

# Sinan Yıldırım

## Resumé

Faculty of Engineering and Natural Sciences  
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### Education

- 2009–2013 **PhD**, *Pure Mathematics and Mathematical Statistics, University of Cambridge, UK.*  
2007–2009 **MSc**, *Electrical and Electronics Engineering, Boğaziçi University, Turkey, 4.00/4.00.*

### PhD thesis

- title *Maximum Likelihood Parameter Estimation in Time Series Models Using Sequential Monte Carlo*  
date May, 2013  
supervisor Dr. Sumeetpal S. Singh, Department of Engineering, University of Cambridge, UK

### Work experience

- 2015– **Faculty member**, *Faculty of Engineering and Natural Sciences, Sabancı University, Turkey*, Research and teaching.  
From 01 September 2015
- 2013–2015 **Postdoctoral Research Associate**, *School of Mathematics, University of Bristol, UK*, Member of the EPSRC project “Intractable Likelihood: New Challenges from Modern Applications (i-like)”.  
01 September 2013 to 31 August 2015
- 2014–2015 **Teaching**, *School of Mathematics, University of Bristol, UK*, Example classes for courses on Probability, Statistics, and Linear Algebra & Geometry.  
January 2014 to June 2015
- 2012–2013 **Temporary research conductor**, *Department of Engineering, University of Cambridge, UK*, Research on algorithmic development for multi-target tracking model calibration and testing.  
4 December 2012 to 28 February 2013
- 2011–2013 **Teaching**, *University of Cambridge, UK*, (a) Department of Pure Maths and Math Statistics: Supervised 1B Markov Chains, and currently giving example classes on Part III Time Series and Markov Chains; (b) Department of Engineering: supervised 3M1 Mathematical Methods and gave demonstration in Computing 1B.
- 2008–2008 **Academic visitor**, *Signal Processing and Telecommunications Laboratory, University of Cambridge, UK*, hosted by Prof. W. Fitzgerald, worked with Dr. A. Taylan Cemgil.  
1 August 2008 to 17 September 2008
- 2007–2009 **Teaching Assistant**, *Boğaziçi University, Department of Electrical and Electronics Engineering, Turkey*, helped teaching courses on Signal Processing and Telecommunications.  
December 2007 to June 2009
- 2007–2009 **Academic researcher**, *in the project “Time Series Modelling for Bayesian Source Separation” funded by the Scientific and Technical Research Council of Turkey, Boğaziçi University Signal Processing Laboratory, Turkey.*  
September 2007 to June 2009

## Research

Research Interests Bayesian inference, time series models, Markov chain Monte Carlo, sequential Monte-Carlo, Approximate Bayesian Computation, online parameter estimation, data privacy

### Publications **Journal papers:**

- [PJ1] Lan Jiang, Sumeetpal S. Singh, S. Yıldırım (2015), Bayesian tracking and parameter learning for non-linear multiple target tracking models *IEEE Transactions on Signal Processing*
- [PJ2] S. Yıldırım, Sumeetpal S. Singh, Thomas Dean, Ajay Jasra (2015), Parameter Estimation in Hidden Markov Models with Intractable Likelihoods Using Sequential Monte Carlo, *Journal of Computational and Graphical Statistics*,
- [PJ3] S. Yıldırım, Lan Jiang, Sumeetpal S. Singh, and Thomas Dean (2014), Calibrating the Gaussian Multi-target Tracking Model, *Statistics and Computing*
- [PJ4] S. Yıldırım, Sumeetpal S. Singh, and Arnaud Doucet (2013), An Online Expectation-Maximisation Algorithm for Changepoint Models, *Journal of Computational and Graphical Statistics*
- [PJ5] S. Yıldırım, A. Taylan Cemgil, Mustafa Aktar, Yaman Özakın, and Aysin Ertüzün (2010), A Bayesian Deconvolution Approach for Receiver Function Analysis, *IEEE Transactions in Geoscience and Remote Sensing*
- [PJ6] Deniz Genççağa, Ercan E. Kuruoğlu, Aysin Ertüzün, and S. Yıldırım (2008), Estimation of Time Varying AR S $\alpha$ S Processes using Gibbs Sampling, *Signal Processing*

