# A short (selective) reading list for neural encoding models

This list is not really meant to be exhaustive: it largely contains references to papers directly discussed in my lectures, many of which were from my lab. PDFs and/or links to these can be found on my webpage: `http://www.gatsby.ucl.ac.uk/~maneesh/papers/`. I have ocassionally included earlier references when I feel they provide valuable background, but I'm not really trying to be historically accurate. If you want to attribute these ideas to their inventors or first discussants, please check the references within the papers listed below.

**Encoding model review**

- AF Meyer, RS Williamson, JF Linden, and M Sahani. Models of neuronal stimulus-response functions: elaboration, estimation and evaluation. *draft review*, 2016 (available in the course file store)

**Linear models**

- F Rieke, D Warland, R de Ruyter van Steveninck, and W Bialek. *Spikes: Exploring the Neural Code*. MIT Press, Cambridge, MA, 1997
- FE Theunissen, SV David, NC Singh, A Hsu, WE Vinje, and JL Gallant. Estimating spatio-temporal receptive fields of auditory and visual neurons from their responses to natural stimuli. *Network: Computation in Neural Systems*, 12(3):289–316, 2001

**Measuring model performance**

- M Sahani and JF Linden. How linear are auditory cortical responses? In S Becker, S Thrun, and K Obermayer, eds., *Advances in Neural Information Processing Systems*, vol. 15, pp. 109–116, Cambridge, Massachusetts, 2003. MIT Press
- A Hsu, A Borst, and FE Theunissen. Quantifying variability in neural responses and its application for the validation of model predictions. *Network: Computation in Neural Systems*, 15(2):91–109, 2004

**Regularization**

- M Sahani and JF Linden. Evidence optimization techniques for estimating stimulus-response functions. In S Becker, S Thrun, and K Obermayer, eds., *Advances in Neural Information Processing Systems*, vol. 15, pp. 301–308, Cambridge, Massachusetts, 2003. MIT Press
- There's plenty of other work, much of it buried in the methods sections of applied papers.

**Nonlinearities or adaptation?**

- A Borst, VL Flanagin, and H Sompolinsky. Adaptation without parameter change: Dynamic gain control in motion detection. *Proceedings of the National Academy of Sciences, USA*, 102(17):6172–6, 2005
- GB Christianson, M Sahani, and JF Linden. The consequences of response nonlinearities for interpretation of spectrotemporal receptive fields. *Journal of Neuroscience*, 28(2):446–455, 2008

**LNP models: STA, STC, MID**

- O Schwartz, JW Pillow, NC Rust, and EP Simoncelli. Spike-triggered neural characterization. *Journal of Vision*, 6(4):484–507, 2006
- T Sharpee, N Rust, and W Bialek. Analyzing neural responses to natural signals: maximally informative dimensions. *Neural Computation*, 16(2):223–250, 2004
- R Rowekamp and T Sharpee. Analyzing multicomponent receptive fields from neural responses to natural stimuli. *Network: Computation in Neural Systems*, 2011
- RS Williamson, M Sahani, and JW Pillow. The equivalence of information-theoretic and likelihood-based methods for neural dimensionality reduction. *PLoS Computational Biology*, 11(4):e1004141, 2015

**Multilinear models**


- MB Ahrens, L Paninski, and M Sahani. Inferring input nonlinearities in neural encoding models. *Network: Computation in Neural Systems*, 19(1):35–67, 2008
- MB Ahrens, JF Linden, and M Sahani. Nonlinearities and contextual influences in auditory cortical responses modeled with multilinear spectrotemporal methods. *Journal of Neuroscience*, 28(8):1929–1942, 2008
- M Sahani, RS Williamson, MB Ahrens, and JF Linden. Probabilistic methods for linear and multilinear models. In D Depirieux and M Elhilahi, eds., *Handbook of Modern Techniques in Auditory Cortex*. Nova, Hauppage, NY, 2013
- RS Williamson, MB Ahrens, JF Linden, and M Sahani. Input-specific gain modulation by local sensory context shapes cortical and thalamic responses to complex sounds. *Neuron*, 2016

**Latent dynamics**

Discrete states (HMMs)

