentration in adult and neonates.," ADv. Exp. Med. Biol., vol. 428, pp. 219–227, 1997.
- [7] B. Chance and Z. Zhuang, "Cognition-activated low-frequency modulation of light absorption in human brain.," *Proc. Natrl. Acad. Sci. USA*, vol. 90 (8), pp. 3770–3774, 1993
- [8] Y. Hoshi and M. Tamura, "Detection of dynamic changes in cerebral oxygenation coupled to neuronal funfunction during mental work in man.," *Neurosci. Lett.*, vol. 150 (1), pp. 5–8, 1993.
- [9] T. Kato, A. Kamei, and S. Takashima, "Human visual cortical function during photic stimulation monitoring by means of near-infrared spectroscopy.," *J. Cereb. Blood Flow Metab.*, vol. 13 (3), pp. 516–520, 1993.
- [10] A. Villringer, J. Planck, and J. Hock, "Near infrared spectroscopy (NIRS): a new tool to study hemodynamic changes during activation of brain function in human adult.," *Neurosci. Lett.*, vol. 154 (1-2), pp. 101–104, 1993.
- [11] F. Scholkmann, S. Kleiser, A. J. Metz, R. Zimmermann, J. M. Pavia, U. Wolf, and M. Wolf, "A review on continuous wave functional near-infrared spectroscopy and imaging instrumentation and methodology," *NeuroImage*, no. 0, pp. –, 2013.
- [12] I.-Y. Son and B. Yazici, Near Infrared Imaging and Spectroscopy for Brain Activity Monitoring, ch. Advances in Sensing with Security Applications, pp. 341–372. NATO Security through Science Series-A: Chemistry and Biology, Springer, 2006.

[13] G. Strangman, D. A. Boas, and J. P. Sutton, "Non-invasive neuroimaging using near-infrared light," *Biological Psychiatry*, vol. 52, no. 7, pp. 679 – 693, 2002.

- [14] S. Bunce, M. Izzetoglu, K. Izzetoglu, B. Onaral, and K. Pourrezaei, "Functional near-infrared spectroscopy," *Engineering in Medicine and Biology Magazine*, *IEEE*, vol. 25, no. 4, pp. 54–62, 2006.
- [15] J. Safaie, R. Grebe, H. A. Moghaddam, and F. Wallois, "Toward a fully integrated wireless wearable EEG-NIRS bimodal acquisition system," *Journal of Neural Engi*neering, vol. 10, no. 5, p. 056001, 2013.
- [16] G. Pfurtscheller, B. Z. Allison, G. Bauernfeind, C. Brunner, T. Solis Escalante, R. Scherer, T. O. Zander, G. Mueller-Putz, C. Neuper, and N. Birbaumer, "The hybrid BCI," *Frontiers in Neuroscience*, vol. 4, no. 3, 2010.
