Ricardo Pio Monti

CONTACT
INFORMATION

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Italian, Argentine citizen

PROFILE

I am an experienced and motivated researcher whose primary goal is to develop novel statistical methodology with a view to addressing some of the challenges faced by modern data analysis. My research lies at the intersection of statistical methodology and applications, primarily focusing on the study of neuroimaging data.

EXPERTISE

- Graphical models - see publications 4, 8
- Optimization (particularly convex optimization) - see publications 1, 7
- Causal discovery - see publications 10, 21
- Machine learning applications in neuroscience - see publications 2, 6, 14
- Deep learning - see publications 9, 10, 13

EXPERIENCE

- **Postdoctoral training fellow, *Gatsby Unit, UCL***   April 2017 — Present

  Working under the supervision of Prof. Aapo Hyvärinen. My current research focuses on exploiting recent advances in non-linear independent component analysis as well as deep learning methods to develop novel algorithms for causal discovery. Previous projects have related to the development of novel latent variable models to address challenges in neuroimaging data analysis.

- **Visiting Researcher, *ATR Brain Research Lab, Kyoto, Japan***   March 2019 — June 2019

  Visiting researcher within the Brain Information Research group over a three month period. Collaborated with local researchers to develop and implement bespoke algorithms for the analysis of large-scale fMRI datasets.

- **Consultant, *Mentat Innovations***   January 2017 — March 2017

  Mentat Innovations is a small consultancy focused on delivering data science driven solutions to challenges in cyber-security. Working with a major financial services provider, my role consisted in implementing and validating anomaly detection models in the context of physical security.

- **Data Science Intern, *Spotify***   July 2016 — Sept 2016

  Spotify is a leading music streaming service with over 100 million users. Working within the Analytics Research team, my role consisted of quantifying the stability and robustness of in-house music recommendation systems; resulting in several suggestions to improve performance and interpretability of recommendations.

- **Data Scientist, *DataKind***   Sept 2014 — Sept 2015

  DataKind is a volunteering organization which allows data scientists to donate their skills to charities. Over the course of one year I was involved with a large UK charity helping quantify the impact of their programs and identifying areas for further investment of resources.

EDUCATION

Imperial College London

Ph.D., Statistics   October 2012 — April 2017
- Advisors: Dr. Anagnostopoulos and Prof. Montana
- Thesis Overview: *Penalized likelihood methods for covariance selection in the context of non-stationary data*

MSci., Mathematics   October 2008 — June 2012
- 1$^{\text{st}}$ Class Honours
- Scorex Prize for Academic Excellence
- Final Year Project: *Sequential Monte Carlo methods to predict results in tennis matches*

PUBLICATIONS

Journal and international conference publications

1. **Monti, R. P.**, *et al.*, (2014). "Estimating Time-varying Brain Connectivity Networks from Functional MRI Time Series", *NeuroImage* (103):427-443   [Code]

2. Lorenz, R., **Monti R. P.**, *et al.*, (2016). "The automatic neuroscientist: A framework for optimizing experimental design with closed-loop real-time fMRI", *NeuroImage* (129):320-334
                              [Imperial College Press Coverage] [Wired article]

3. **Monti, R. P.**, *et al.*, (2017). "Real-time estimation of dynamic functional connectivity networks", *Human Brain Mapping*, (38):202-220

4. **Monti, R. P.**, *et al.*, (2017). "Learning population and subject-specific brain connectivity networks via Mixed Neighborhood Selection", *Annals of Applied Statistics*, (11):2142-2164 [Code]

5. **Monti, R. P.**, *et al.*, (2017). "Decoding time-varying functional connectivity networks via linear graph embedding methods", *Frontiers in Computational Neuroscience*, (11):1-12

6. Lorenz, R., Violante, I.*, **Monti R. P.***, *et al.*, (2018). "Dissociating frontoparietal networks using neuroadaptive Bayesian optimization". *Nature Communications*, (9):1227.

7. **Monti, R. P.**, *et al.*, (2018). "Adaptive regularization for Lasso models in the context of nonstationary data streams", *Statistical Analysis and Data Mining: The ASA Data Science Journal*, (5):237-247   [Code]

8. **Monti R. P.**, Hyvärinen, A., (2018). "A Unified Probabilistic Model for Learning Latent Factors and Their Connectivities from High-Dimensional Data", *34th Conference on Uncertainty in Artificial Intelligence*   [Code]

9. **Monti R. P.**, Tootoonian S., Cao R., (2018). "Avoiding degradation in deep feed-forward networks by phasing out skip-connections" *International Conference on Artificial Neural Networks*, 447-456

10. **Monti R. P.**, Zhang K., Hyvärinen, A., (2019). "Causal discovery with general non-linear relationships using non-linear ICA", *35th Conference on Uncertainty in Artificial Intelligence*

11. Lorenz R., Simmons L.*, **Monti, R. P.***, *et al.*, (2019). "Assessing tACS-induced phosphene perception using closed-loop Bayesian optimization", *Brain Stimulation*.