- M Abeles, H Bergman, E Margalit, and E Vaadia. Spatiotemporal firing patterns in the frontal- cortex of behaving monkeys. *Journal of Neurophysiology*, 70(4):1629–1638, 1993
- E Seidemann, I Meilijson, M Abeles, H Bergman, and E Vaadia. Simultaneously recorded single units in the frontal cortex go through sequences of discrete and stable states in monkeys performing a delayed localization task. *Journal of Neuroscience*, 16(2):752–768, 1996
- I Gat, N Tishby, and M Abeles. Hidden Markov modelling of simultaneously recorded cells in the associative cortex of behaving monkeys. *Network: Computation in Neural Systems*, 8(3):297–322, 1997
- LM Jones, A Fontanini, BF Sadacca, P Miller, and DB Katz. Natural stimuli evoke dynamic sequences of states in sensory cortical ensembles. *Proceedings of the National Academy of Sciences*, 104(47):18772–18777, 2007

PCA / non-linear dimensionality reduction

- KL Briggman, HDI Abarbanel, and WB Kristan. Optical imaging of neuronal populations during decision-making. *Science*, 307(5711):896, 2005
- M Stopfer, V Jayaraman, and G Laurent. Intensity versus identity coding in an olfactory system. *Neuron*, 39(6):991–1004, 2003

Latent variable models

- BM Yu, A Afshar, G Santhanam, SI Ryu, KV Shenoy, and M Sahani. Extracting dynamical structure embedded in neural activity. In Y Weiss, B Schölkopf, and J Platt, eds., *Advances in Neural Information Processing Systems*, vol. 18, pp. 1545–1552, Cambridge, Massachusetts, 2006. MIT Press
- JP Cunningham, BM Yu, KV Shenoy, and M Sahani. Inferring neural firing rates from spike trains using Gaussian processes. In JC Platt, D Koller, Y Singer, and S Roweis, eds., *Advances in Neural Information Processing Systems*, vol. 20, Red Hook, New York, 2008. Curran Associates, Inc
- BM Yu, JP Cunningham, G Santhanam, SI Ryu, KV Shenoy, and M Sahani. Gaussian-process factor analysis for low-dimensional single-trial analysis of neural population activity. *Journal of Neurophysiology*, 102:614–635, 2009
- A Afshar, G Santhanam, BM Yu, SI Ryu, M Sahani, and KV Shenoy. Single-trial neural correlates of arm movement preparation. *Neuron*, 71(3):555–564, 2011
- B Petreska, BM Yu, JP Cunningham, G Santhanam, SI Ryu, KV Shenoy, and M Sahani. Dynamical segmentation of single trials from population neural data. In J Shawe-Taylor, RS Zemel, P Bartlett, FCN Pereira, and KQ Weinberger, eds., *Advances in Neural Information Processing Systems*, vol. 24, pp. 756–764, Red Hook, New York, 2011. Curran Associates, Inc
- JH Macke, L Büsing, JP Cunningham, BM Yu, KV Shenoy, and M Sahani. Empirical models of spiking in neural populations. In J Shawe-Taylor, RS Zemel, P Bartlett, FCN Pereira, and KQ Weinberger, eds., *Advances in Neural Information Processing Systems*, vol. 24, pp. 1350–1358, Red Hook, New York, 2011. Curran Associates, Inc
- L Buesing, JH Macke, and M Sahani. Spectral learning of linear dynamics from generalised-linear observations with application to neural population data. In P Bartlett, FCN Pereira, L Bottou, CJC Burges, and KQ Weinberger, eds., *Advances in Neural Information Processing Systems*, vol. 25, 2012
- L Buesing, JH Macke, and M Sahani. Learning stable, regularised latent models of neural population dynamics. *Network: Computation in Neural Systems*, 23(1–2):24–47, 2012
- M Pachitariu, B Petreska, and M Sahani. Recurrent linear models of simultaneously-recorded neural populations. In L Bottou, CJC Burges, M Welling, Z Ghahramani, and KQ Weinberger, eds., *Advances in Neural Information Processing Systems*, vol. 26, 2013

- JH Macke, L Buesing, and M Sahani. Estimating state and model parameters in state-space models of spike trains. In Z Chen, ed., *Advanced State Space Methods for Neural and Clinical Data*. Cambridge University Press, 2015