### **Conference papers:**

- [PC1] Ertunç Erdil, S. Yıldırım, Tolga Taşdizen, Müjdat Çetin (2016) MCMC Shape Sampling for Image Segmentation with Nonparametric Shape Priors, *Computer Vision and Pattern Recognition (CVPR)*
- [PC2] Lan Jiang, Sumeetpal S. Singh, S. Yıldırım, A New Particle Filtering algorithm for Multiple Target Tracking with Non-linear Observations, in the *17'th International Conference on Information Fusion 2014*
- [PC3] S. Yıldırım, Lan Jiang, Sumeetpal S. Singh, and Thomas Dean (2012), A Monte Carlo Expectation Maximisation Algorithm for Parameter Estimation in Multiple Target Tracking, in the *15'th International Conference on Information Fusion 2012*
- [PC4] S. Yıldırım, A. Taylan Cemgil, and Sumeetpal S. Singh (2012), An Online Expectation-Maximisation Algorithm for Nonnegative Matrix Factorisation Models, *SYSID 2012*
- [PC5] S. Yıldırım, A. Taylan Cemgil, and Aysin Ertüzün (2009), A Hybrid Method for Deconvolution of Bernoulli-Gaussian Processes, *IEEE ICASSP 2009*
- [PC6] S. Yıldırım, A. Taylan Cemgil (2011), Forward smoothing and online expectation-maximisation in Gaussian linear state-space models, *IEEE SIU 2011*
- [PC7] S. Yıldırım, Murat Saraçlar (2009), Single channel music and speech separation using non-negative matrix factorization, *IEEE SIU 2009*

### **Workshop (refereed):**

- [PW1] Ertunç Erdil, S. Yıldırım, Tolga Taşdizen, Müjdat Çetin (2017) Image Segmentation with Pseudo-marginal MCMC Sampling and Nonparametric Shape Priors, *NIPS 2017 Workshop on Advances in Approximate Bayesian Inference*
- [PW2] M. Burak Kurutmaz, A. Taylan Cemgil, Umut Şimşekli, S. Yıldırım (2017), Bayesian Nonnegative Matrix Factorization as an Allocation Model, *NIPS 2017 Workshop on Advances in Approximate Bayesian Inference*
- [PW3] Nurdan Kuru, Sinan Yıldırım, İlker Birbil (2017), A Differentially Private Stochastic Gradient Descent Algorithm with Smoothing, *FAIM 2018 Workshop on Privacy in Machine Learning and Artificial Intelligence*

#### In progress **Accepted:**

- Vahid Tavakol, Ahmet Onat and Sinan Yıldırım (2018), A Markov Chain Monte Carlo Algorithm for Bayesian Policy Search, *Systems Science and Control Engineering* accepted

#### **Submitted:**

- S. Yıldırım, Christophe Andrieu, Arnaud Doucet (2018), Scalable Monte Carlo inference in state-space models, submitted to *Biometrika*
- S. Yıldırım, Beyza Ermiş (2018), Exact MCMC with differentially private moves, revision submitted to *Statistics and Computing*
- Ertunç Erdil, S. Yıldırım, Tolga Taşdizen, Müjdat Çetin (2018), Pseudo-marginal MCMC Sampling for Image Segmentation using Nonparametric Shape Priors, submitted to *IEEE Transactions on Image Processing*
- Beyza Ermiş, Taylan Cemgil, S. Yıldırım (2018), Data Sharing via Differentially Private Coupled Tensor Factorization, submitted to *The Journal of Machine Learning Research*

#### **In preparation:**

- Christophe Andrieu, Arnaud Doucet, S. Yıldırım, Nicolas Chopin (2018), On the utility of Metropolis-Hastings with asymmetric acceptance ratio, Technical report: arXiv:1803.09527
- M. Burak Kurutmaz, A. Taylan Cemgil, Umut Şimşekli, S. Yıldırım (2018), Allocation Models: Unifying Bayesian Networks, Topic Models and Bayesian Nonnegative Tensor Factorization, draft available on request
- S. Yıldırım, Didem Koçhan, Umut Şimşekli, A. Taylan Cemgil (2018), Subsampling for Bayesian inference in hidden Markov models, draft available on request
- S. Yıldırım, Hilal Tüysüz, (2018), Online Bayesian changepoint detection in fraud data, draft available on request

## Theses supervised

### Completed

- August 2018 **Hilal Tüysüz**, *Changepoint Model for Bayesian Online Fraud Detection in Call Data*, MSc.
- August 2018 **Didem Koçhan**, *Scalable Monte Carlo Inference In Regression Models With Missing Data*, MSc, Co-supervisor: İlker Birbil.
- January 2018 **Alara Güler**, *Applications of Bayesian Inference for the Origin-Destination Matrix Problem*, MSc, Co-supervisor: İlker Birbil.

