

# Jesper Løve Hinrich

## Contact

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 jlhinrich

 JesperLH

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## Personal Traits

Critical thinking  
Social  
Curious  
Self-motivating  
Creative

## Skills

Statistical Modelling  
Machine Learning  
Signal Processing  
Bayesian Statistics  
Deep Learning  
Scientific Writing  
Visualization  
Presentation

## Languages

Danish (native)  
English (fluent)

## Programming Languages

MATLAB (+6 y)  
Python (+3 y)  
Java (+3 y)  
C++ (2 y)

## Research Profile

Postdoc at Technical University of Denmark, Dept. for Applied Mathematics and Computer Science, doing research on improve quantification and identification of chemicals in biological samples.

The overarching theme of my research is statistical machine learning for challenges in biological, chemical, and physical systems. My focus areas are statistical modelling, Bayesian inference, multi-way and high dimensional data, and high performance computing.

## Work Experience

2022– **Technical University of Denmark, DTU Compute**  
Post.doc.: Research in shift-invariant methods for multi-dimensional data, multi-way decomposition, 1D and 2D nuclear magnetic resonance data.

2020–2022 **University of Copenhagen, Dept. Food Science**  
Post.doc.: Research in multi-way analysis, statistical machine learning, causal inference, and data fusion. Applications are targeted the Life Sciences, especially untargeted analysis of chromatography (gas, liquid, two-dimensional) data, time-resolved fluorescence spectroscopy, connecting chemicals to toxicity (in model systems), and low level data fusion (genetics, metabolomics, medical history, etc) for precision health and nutrition.

2018–2019 **Duke University, Department of Statistical Science.**  
Oct–April Visiting Scholar: Collaboration on Bayesian statistics, tensor models, and longitudinal data analysis. Research, networking, and attending scientific seminars.

2016 **Technical University of Denmark, DTU Compute, Section for Cognitive Systems.**  
Research Assistant: Machine learning for neuroimaging. Particularly, decomposition methods for high dimensional fMRI data. I also supervised projects in the context of Advanced Machine Learning.

2015 **Rigshospitalet, Centre for Clinical Education**  
Jun–Dec Data Science Consultant: Data preprocessing, statistical analysis and visualization for relating experience and social relations between members of the hospitals trauma team to patient outcome.

2011–2015 **Technical University of Denmark**  
Teaching Assistant: Advising the students, feedback and grading assignment, course development. Total teaching experience (in-class and preparation) is over 1000 hours.  
**Selected courses:** Non-Linear Signal Processing (02457), Data mining and machine learning (02450), Time-series analysis (02417), Meta-heuristics (42137), Operations research (42101), Algorithms and data structures I (02105) and Software technology (02121).

## Education

2017–2020 **Ph.D. in Probabilistic Machine Learning and Tensor Modelling**  
Section for Cognitive Systems, DTU Compute, Technical University of Denmark (DTU).  
• **Research:** Statistical Machine Learning, Unsupervised Learning, Bayesian Inference, and Multi-way modelling within the Life Sciences.  
• **Thesis:** Development of multi-way/tensor decomposition methods with application to neuroscience (fMRI, EEG), gene expressions, and chemometrics.

2014–2016 **M.Sc. Eng. in Mathematical Modeling and Computation**  
Technical University of Denmark.  
**Certificate:** Specialization in Big Data and Data Science

2010–2014 **B.Sc. Eng. in Mathematics and Technology**  
Technical University of Denmark .  
**Exchange stay:** One semester at San Francisco State University, California, USA.

## Volunteer Experience

I am part of the newly (2022) established Danish Data Science Academy as an appointed member of the Young Academic Panel (<https://ddsa.dk/organization/yap/>). An initiative to improve

Data Science research, industrial applications, and the DS environment in Denmark. Here, I sit on the organising committees of the Pre-Graduate retreat (targeting M.Sc. and young professionals) and the annual Danish Data Science conference (targeting the Danish DS environment).