- [17] K. Yanagisawa, K. Asaka, H. Sawai, H. Tsunashima, T. Nagaoka, T. Tsujii, and K. Sakatani, "Brain-computer interface using near-infrared spectroscopy for rehabilitation," in *Control Automation and Systems (ICCAS)*, 2010 International Conference on, pp. 2248–2253, 2010.
- [18] S. Coyle, T. Ward, and C. Markham, "Physiological noise in near-infrared spectroscopy: implications for optical brain computer interfacing," in *Engineering in Medicine and Biology Society*, 2004. IEMBS '04. 26th Annual International Conference of the IEEE, vol. 2, pp. 4540–4543, 2004.
- [19] C. Soraghan, F. Matthews, C. Markham, B. Pearlmutter, R. O'Neill, and T. Ward, "A 12-Channel, real-time near-infrared spectroscopy instrument for brain-computer interface applications," in *Engineering in Medicine and Biology Society*, 2008. EMBS 2008. 30th Annual International Conference of the IEEE, pp. 5648–5651, 2008.
- [20] S. Coyle, T. Ward, and C. Markham, "Brain-computer interface using a simplified functional near-infrared spectroscopy system.," *J Neural Eng.*, vol. 4(3), pp. 219–226, 2007.
- [21] M. Cope, The application of near infrared spectroscopy to non invasive monitoring of cerebral oxygenation in the newborn infant. PhD thesis, Department of Medical Physics and Bioengineering, University College London, 1991.
- [22] M. Cutler, "Transillumination as an aid in the diagnosis of breast lesions.," Surg. Gynecol. Obstet., vol. 48, pp. 721–729, 1929.
- [23] T. Curling, W. Gobrecht, and P. Goddard, A Practical Treatise on the Diseases of the Testis, and of the Spermatic Cord and Scrotum. https://archive.org/details/101504825.nlm.nih.gov: Blanchard and Lea, Philadel-phia, 1856.
- [24] A. Beer, "Bestimmung der Absorption des rothen Lichts in farbigen Flüssigkeiten," Annalen der Physik, vol. 162, pp. 78–88, 1852.
- [25] K. Matthes and F. Gross, "Fortlaufende Registrierung der Lichtabsorption des Blutes in zwei verschiedenen Spektralbezirken.," Naunyn-Schmiedeberg's Archives of Pharmacology, vol. 191, pp. 381–390, 1938.
- [26] K. Matthes and F. Gross, "Untersuchung Aijber die Absorption von rotem und ultrarotem Licht durch kohlenoxygesÄd'ttigtes, sauerstoffgesÄd'ttigtes und reduziertes Blut.," Naunyn-Schmiedeberg's Archives of Pharmacology, vol. 191, pp. 369–380, 1938.
- [27] K. Matthes and F. Gross, "Zur Methode der fortlaufende Registrierung der Farbe des menschlichen Blutes.," Naunyn-Schmiedeberg's Archives of Pharmacology, vol. 191, pp. 523–528, 1938.

