MICHALIS K. TITSIAS

CONTACT DETAILS

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RESEARCH INTERESTS

My research interests include the theory and applications of machine learning, Bayesian statistics, deep learning and data science. My theoretical interests expand across topics such as Gaussian processes, neural networks, Bayesian non-parametric models, probabilistic graphical models, mixture models and latent variable models, kernel methods, hidden Markov models, nonlinear dynamical systems and stochastic differential equations. I am particularly interested in developing new practical algorithms for solving intractable inference problems through the use of Markov chain Monte Carlo, variational inference and stochastic approximation techniques. I am also interested in applications in biomedical sciences and systems biology.

EDUCATION

Ph.D (2001-2005), School of Informatics, University of Edinburgh, UK.
Thesis title: Unsupervised Learning of Multiple Objects in Images.
Supervisor: Prof. Christopher K. I. Williams.

M.Sc (1999-2001), Department of Computer Science, University of Ioannina, Greece.
Final grade: 8.8/10 (top 5%) for the two-years program.
Thesis title: Mixture Models for Classification.
Supervisor: Prof. Aristidis Likas.

B.Sc (1995-1999), Department of Computer Science, University of Ioannina, Greece.
Grade: 7.44/10 (top 5%).

PROFESSIONAL HISTORY

Lecturer, 2012-present.
Department of Informatics, Athens University of Economics and Business, Greece.

Academic visitor. From 2013 to present I have been visiting (five visits so far where each lasted two to three weeks) the Department of Statistics in the University of Oxford where I work in statistical methodology related projects in collaboration with Professor Chris Holmes and Dr Christopher Yau.

Postdoctoral research scientist, 2011-2012.
I worked in statistical cancer genomics at the Wellcome Trust Centre for Human Genetics and the Department of Statistics in the University of Oxford. The position was funded by the Wellcome Trust and the UK Department of Health.

Research associate, 2007-2011.
I worked in the Machine Learning and Optimization Research Group at the School of Computer Science of the University of Manchester, under the supervision of Professor Neil Lawrence and

Professor Magnus Rattray. This work was funded by EPSRC Grant No EP/F005687/1 "Gaussian Processes for Systems Identification with Applications in Systems Biology".

PUBLICATIONS

Journal articles

1. A. Damianou*, M. K. Titsias* and N. Lawrence. Variational Inference for Latent Variables and Uncertain Inputs in Gaussian Processes. Journal of Machine Learning Research (JMLR), 17(42):1-62, 2016.
2. M. K. Titsias, C. C. Holmes, and C. Yau. Statistical Inference in Hidden Markov Models using k-segment constraints. Journal of the American Statistical Association (JASA), Theory and Methods, 111(513):200-215, 2016.
3. R. Clifford, T. Louis, P. Robbe, S. Ackroyd, A. Burns, A. T. Timbs, G. W. Colopy, H. Dreau, F. Sigaux, J. G. Judde, M. Rotger, A. Telenti, Y-L Lin, P. Pasero, J. Maelfait, M. Titsias, D. Cohen, S. J. Henderson, M. Ross, D. Bentley, P. Hillmen, A. Pettitt, J. Rehwinkel, S. J. L. Knight, J. C. Taylor, Y. J. Crow, M. Benkirane, A. Schuh. SAMHD1 is mutated recurrently in chronic lymphocytic leukaemia and is involved in response to DNA damage. Blood, 123(7), 1021-31, 2014.
4. M. Lázaro-Gredilla, M. K. Titsias, J. Verrelst and G. Camps-Valls. Retrieval of Biophysical Parameters with Heteroscedastic Gaussian Processes. IEEE Geoscience and Remote Sensing Letters, 11(4), 838-842, 2014.
5. M. K. Titsias*, A. Honkela*, N. D. Lawrence and M. Rattray. Identifying targets of multiple co-regulating transcription factors from expression time-series by Bayesian model comparison. BMC Systems Biology 6:53 (2012).
6. C. Constantinopoulos, M. K. Titsias and A. Likas. Bayesian Feature and Model Selection for Gaussian Mixture Models. IEEE Trans. on Pattern Analysis and Machine Intelligence, 28(6), 1013-1018, June 2006.
7. C. K.I. Williams and M. K. Titsias. Greedy Learning of Multiple Objects in Images using Robust Statistics and Factorial Learning. Neural Computation, 16(5), 1039-1062, May 2004.
8. M. K. Titsias and A. Likas. Class Conditional Density Estimation using Mixtures with Constrained Component Sharing. IEEE Trans. on Pattern Analysis and Machine Intelligence, 25(7), 924-928, July 2003.
9. M. K. Titsias and A. Likas. Mixture of Experts Classification using a Hierarchical Mixture Model. Neural Computation, 14(9), 2221-2244, September 2002.
10. M. K. Titsias and A. Likas. Shared Kernel Models for Class Conditional Density Estimation. IEEE Trans. on Neural Networks, 12(5), 987-997, September 2001.