12. Zbonakova L., **Monti R. P.**, Härdle W., (2019). "Towards the interpretation of time-varying regularization parameters in streaming penalized regression models", *Pattern Recognition Letters*, (125):542-548

13. Khemakhem, I., Kingma, D.P., **Monti R. P.**, Hyvrinen, A., (2020). "Variational autoencoders and nonlinear ICA: A unifying framework", *23rd International Conference on Artificial Intelligence and Statistics*

14. Tei S., Kauppi, J-P., Jankowski K. F., Fujino J., **Monti R. P.**, *et al.*, (2020). "Brain and behavioral alterations in subjects with social anxiety dominated by empathic embarrassment", *Proceedings of the National Academy of Sciences*, To Appear

International workshop publications

15. **Monti, R. P.**, *et al.*, (2015). "Graph embeddings of dynamic functional connectivity reveal discriminative patterns of task engagement in HCP data", *International Workshop on Pattern Recognition in NeuroImaging*. Stanford, CA, USA   [Awarded best student paper]

16. Lorenz, R.*, **Monti, R. P.***, *et al.*, (2015). "Stopping criteria for boosting automatic experimental design using real-time fMRI with Bayesian optimization", *NeurIPS Workshop on Machine Learning and Interpretation in Neuroimaging*. Montreal, Canada

17. **Monti, R. P.**, *et al.*, (2016). "Text-mining the NeuroSynth corpus using deep Boltzmann machines", *International Workshop on Pattern Recognition in NeuroImaging*. Trento, Italy

18. Chung A., Pesce E., **Monti, R. P.**, Montana G., (2016). "Classifying HCP task-fMRI networks using heat kernels", *International Workshop on Pattern Recognition in NeuroImaging*. Trento, Italy

19. Lorenz R., **Monti, R. P.**, *et al.*, (2016). "Towards tailoring non-invasive brain stimulation using real-time fMRI and Bayesian optimization", *International Workshop on Pattern Recognition in NeuroImaging*. Trento, Italy

20. **Monti R. P.**, Hyvärinen, A., (2018). "A latent variable model for simultaneous dimensionality reduction and connectivity estimation", *14th International Conference on Latent Variable Analysis and Signal Separation*. Guildford, UK

21. **Monti R. P.**, Zhang K., Hyvärinen, A., (2018). "NonSENS: Non-Linear SEM Estimation using Non-Stationarity", *NeurIPS Workshop on Causal Learning.* Montreal, Canada

Preprints

22. **Monti, R. P.**, *et al.*, (2020). "Interpretable brain age prediction using linear latent variable models of functional connectivity", *Under Review.*

23. Sasaki H., Takenouchi T., **Monti R. P.**, Hyvärinen A., (2020). "Robust contrastive learning and nonlinear ICA in the presence of outliers", *Under Review.*

HONOURS AND AWARDS	• **Student Paper Award** June 2015 International Workshop on Pattern Recognition in Neuroimaging, Stanford University • **Faculty of Natural Science Award for Excellence in Teaching** May 2013 Imperial College London • **Scorex Prize for Academic Excellence** May 2012 Imperial College London

SUPERVISION

- Ka Wai Lam, *MSci Natural Science, UCL*   Oct 2018 — March 2019
    - Project title: "Understanding heterogeneity in large-scale fMRI datasets"
- Pedro Costa, *MSci Comp. Nueroscience, Imperial College London*   June 2017 — Oct 2018
    - Project title: "Elucidating cognitive processes using LSTMs"
    - Now PhD student at King's College London
- Jenessa Lancaster, *MRes Experimental Nueroscience, Imperial College London*   Summer 2017
    - Project title: "Deep learning for text-mining the NeuroSynth Corpus"
    - Now Data Scientist at Ocado Technology

SOFTWARE

- **pySINGLE**: Python implementation of the SINGLE algorithm described in Monti *et al.,* (2014).
- **MNS**: R package for estimating multiple related functional connectivity networks via Mixed Neighborhood Selection, described in Monti, Anagnostoupolos and Montana (2017). Available on CRAN.
- **rRAP**: R package for real-time adaptive penalization for streaming Lasso models, as described in Monti, Anagnostoupolos and Montana (2018). Available on CRAN.
- **DeepTextMining**: Python implementation of deep Boltzmann machines applied to text-mining the NeuroSynth corpus, as described in Monti *et al.,* (2016).

SKILLS

- Programming (proficient) — R, Python
- Programming (working knowledge) — SQL, Shell scripting, C
- Languages — Spanish (native), English (native), Italian (Basic), Japanese (elementary)

SERVICE

- Reviewing submissions:
    - Journals: Journal of Machine Learning Research, Computational Statistics and Data Mining, NeuroImage
    - Conferences: NeurIPS 2018, ICML 2018, AISTATS 2019, NuerIPS 2019
- Member of UCL Intellectual Property Rights working group

REFERENCES   Available upon request