[28] E. Merrick and T. Hayes, "Continuous non-invasive measurements of arterial oxgen levels.," *Hewlett-Packard J.*, vol. 28, pp. 2–9, 1976.

- [29] T. Aoyagi, T. Kishi, K. Yamaguchi, and S. Watanabe, "Improvement of ear-piece oximeter," *Proc. Jpn. Med. Elect. Biol. Eng. Conf.*, vol. 13th, p. 90, 1974.
- [30] P. Rolfe, "In Vivo Near Infra-Red Spectrophotometry," Annual Review in Biomedical Engineering, vol. 2, pp. 315–354, 2000.
- [31] E. Okada, M. Firbank, M. Schweiger, S. Arridge, M. Cope, and D. Delpy, "Theoretical and experimental investigation of near-infrared light propagation in a model of the adult head," *Applie*, vol. 36, Issue 1, pp. 21–31, 1997.
- [32] P. Benni, B. Chen, D. Amory, and J. K. J. Li, "A novel near-infrared spectroscopy (NIRS) system for measuring regional oxygen saturation," in *Bioengineering Conference*, 1995., Proceedings of the 1995 IEEE 21st Annual Northeast, pp. 105–107, 1995.
- [33] M. W. W. Wolf and V. Toronov, "Different time evolution of oxyhemoglobin and deoxyhemoglobin concentration changes in visual and motor cortices during functional stimulation: a near-infrared spectroscopy study.," *Neuoimage*, vol. 16, pp. 704–712, 2002.
- [34] P. Fox and M. Raichle, "Focal physiological uncoupling of cerebral blood low and oxidative metabolism during somatosensory stimulation in human subjects.," *Proc. Natrl. Acad. Sci. USA*, vol. 83, pp. 1140–1144, 1986.
- [35] H. Obrig and A. Villringer, "Beyond the visible imaging the human brain with light," Journal of Cerebral Blood Flow and Metabolism, vol. 12, pp. 1–18, 2003.
- [36] G. Strangman, G. Culver, J. Thompson, and D. Boas, "A quantitative comparison of simultaneous bold fmri and nirs recordings during functional brain activation.," *Neuroimage*, vol. 17, pp. 719–731, 2002.
- [37] G. Gratton, M. Fabiani, T. Elbert, and B. Rockstroh, "Seeing right through you: Applications of optical imaging to the study of the human brain.," *Psychophysiology*, vol. 40 (4), pp. 487–491, 2003.
- [38] E. Lareau, G. Simard, F. Lesage, D. Nguyen, and M. Sawan, "Near infrared spectrometer combined with multichannel EEG for functional brain imaging," in *Medical Information Communication Technology (ISMICT)*, 2011 5th International Symposium on, pp. 122–126, 2011.
- [39] C. Elwell, R. Springett, and E. Hillman, "Oscillations in cerebral haemodynamics implications for functional activation studies.," *Adv. Exp. Med. Biol.*, vol. 471, pp. 57–65, 1999.
- [40] Y. Zhang, M. A. Franceschini, D. A. Boas, and D. H. Brooks, "Eigenvector-based spatial filtering for reduction of physiological interference in diffuse optical imaging," *Journal of Biomedical Optics*, vol. 10, no. 1, pp. 011014–011014–11, 2005.
- [41] K. Izzetoglu, S. Bunce, M. Izzetoglu, B. Onaral, and K. Pourrezaei, "Functional near-infrared neuroimaging," in *Engineering in Medicine and Biology Society*, 2004. *IEMBS '04. 26th Annual International Conference of the IEEE*, vol. 2, pp. 5333–5336, 2004.
- [42] H. Ayaz, M. Izzetoglu, P. Shewokis, and B. Onaral, "Sliding-window motion artifact rejection for Functional Near-Infrared Spectroscopy," in *Engineering in Medicine* and Biology Society (EMBC), 2010 Annual International Conference of the IEEE, pp. 6567–6570, 2010.
- [43] E. Gratton, W. Mantulin, M. vandeVen, J. Fishkin, M. Maris, and B. Chance, "The possibility of a near-infrared optical imaging system using frequency-domain

methods.," in *Proceedings of the 3rd International Converence on Peace through Mind/Brain Science*, pp. 183–189, 1990.