Conference proceedings

1. F. J. R. Ruiz, M. K. Titsias and D. M. Blei. Overdispersed Black-Box Variational Inference. In Uncertainty in Artificial Intelligence (UAI), 2016.
2. M. Karaliopoulos, I. Koutsopoulos and M. K. Titsias. First Learn then Earn: Optimizing Mobile Crowdsensing campaigns through data-driven user profiling. In Proceedings of ACM International Symposium on Mobile Ad-Hoc Networking and Computing (Mobihoc), 2016.
3. M. K. Titsias and M. Lázaro-Gredilla. Local Expectation Gradients for Black Box Variational Inference. In Advances in Neural Information Processing Systems (NIPS), 28, 2015.
4. R. Bardenet* and M. K. Titsias*. Inference for determinantal point processes without spectral knowledge. In Advances in Neural Information Processing Systems (NIPS), 28, 2015.
5. M. K. Titsias, C. Yau. Hamming ball Auxiliary Sampling for Factorial Hidden Markov Models. In Advances in Neural Information Processing Systems (NIPS), 27, 2960-2968, 2014.

6. M. K. Titsias and M. Lázaro-Gredilla. Doubly Stochastic Variational Bayes for non-conjugate Inference. In Proceedings of the 31st International Conference on Machine Learning (ICML), 1971-1979, 2014.
7. M. K. Titsias and M. Lázaro-Gredilla. Variational Inference for Mahalanobis Distance Metrics in Gaussian Process Regression. In Advances in Neural Information Processing Systems (NIPS), 26, 2013.
8. A. C. Damianou, C. H. Ek, M. K. Titsias and N. D. Lawrence. Manifold Relevance Determination. In Proceedings of the 29st International Conference on Machine Learning (ICML), 2012,
9. M. K. Titsias and M. Lázaro-Gredilla. Spike and Slab Variational Inference for Multi-Task and Multiple Kernel Learning. In Advances in Neural Information Processing Systems (NIPS), 24, 2011.
10. A. C. Damianou, M. K. Titsias and N. D. Lawrence. Variational Gaussian Process Dynamical Systems. In Advances in Neural Information Processing Systems (NIPS), 24, 2011.
11. M. Lázaro-Gredilla and M. K. Titsias. Variational Heteroscedastic Gaussian Process Regression. International Conference on Machine Learning (ICML), 2011, **Distinguished Paper Award**.
12. M. K. Titsias and N. D. Lawrence. Bayesian Gaussian Process Latent Variable Model. Thirteenth International Conference on Artificial Intelligence and Statistics (AISTATS), 2010.
13. M. Alvarez, D. Luengo, M. K. Titsias and N. D. Lawrence. Efficient Multioutput Gaussian Processes through Variational Inducing Kernels. Thirteenth International Conference on Artificial Intelligence and Statistics (AISTATS), 2010.
14. P. Zacharouli, M. K. Titsias and M. Vazirgiannis. Web Page Rank Prediction with PCA and EM Clustering. WAW 2009: 104-115.
15. M. K. Titsias. Variational Learning of Inducing Variables in Sparse Gaussian Processes. Twelfth International Conference on Artificial Intelligence and Statistics (AISTATS), 2009.
16. M. K. Titsias, N.D. Lawrence and M. Rattray. Efficient Sampling for Gaussian Process Inference using Control Variables. In Advances in Neural Information Processing Systems (NIPS), 22, 2009.