## Presentations, Invited Talks, and Awards

I have participated in 6 international conferences (5 papers, 4 talks, 2 posters), 3 international workshops (3 talks) and 1 national conference. I was **invited speaker** at DSK2020 (hosted by the Danish Society for Chemometrics) and at AI and Tensor Factorizations for Physical, Chemical, and Biological Systems 2019, Sept. (hosted by Los Alamos National Lab., Sandia National Lab., National Science Foundation, and UC San Diego). I received a **Best Student Paper** award at the International Workshop on Machine Learning for Signal Processing 2018.

## Review Experience

IEEE Transactions on Signal Processing (2019-), Journal of Chemometrics (2020), Springer Psychometrica (2019-), De Gruyter Statistical Applications in Genetics and Molecular Biology (2019), IEEE Transactions on Medical Imaging (2018), IEEE International Conference on Acoustics, Speech, and Signal Processing (2017).

## Teaching Experience

Guest lecturing in Adv. Chemometrics and Machine Learning (NFOK21000U, 2022) and Food Quality Management and Control (NFOK15011U, 2021). Course development: Control charts material and demonstration app (freely available at <https://github.com/JesperLH/ControlChartApp>) in Food Quality Management and Control (2020-2021), Python toolbox migration (2.x to 3.x) and improvement in Introduction to Machine Learning (DTU-02450, 2017-2018). Project supervision: Thesis (B.Sc. and M.Sc.) and Special courses (M.Sc. students). Lastly, as a teaching assistant I have taught and provided feedback to students for over 1000 hours in a diverse set of courses related to software engineering, machine learning, statistics, operations research and optimization.

## Funding

Below are listed funding proposal of which I have been part of, either formally - as applicant or named candidate - or informally as a co-writer to the proposals. The latter stemming from my position as a Postdoc not requiring funding applications and few funding opportunities for Postdocs as the main applicant.

### Funding Obtained

1. (2022-, 6.1m DKK) Grant from Independent Research Fond Denmark - DFF2-Research Project 2 on "Learning to EXplore the 2nd Order Advantage of 2D NMR (LEX2)" - PI Morten Mørup (DTU), my role was as **co-writer & named candidate**.
2. (2018-2019, 135k DKK) Research stay at Duke from StiboFonden, Otto Mønstedts Fond, Oticon Fond, Augustinus Fond, and Jorcks stipendium - **main applicant**.
3. (2017-2020) Full Ph.D. Scholarship (3y) at DTU Compute, **main applicant**.

## Publications

Peer-reviewed publications: 8 journal articles and 7 conference articles. I am the first / corresponding author of Google Scholar: 108 citations, h-index 6 as of January 2024. Scopus: 66 citations, h-index 5 as of January 2024, Semantic Scholar: 95 citations, h-index 5, as of January 2024.

### Journal Papers

1. Bech Risum, A.\*, **Hinrich, J. L.\***, Rinnan, Å. (2023). Multiway Decomposition Followed by Reconvolution of Fluorescence Time Decay Data. *Analytical Chemistry*.
2. Armstrong, M. D. S., **Hinrich, J. L.**, de la Mata, A. P., & Harynuk, J. J. (2023). PARAFAC2× N: Coupled decomposition of multi-modal data with drift in N modes. *Analytica Chimica Acta*, 1249, 340909.
3. Olsen, A. S., Høegh, R. M. T., **Hinrich, J. L.**, Madsen, K. H., & Mørup, M. (2022). Combining Electro-and Magnetoencephalography Data using Directional Archetypal Analysis. *Frontiers in Neuroscience*, 1256.
4. Andersen, B. R., Ammitzbøll, I., **Hinrich, J.**, Lehmann, S., Ringsted, C. V., Løkkegaard, E. C. L., & Tolsgaard, M. G. (2022). Using machine learning to identify quality-of-care predictors for emergency caesarean sections: a retrospective cohort study. *BMJ open*, 12(3), e049046.