- [44] A. Siegel, J. Marota, and D. Boas, "Design and evaluation of a continuous-wave diffuse optical tomography system," *Optics Express*, vol. 4, pp. 287–298, 1999.
- [45] D. A. Boas, T. Gaudette, G. Strangman, X. Cheng, J. J. Marota, and J. B. Mandeville, "The Accuracy of Near Infrared Spectroscopy and Imaging during Focal Changes in Cerebral Hemodynamics," *NeuroImage*, vol. 13, no. 1, pp. 76 90, 2001.
- [46] A. Duncan, J. H. Meek, M. Clemence, C. E. Elwell, L. Tyszczuk, M. Cope, and D. T. Delpy, "Optical pathlength measurements on adult head, calf and forearm and the head of the newborn infant using phase resolved optical spectroscopy," *Physics in Medicine and Biology*, vol. 40, pp. 295–304, 1995.
- [47] M. Essenpreis, C. Elwell, M. Cope, P. Van der Zee, S. Arridge, and D. Delpy, "Spectral dependence of temporal point spread functions in human tissues," *Applied Optics*, vol. 32, no. 4, pp. 418–425, 1993.
- [48] M. Kiguchi, H. Atsumori, I. Fukasaku, Y. Kumagai, T. Funane, A. Maki, Y. Kasai, and A. Ninomiya, "Note: Wearable near-infrared spectroscopy imager for haired region," *Review of Scientific Instruments*, vol. 83, p. 056101, 2012.
- [49] S. K. Piper, A. Krueger, S. P. Koch, J. Mehnert, C. Habermehl, J. Steinbrink, H. Obrig, and C. H. Schmitz, "A wearable multi-channel fNIRS system for brain imaging in freely moving subjects," *NeuroImage*, no. 0, pp. –, 2013.
- [50] G. Bauernfeind, R. Leeb, S. C. Wriessnegger, and G. Pfurtscheller, "Development, set-up and first results for a one-channel near-infrared spectroscopy system," *Biomed Tech*, vol. 53, pp. 36–43, 2008.
- [51] P. Rolfe, G. Mondo, F. Bottini, D. Repetto, and C. Ruggiero, "Near infra-red spectroscopy: a low cost device," in *Engineering in Medicine and Biology Society*, 2001. Proceedings of the 23rd Annual International Conference of the IEEE, vol. 3, pp. 3147–3149 vol.3, 2001.
- [52] H. Atsumori, M. Kiguchi, A. Obata, H. Sato, T. Katura, K. Utsugi, T. Funane, and A. Maki, "Development of a Multi-channel, Portable Optical Topography System," in Engineering in Medicine and Biology Society, 2007. EMBS 2007. 29th Annual International Conference of the IEEE, pp. 3362–3364, 2007.
- [53] A. Bozkurt, A. Rosen, H. Rosen, and B. Onaral, "A portable near infrared spectroscopy system for bedside monitoring of newborn brain," *BioMedical Engineering OnLine*, vol. 4, no. 1, p. 29, 2005.
- [54] F. Chenier and M. Sawan, "A New Brain Imaging Device Based on fNIRS," in *Biomedical Circuits and Systems Conference*, 2007. BIOCAS 2007. IEEE, pp. 1–4, 2007.
- [55] Y. Zhang, J. Sun, G. Wei, F. Scopesi, G. Serra, and P. Rolfe, "Design of a Portable Near Infra-Red Spectroscopy System for Tissue Oxygenation Measurement," in Bioinformatics and Biomedical Engineering, 2009. ICBBE 2009. 3rd International Conference on, pp. 1–4, 2009.
- [56] M.-H. Chang, C.-L. Cheng, H.-M. Huang, J.-R. Kuo, and B.-S. Lin, "Wireless multi-channel near-infrared spectroscopy for monitoring middle cerebral artery occlusion," in *System Integration (SII)*, 2011 IEEE/SICE International Symposium on, pp. 1072–1077, 2011.
- [57] A. Bozkurt and B. Onaral, "Safety assessment of near infrared light emitting diodes for diffuse optical measurements," *BioMedical Engineering OnLine*, vol. 3:9, 2004.

[58] T. Vaithianathan, I. D. C. Tullis, N. Everdell, T. Leung, and A. Gibson, "Design of a portable near infrared system for topographic imaging of the brain in babies," *Review of Scientific Instruments*, vol. 75, pp. 3276–3283, 2004.