17. M. K. Titsias. The Infinite Gamma-Poisson Feature Model. In Advances in Neural Information Processing Systems (NIPS) 21. 2008.
18. M. K. Titsias, C. K. I. Williams. Unsupervised Learning of Multiple Aspects of Moving Objects from Video. In Advances in Informatics, 10th Panhellenic Conference on Informatics, Volos, Greece, LNCS 3746 Springer, pp 746-756, 2005.
19. M. Allan, M. K. Titsias and C. K.I. Williams. Fast Learning of Sprites using Invariant Features. British Machine Vision Conference, 2005.
20. M. K. Titsias and C. K. I. Williams. Fast Unsupervised Greedy Learning of Multiple Objects and Parts from Video. Generative-Model Based Vision Workshop, 2004.
21. C. K.I. Williams and M. K. Titsias. Learning About Multiple Objects in Images: Factorial Learning without Factorial Search. In Advances in Neural Information Processing Systems (NIPS) 15, 2003.
22. C. Constantinopoulos, M. K. Titsias and A. Likas. A Bayesian Regularization Method for the Probabilistic RBF Network, Hellenic Conference on Artificial Neural Networks, pp. 337-345, 2002.
23. M. K. Titsias, D. I. Fotiadis and A. Likas. Estimation of the Concrete Characteristics using Pattern Recognition methods. Proc. of the 6th National Congress on Mechanics, Greece, 2001.
24. M. K. Titsias and A. Likas. A Probabilistic RBF Network for Classification. Proc. of the Int. Joint Conference on Neural Networks (IJCNN'2000), Como, Italy, 2000.

Book chapters

1. N. Lawrence, M. Rattray, A. Honkela, and M. K. Titsias. Gaussian Process Inference for Differential Equation Models of Transcriptional Regulation. In M. P. H. Stumpf, D. J. Balding, and M. Girolami, eds., Handbook of Statistical Systems Biology, pp. 376-394, John Wiley & Sons, Chichester, UK (2011).
2. M. K. Titsias, M. Rattray and N.D. Lawrence. Markov chain Monte Carlo algorithms for Gaussian processes. In Barber, Chiappa and Cemgil (eds), Bayesian Time Series Models, Cambridge University Press, 2011.
3. N. D. Lawrence, M. Rattray, P. Gao and M. K. Titsias. Gaussian processes for missing species in biochemical systems. In N. D. Lawrence, M. Girolami, M. Rattray and G. Sanguinetti (eds), Learning and Inference in Computational Systems Biology, MIT Press, Cambridge, MA. 2010.
4. M. K. Titsias and C. K. I. Williams. Sequential Learning of Layered Models from Video. In C. S. J. Ponce, M. Herbert and A. Zisserman (Eds.), Proceedings Sicily Workshop on Object Recognition, Sicily, 2005.

Theses

1. M. K. Titsias, Unsupervised Learning of Multiple Objects in Images. Ph.D. Thesis, School of Informatics, University of Edinburgh, 2005.
2. M. K. Titsias, Classification using Gaussian Mixture Models. M.Sc. Thesis, Dept. of Computer Science, University of Ioannina, 2001.

*Joint first author.

Google scholar:
According to google scholar my h-index is 16 and my work so far has received 1138 citations (June 2016).

PEER REVIEWING ACTIVITY

Journals:
Journal of Machine Learning Research, Machine Learning, IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Neural Networks, Neurocomputing, Journal of the American Statistical Association, Statistics and Computing, Electronic Journal of Statistics.