### In progress:

- August 2021 **Soner Aydın**, *Differential privacy in database systems*, PhD.
- August 2019 **Nurdan Kuru**, *Novel Gradient-Based Methods For Modern Applications In Data Science*, PhD, Main supervisor: İlker Birbil.
- August 2019 **Vahid Tavakol**, *TBA*, PhD, Main supervisor: Ahmet Onat.

## Talks & presentations

- September 2018 **Bayesian Computation for High-Dimensional Statistical Models (workshop), Singapore**, *Utilising inference in state-space models with multiple paths from conditional sequential Monte Carlo*, talk.
- July 2018 **IMS Workshop, Vilnius, Lithuania**, *Inference in state-space models with multiple paths from conditional SMC*, talk.
- May 2018 **IMBM Probability Days, Boğaziçi University, Turkey**, *Tutorial on Bayesian statistics and Monte Carlo*, talk.
- March 2018 **Bayes Comp 2018 (workshop), Universtat Pompeu Fabra, Barcelona**, *Utilising inference in state-space models with multiple paths from conditional sequential Monte Carlo*, talk.
- November 2017 **Math Seminars, Mimar Sinan Guzel Sanatlar Üniversitesi, İstanbul, Turkey**, *On the Use of Penalty MCMC for Differential Privacy*, talk.

- July 2017 **Scalable Statistical Inference (workshop), Isaac Newton Institute, Cambridge, UK**, *Scalable Monte Carlo inference for state-space models*, talk.
- June 2016 **3rd Ankara-Istanbul Workshop on Stochastic Processes, Ankara, Turkey**, *On the use of penalty MCMC for differential privacy*, talk.
- June 2016 **i-Like Workshop in Lancaster, UK**, *On the use of penalty MCMC for differential privacy*, talk.
- August 2015 **SMC Conference in Paris, ENSAE, Paris, France**, *AIS MCMC for parameter estimation in HMMs*, poster.
- June 2015 **Workshop on Bayesian Inference for Big Data (BIBiD 2015), University of Oxford, UK**, *Facilitating the penalty method for MCMC with large data*, talk.
- May 2015 **i-like Workshop, University of Bristol, UK**, *On an alternative class of exact-approximate MCMC algorithms*, talk.
- February 2015 **Department of Statistics, University of Oxford, UK**, *On an alternative class of exact-approximate MCMC algorithms*, talk.
- February 2015 **Department of Statistics, University College London, UK**, *On an alternative class of exact-approximate MCMC algorithms*, talk.
- December 2014 **Department of Mathematics, University College London, UK**, *On the usefulness of asymmetric acceptance ratio Metropolis-Hastings updates*, talk.
- July 2013 **Department of Electrical and Electronics Engineering, Boğaziçi University, İstanbul, Turkey**, *Parameter estimation in Hidden Markov Models*, talk.
- March 2013 **Department of Statistical Science, University College London, UK**, *Approximate Bayesian Computation for Maximum Likelihood Estimation in Hidden Markov Models*, talk.
- Sept 2012 **Workshop on Recent Advances in Sequential Monte Carlo, Warwick, UK**, *Approximate Bayesian Computation for Maximum Likelihood Estimation in Hidden Markov Models*, talk.
- April 2012 **SuSTaIn 2012, Bristol, UK**, *ABC Maximum Likelihood Estimation for Hidden Markov Models with intractable likelihoods*, poster.
- June 2010 **ISBA 2010 World Meeting, Valencia, Spain**, *Offline and online expectation-maximisation via forward smoothing in changepoint systems*, poster.

## ■ Honours

- 2012 Travel grant awarded by the conference Fusion 2012
- 2011 Smith-Knight & Rayleigh-Knight Prize (with many other winners)
- 2009 PhD scholarship awarded by Cambridge Statistics Initiative for three years
- 2009 MAN Group PhD award for three years
- 2002 Ranked 10th in the National University Entrance Exam (among 1,600,000 candidates)

## ■ Computer skills

Coding MATLAB, C, Python, R.