- [59] E. R. Rajkumar, J. Safaie, R. Gupta, D. Pattnaik, H. AbrishamiMoghaddam, R. Grebe, and F. Wallois, "Development of an autonomic portable single-board computer based high resolution NIRS device for microcirculation analysis," in Engineering in Medicine and Biology Society (EMBC), 2012 Annual International Conference of the IEEE, pp. 3235–3238, 2012.
- [60] K. Izzetoglu, S. Bunce, M. Izzetoglu, B. Onaral, and K. Pourrezaei, "fNIR spectroscopy as a measure of cognitive task load," in *Engineering in Medicine and Biology Society*, 2003. Proceedings of the 25th Annual International Conference of the IEEE, vol. 4, pp. 3431–3434 Vol.4, 2003.
- [61] S. Coyle, T. Ward, C. Markham, and G. McDarby, "On the suitability of near-infrared systems for next generation brain computer interfaces.," *Physiol. Meas.*, vol. 25, pp. 815–822, 2004.
- [62] S. Kanoh, Y.-m. Murayama, K.-I. Miyamoto, T. Yoshinobu, and R. Kawashima, "A NIRS-based brain-computer interface system during motor imagery: System development and online feedback training," in *Engineering in Medicine and Biology Society*, 2009. EMBC 2009. Annual International Conference of the IEEE, pp. 594–597, 2009.
- [63] T. Ito, T. Hirano, Y. Mitsui, H. Akiyama, S. Ohgi, and C. Mizuike, "Design of brain machine interface using portable Near-InfraRed Spectroscopy," in *Micro-NanoMechatronics and Human Science (MHS)*, 2012 International Symposium on, pp. 415–420, 2012.
- [64] B. Z. Allison, R. Leeb, C. Brunner, G. R. MÃČÂijller-Putz, G. Bauernfeind, J. W. Kelly, and C. Neuper, "Toward smarter BCIs: extending BCIs through hybridization and intelligent control," *Journal of Neural Engineering*, vol. 9, no. 1, p. 013001, 2012.
- [65] N. Birbaumer, "Breaking the silence: brain-computer interfaces (BCI) for communication and motor control.," *Psychophyiology*, vol. 43(6), pp. 517–32, 2006.
- [66] G. Strangman, M. A. Franceschini, and D. A. Boas, "Factors affecting the accuracy of near-infrared spectroscopy concentration calculations for focal changes in oxygenation parameters," NeuroImage, vol. 18, no. 4, pp. 865 – 879, 2003.
- [67] D. A. Boas, A. M. Dale, and M. A. Franceschini, "Diffuse optical imaging of brain activation: approaches to optimizing image sensitivity, resolution, and accuracy," *NeuroImage*, vol. 23, Supplement 1, no. 0, pp. S275 S288, 2004. <ce:title>Mathematics in Brain Imaging</ce:title>.
- [68] Y. Yamashita, A. Maki, and H. Koizumi, "Wavelength dependence of the precision of noninvasive optical measurement of oxy-, deoxy-, and total-hemoglobin," *Medical Physics*, vol. 28, pp. 1108–14, 2001.
- [69] H. Sato, M. Kiguchi, and F. Kawaguchi, "Practicality of wavelength selection to improve signal-to-noise ratio in near-infrared spectroscopy.," *Neuroimage*, vol. 21 (4), pp. 1544–1562, 2004.
- [70] N. Okui and E. Okada, "Wavelength dependence of crosstalk in dual-wavelength measurement of oxy- and deoxy-hemoglobin," *Journal of Biomedical Optics*, vol. 10, pp. 011015–1–0111015–8, 2005.
- [71] K. Uludag, J. Steinbring, A. Villringer, and H. Obrig, "Separability and cross talk: optimizing dual wavelength combinations for near-infrared spectroscopy of the adult head," *Neuroimage*, vol. 22, pp. 583–9, 2004.

- [72] T. Correia and A. G. G. Hebden, "Identification of the optimal wavelengths for optical topography: a photon measurement density function analysis.," *J Biomed. Opt.*, vol. 15 (5), p. 056002, 2010.
- [73] M. L. Meade, Lock-in amplifiers: principles and applications. Peter Peregrinus Ltd., London UK, 1983.
- [74] M. L. Meade, "Advances in lock-in amplifiers," Journal of Physics E: Scientific Instruments, vol. 15, no. 4, p. 395, 1982.
- [75] D. Blair and P. Sydenham, "Phase sensitive detection as a means to recover signals buried in noise," *Journal of Physics E: Scientific Instruments*, vol. 8, no. 8, p. 621, 1975.
- [76] S. K. Sengupta, J. M. Farnham, and J. E. Whitten, "A simple low-cost lock-in amplifier for the laboratory," *Journal of chemical education*, vol. 82, no. 9, p. 1399, 2005.
- [77] S. Salvatori and M. Girolami, "Compact, four-quadrant lock-in amplifier generates two analog outputs," *DesignIdeas*, vol. 45, pp. 45–46, 2009.
- [78] microcontroller.net, "Quarze und avr." http://www.mikrocontroller.net/articles/, December 2013.
- [79] P. Fleury, "Avr-gcc uart library." http://homepage.hispeed.ch/peterfleury/avr-software.html, January 2014.
- [80] T. D. C. for Life Science, "Bodyparts3d." http://dbarchive.biosciencedbc.jp/, September 2011.