5. **Hinrich, J. L.**, Madsen, K. H., & Mørup, M. (2020). The probabilistic tensor decomposition toolbox. *Machine Learning: Science and Technology*, 1(2), 025011.
6. Andersen, B. R., **Hinrich, J. L.**, Rasmussen, M. B., Lehmann, S., Ringsted, C., Løkkegaard, E., & Tolsgaard, M. G. (2019). Social ties between team members affect patient satisfaction: a data-driven approach to handling complex network analyses. *Advances in Health Sciences Education*, 1-26.
7. Krohne, L. G., Wang, Y., **Hinrich, J. L.**, Mørup, M., Chan, R. C., & Madsen, K. H. (2019). Classification of social anhedonia using temporal and spatial network features from a social cognition fMRI task. *Human brain mapping*, 40(17), 4965-4981.
8. **Hinrich, J.L.**, Bardenfleth, S.E., Røge, R.E., Churchill, N. W., Madsen, K.H. and Mørup, M. (2016). "Archetypal Analysis for Modeling Multi-Subject fMRI Data". *IEEE Journal on Selected Topics in Signal Processing*, Special Issue on Advanced Signal Processing in Brain Networks.

#### Conference Papers

9. **Hinrich, J. L.**, & Mørup, M. (2019, September). Probabilistic Tensor Train Decomposition. In 2019 27th European Signal Processing Conference (EUSIPCO) (pp. 1-5). IEEE.
10. Jørgensen, P. J. H., Nielsen, S. F., **Hinrich, J. L.**, Schmidt, M. N., Madsen, K. H., & Mørup, M. (2019). Analysis of Chromatographic Data using the Probabilistic PARAFAC2. In Thirty-Third Annual Conference on Neural Information Processing Systems.
11. **Hinrich, J.L.**, Nielsen, S.F., M.N., Madsen, K.H. and Mørup, M. (2018, September). Variational Bayesian Partially Observed Non-Negative Tensor Factorization. In *Machine Learning for Signal Processing (MLSP)*, 2018 IEEE International Workshop. IEEE. **(Best Student Paper Award)**
12. **Hinrich, J. L.**, & Mørup, M. (2018, July). Probabilistic Sparse Non-negative Matrix Factorization. In *International Conference on Latent Variable Analysis and Signal Separation* (pp. 488-498). Springer, Cham.
13. **Hinrich, J.L.**, Nielsen, S.F., Riis, N.A., Eriksen, C.T., Frøsig, J., Kristensen, M.D., Schmidt, M.N., Madsen, K.H. and Mørup, M. (2017). "Scalable Group Level Probabilistic Sparse Factor Analysis". *International Conference on Acoustics Speech and Signal Processing*, Special Session on Functional MRI Analysis in a Big Data Era.
14. Belieau, V., Papoutskaïs, G., **Hinrich, J.L.** and Mørup, M. (2016). "Sparse Probabilistic Parallel Factor Analysis for the modeling of PET and task-fMRI data", *Medical Computer Vision and Bayesian and Graphical Models for Biomedical Imaging*. Springer.
15. **Hinrich, J.L.**, Nielsen, S.F.V., Madsen, K.H. and Mørup, M. (2016). "Variational Group-PCA for Intrinsic Dimensionality Determination in fMRI Data". *The 6th International Workshop on Pattern Recognition in Neuroimaging*.

#### Non-peer-reviewed Papers or Preprints

16. **Hinrich, J. L.**, & Mørup, M. (2023). Probabilistic Block Term Decomposition for the Modelling of Higher-Order Arrays. arXiv preprint arXiv:2310.02694. **Under review** at *IEEE Computing in Science and Engineering*.
17. Quintanilla-Casas, B., Bro, R., **Hinrich, J. L.**, & Davie-Martin, C. L. (2023) Tutorial on PARADISE: PARAFAC2-based Deconvolution and Identification System for processing GC–MS data. **Tutorial paper**.