Conferences:
Advances in Neural Information Processing Systems, International Conference on Machine Learning, International Conference on Artificial Intelligence and Statistics, Conference on Uncertainty in Artificial Intelligence, European Conference on Machine Learning.

SELECTED TALKS

- The Hamming Ball Sampler, 3rd Meeting on Statistics, 2015.
- Distributed Kernel Representations for Variational Sparse Gaussian Processes, Gaussian Process Approximations Workshop, 2015.
- Variational Inference for Gaussian and Determinantal Point Processes, Advances in Variational Inference NIPS 2014 Workshop, 2014.
- Doubly Stochastic Variational Bayes for non-Conjugate Inference, ICML, 2014.
- Bayesian Gaussian Process Latent Variable Model, AISTATS, 2010.
- Variational Model Selection for Sparse Gaussian Process Regression, BARK, 2008.
- Markov Chain Monte Carlo Algorithms for Gaussian Processes, Newton Institute workshop, 2008.

- Gaussian process modelling of transcription factor networks using Markov chain Monte-Carlo, LICSB, 2008.

TEACHING ACTIVITY

As main instructor in Athens University of Economics and Business:

- Introduction to Computer Programming (Fall 2015).
- Undergraduate Course on Machine Learning. (Spring 2014, Spring 2015).
- Postgraduate Course on Machine Learning. (Spring 2013, Spring 2014, Spring 2015).
- Artificial Intelligence (Fall 2014).
- Statistics for Informatics (Fall 2012, Fall 2013).
- MATLAB lab courses for Computational Mathematics (Fall 2012, Fall 2013).

As teaching assistant in School of Informatics, University of Edinburgh:
Learning from Data (Fall 2001) and Data Mining and Exploration (Spring 2003, Spring 2004).

ACADEMIC SUPERVISION

As the main supervisor:

- Apostolos Adamakos, Optimization of Short-Term Load Forecasting using A Cluster of Artificial Neural Networks, M.Sc in Information Systems, 2015.
- Charalambos Tamvakis. Implementation of the Restricted Boltzmann Machine. B.Sc. thesis, 2015.
- Manolis Christoforou. Hierarchical Mixture Models using Variational Expectation Maximization. B.Sc. thesis, 2015.
- Styliani Loukatou. Implementation of the Hidden Markov Model. B.Sc. thesis, 2014.
- Sevastianos Fournaris. Clustering of Cancer Genomes using Mixtures of Hidden Markov Models. M.Sc in Information Systems, 2014.

As co-supervisor:
I co-supervised (main supervisor was Professor Neil Lawrence) Andreas Damianou in the early stages of his Ph.D thesis: "Deep Gaussian Processes and Variational Propagation of Uncertainty", University of Sheffield, 2015.

GRANTS AND PARTICIPATION IN PROJECTS

- 2012-2014: I participated as a principal investigator in the "Research Funding at AUEB for Excellence and Extroversion, Action 1: 2012-2014" grant.
- 2012-2014: Together with Professor Chris Holmes I awarded a "Lincoln College Michael Zilkha Fund" to support my visits at the Department of Statistics in the University of Oxford.
- Nov 2011 - Sept 2012: I participated as a full time postdoctoral research scientist (Wellcome Trust Center of Human Genetics, Oxford, UK) in the Health Innovation Challenge Fund (HICF-1009-026, WT091989/Z/10/Z), a parallel funding partnership between the Department of Health and Wellcome Trust.
- Oct 2007 - July 2011: I participated as a full time postdoctoral research assistant (University of Manchester, UK) in the EPSRC Grant No EP/F005687/1 "Gaussian Processes for Systems Identification with Applications in Systems Biology".
- Nov 2004 - April 2005: I participated as a technical contributor (University of Edinburgh, UK) for the PASCAL Visual Object Classes Challenge 2005.

- Oct 1999 - June 2001: I participated as a postgraduate research assistant (University of Ioannina, Greece) in the project "Non Destructive Methods for the Estimation of Concrete characteristics", EPET III Project supported by Greek General Secreteriat for Research and Technology.